OPERATION MANUAL

MULTIQUIP®

MQ POWER®

MODELS
SG1400C4F
SG1600C4F
STUDIO GENERATOR
(CUMMINS QSB7-G9 DIESEL ENGINE)

Revision #0 (07/22/20)

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

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.


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

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Multiquip Inc. at 1-800-421-1244.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Multiquip Inc.

To contact NHTSA, you may either call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153), go to *http://www.safercar.gov*; or write to:

Administrator
NHTSA
1200 New Jersey Avenue, SE
Washington, DC 20590

You can also obtain information about motor vehicle safety from *http://www.safercar.gov.*

SG1400C4F/SG1600C4F Studio Generator

NOTICE

Specifications are subject to change without notice.

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.

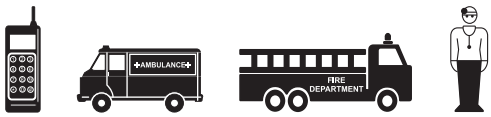
- **ALWAYS** check the equipment for loosened threads or bolts before starting.
- **DO NOT** use the equipment for any purpose other than its intended purposes or applications.

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.

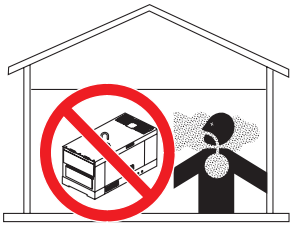
NOTICE

- **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** operate generator with doors open. Stop the engine before servicing**.**
- **DO NOT** remove the radiator cap while the engine is hot. High pressure boiling water will gush out of the radiator and severely scald any persons in the general area of the generator.

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

⚠ CAUTION

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing 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 30–35% of the rated output), it will not operate at its optimum temperature. This will allow unburned fuel to accumulate in the exhaust system, which can foul the fuel injectors, engine valves and exhaust system, including turbochargers, and reduce the operating performance.

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

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

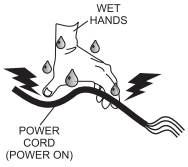
- **NEVER** insert any objects into the output receptacles during operation. This is extremely dangerous. The possibility exists of **electrical shock, electrocution or death.**

- 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 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	SG1400C4F/SG1600C4F	
Type	Revolving field, self ventilated, open protected type synchronous generator	
Armature Connection	12-Lead WYE	
No of Poles	4	
Prime Output	282 hp (210 kWm)	
1Ø Voltage	120/240 V	
3Ø Voltages	120/208 V and 277/480 V	
Frequency	60 Hz	
Voltage Regulation (no load to full load)	±1%	
Frequency Regulation (steady state load)	±0.25%	
Speed	1800 rpm	
Power Factor	0.8	
Aux. AC Voltage	120/240V, 60 Hz	
Weight (Generator Only)	6,600 lbs. (2,994 kg)	
Weight (Trailer Only)	2,580 lbs. (1,170 kg)	
Table 2. Engine Specifications		
Model	Cummins QSB7-G9	
Emissions	Tier 4	
Type	4 cycle, direct injection, turbocharged, charge air cooled, EGR, DOC, SCR	
No. of Cylinders	6 cylinders	
Bore x Stroke in (mm)	4.21 x 4.88 (107 x 124)	
Displacement	409 cu. in. (6.7 liters)	
Rated Output	282 HP/1800 RPM	
Starting	Electric	
Coolant Capacity	12 gallons (45 liters)	
Lube Oil Capacity	5.0 gal. (19.0 liters)	
Fuel Type	#2 Diesel Fuel	
Fuel Consumption	13.5 gal. (51.1 L)/hr at **full load**	10.3 gal. (38.9 L)/hr at **3/4 load**
	7.2 gal. (27.3 L)/hr at **1/2 load**	4.1 gal. (15.5 L)/hr at **1/4 load**
DEF Tank Capacity	10 gal. (37.8 L)	
Table 3. Battery Specifications		
Battery (Top Post)	12V 750 CCA x 2 (24 VDC System) Group 27	
Dimensions HxWxL in. (cm)	8 x 12 x 6.6 (20.3 x 30.5 x 16.8)	

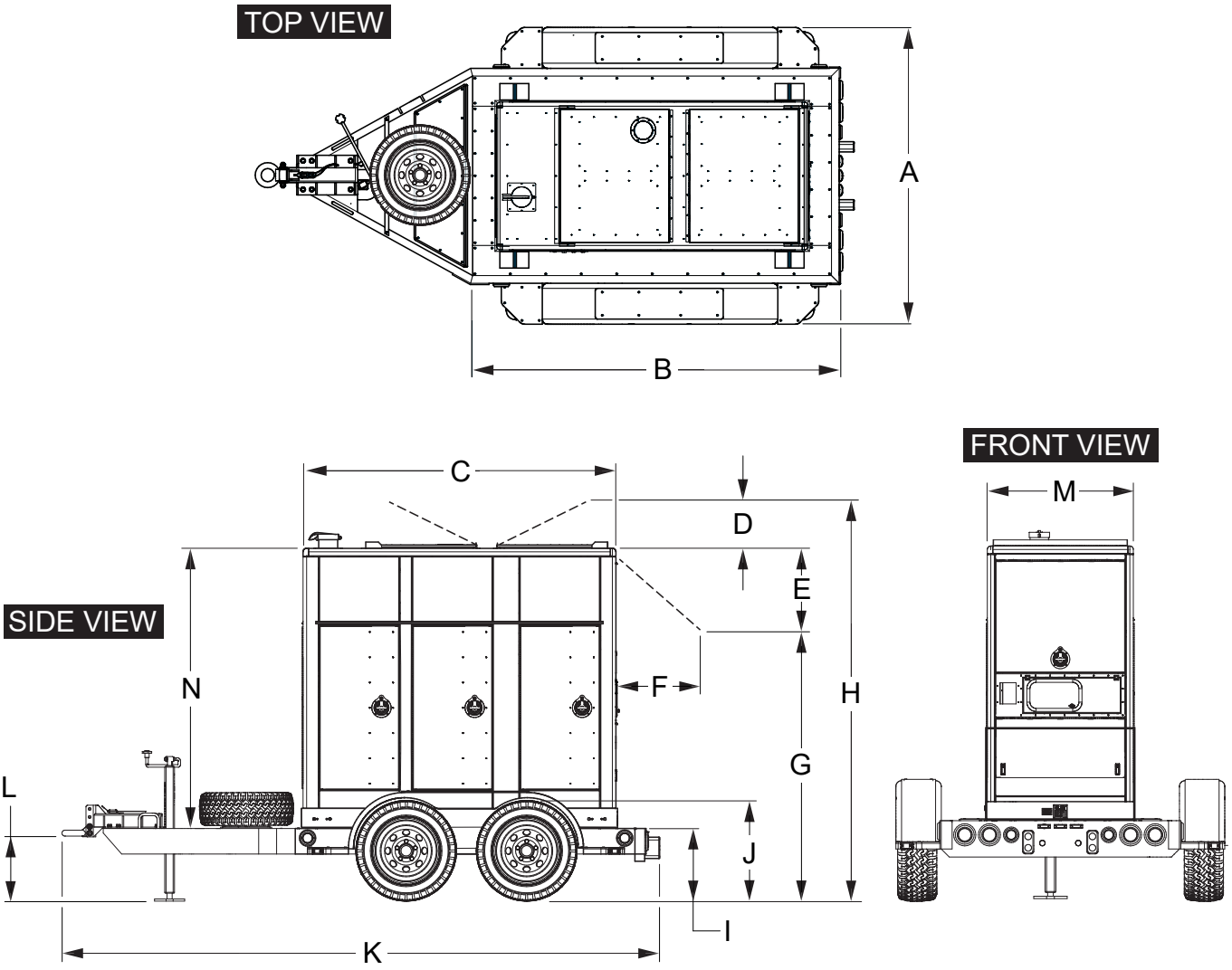


Figure 1. Dimensions

Table 4. Dimensions			
Reference Letter	**Dimensions in. (mm)**	**Reference Letter**	**Dimensions in. (mm)**
A	92 (2,336.8)	I	22.5 (571)
B	119.6 (3,038.6)	J	23 (584) Chrome Wheels
C	100 (2,514.6)	J	24 (610) Aluminum Wheels
D	25.25 (641.3)	K	183.75 (4,667.25)
E	31.5 (800.1)	L	22.125 (561.97)
F	25.5 (647.7)	M	48 (1,219.2)
G	79.5 (2,019.3)	N	112 (2, 844.8)
H	136.25 (3,460.8)		

NOTICE

Trailer mounted generators have a fuel tank located inside the trailer frame. Fuel tank capacity is 145 gallons (548 liters). Skid mount generators have no fuel tank and will require an external fuel system.

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.

Either copper or aluminum wire can be used as the ground cable. Cable size is determined by the maximum amperage of the generator. Reference Conductor Grounding Table, Article 250 of the NEC handbook.

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).

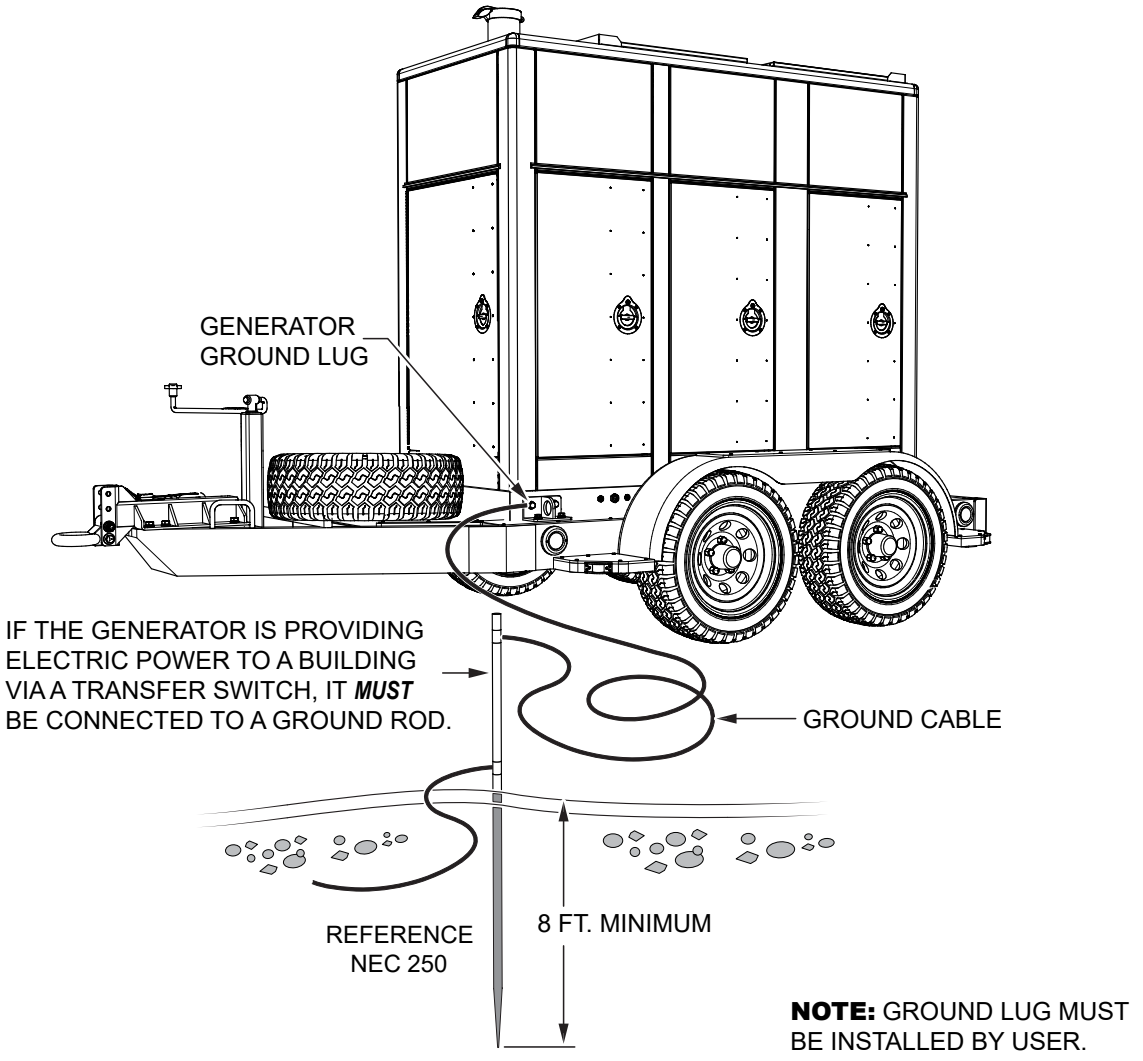


Figure 2. Typical Generator Grounding Application

OUTDOOR INSTALLATION

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

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

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

⚠ CAUTION

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

INDOOR INSTALLATION

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

MOUNTING

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

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 a 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 the 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.

1. Use one of the following wire types to connect the generator to earth ground.
   a. Copper
   b. Aluminum

NOTICE

Reference Conductor Grounding Table, Article 250 of the NEC handbook for proper conductor wire size. Wire size is determined by the maximum amperage of the generator.

2. When grounding of the generator (Figure 2) is required, connect one end 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 feet into the ground.

NOTICE

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

Generator

The MQ Power Model SG1400C4F/SG1600C4F is a studio generator that is designed as a high quality power source for entertainment and studio applications.

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

Permanent Magnet Generator Excitation System

This generator is equipped with a PMG (Permanent Magnet Generator) generator end. The excitation system provides a minimum short circuit support current of 300% of the standby rating for 10 seconds at 60 Hz, and approximately 275% at 50 Hz.

Both the PMG and the exciter are mounted outboard of the bearing for ease of maintenance. The rotating brushless exciter features hermetically sealed diodes for three-phase full-wave rectification. The three-phase bridge is protected against abnormal transient conditions by a multiplate selenium surge protector.

Engine

This generator is powered by a six-cylinder, 4-cycle direct injection, turbocharged, air-cooled Cummins QSB7-G9 diesel engine. Engine speed is set at the factory at 1800 RPM. This engine is designed to meet every performance requirement for the generator. Refer to Table 2 for engine specifications.

Principle Of Operation

This generator is a brushless, self-excited, externally voltage regulated, synchronous AC generator. The generator is made up of six major components: main stator (armature), main rotor (field), exciter stator (field), exciter rotor (armature), rectifier assembly, and voltage regulator.

The generator's exciter consists of a stationary field and a rotating armature. The stationary field (exciter stator) is designed to be the primary source of the generator's residual magnetism. This residual magnetism allows the exciter rotor (armature) to produce AC voltage even when the exciter stator (field) is not powered. This AC voltage is rectified to DC by the rotating rectifier assembly and fed directly to the main rotor (field). As the generator shaft continues to rotate, the main rotor (field) induces a voltage into the generator's main stator (armature).

At rated speed, the main stator's voltage produced by the residual magnetism of the exciter allows the automatic voltage regulator to function.

The regulator provides voltage to the exciter resulting in a build-up of generator terminal voltage. This system of using residual magnetism eliminates the need for a special field flashing circuit in the regulator. After the generator has established the initial residual voltage, the regulator provides a controlled DC field voltage to the exciter stator resulting in a controlled generator terminal voltage.

Voltage Regulation

In the standard configuration (shunt excited), the automatic voltage regulator receives both its input power and voltage sensing from the generator's output terminals. The regulator automatically monitors the generator's output voltage against an internal reference set point and provides the necessary DC output voltage to the exciter field required to maintain constant generator terminal voltage. The generator's terminal voltage is changed by adjusting the regulator's reference set point.

Electronic Governor System

The electronic governor system controls the RPMs of the engine. When the engine demand increases or decreases, the governor system regulates the frequency variation to ± 0.25%.

Battery

The battery system is located in the engine compartment on the sub-base. The battery's primary purpose is to provide starting power for the diesel engine starter motor. The battery system is comprised of two 12 VDC, sealed lead acid batteries wired in series to provide 24 VDC to the starting motor. The battery is charged by the charging alternator while the engine is engaged.

Exhaust System

The exhaust system is located above the diesel engine. The exhaust system is comprised of rigid and flexible tubing, a silencer, and a roof-mounted exhaust riser with a rain cap.

Fuel Tank

This generator can be equipped with a 150 gallon (567 liters) fuel tank located beneath the trailer deck. The tank is made of steel (baffled). The tank can be filled from an external fill port located on the side of the trailer. The fill port has a 2-inch (51 mm) fill neck with vented cap.

When refueling, it is recommended to use ASTM-D975/No. 2 diesel fuel. A drain port is provided on the end of the tank.

Fuel Priming Pump

The generator set is equipped with an electric (24 VDC) fuel priming pump to assist in priming the system for maintenance purposes. The priming pump, bypass valves, and priming switch are located on the side of the diesel engine in the engine compartment.

Fuel Water Separator

A 30-micron Racor 900 fuel water separator is part of the fuel system assembly and is located on the side of the engine in within the enclosure compartment.

The supply line between the engine fuel pump and tank passes through an in-line fuel/water separator filter. The filter element is rated to filter elements down to 10 microns.

Intake Ventilation Door

The intake air ventilation door is located on the roof of the generator set enclosure near the control panel. The door is hydraulically actuated. Upon startup of the diesel engine, pressure fills the cylinder and opens the door. Intake air passes through the opening, and across the engine's radiator to cool the engine.

During rainy conditions the roof ventilation door will close when the front ventilation door is opened.

Interior Lighting

The interior lighting system is distributed throughout the interior. There are three separate lighting fixtures. Two lights are in the engine compartment, and one light is in the generator compartment. The lighting system operates from the 24 VDC battery system.

The light fixtures are sealed incandescent bulbs which are activated by a 0-15 minute timer switch located on the side control panel box. The DC lighting system can be used to perform off-line maintenance or assist in setup prior to AC power connection.

Trailer (Optional)

If equipped, the generator set can be mounted on a tandem axle trailer. Standard trailer is available with 8-lug chrome wheels and electric or hydraulic brakes. Options may include electric jack stands, adjustable hitch, ground rod holder and rear stabilizing jacks.

OPTIONS

- **277/480 Volt Three-Phase with Three-Position Selector Switch (derate to 1400 Amps)**
- **Paralleling**
- **Custom Paint Color**
- **Hubble Connector (50 amp / 120/240V)**
- **3 kVA Transformer**
- **Exterior LED Lighting Package**
- **Custom Outlet Panel**
- **Fire Extinguisher Flush Mounted in Housing**
- **Block Heater**
- **Battery Charger**
- **Battery Disconnect Switch**
- **Forklift Pocket Skid Base**

InteliVision 5 ™ Digital Controller

The InteliVision 5 Digital Controller provides monitoring and fault detection capability of all engine and generator operating parameters. A list of operating parameters is shown below:

- 5.7" Color Display
- Generator Measurement: U, I, Hz, kW, kVAr, kVA, PF, kWh, kVAhr
- RS232/RS485 Interface with Modbus support; Analog/ GSM/ISDN/CDMA modem support; SMS messages; ECU Modbus Interface
- Event-based history (up to 500 records) with customer selectable list of stored values; RTC; statistic values
- 3-phase integrated generator protection
- IDMT Overcurrent + Shortcurrent Protection
- Overload Protection

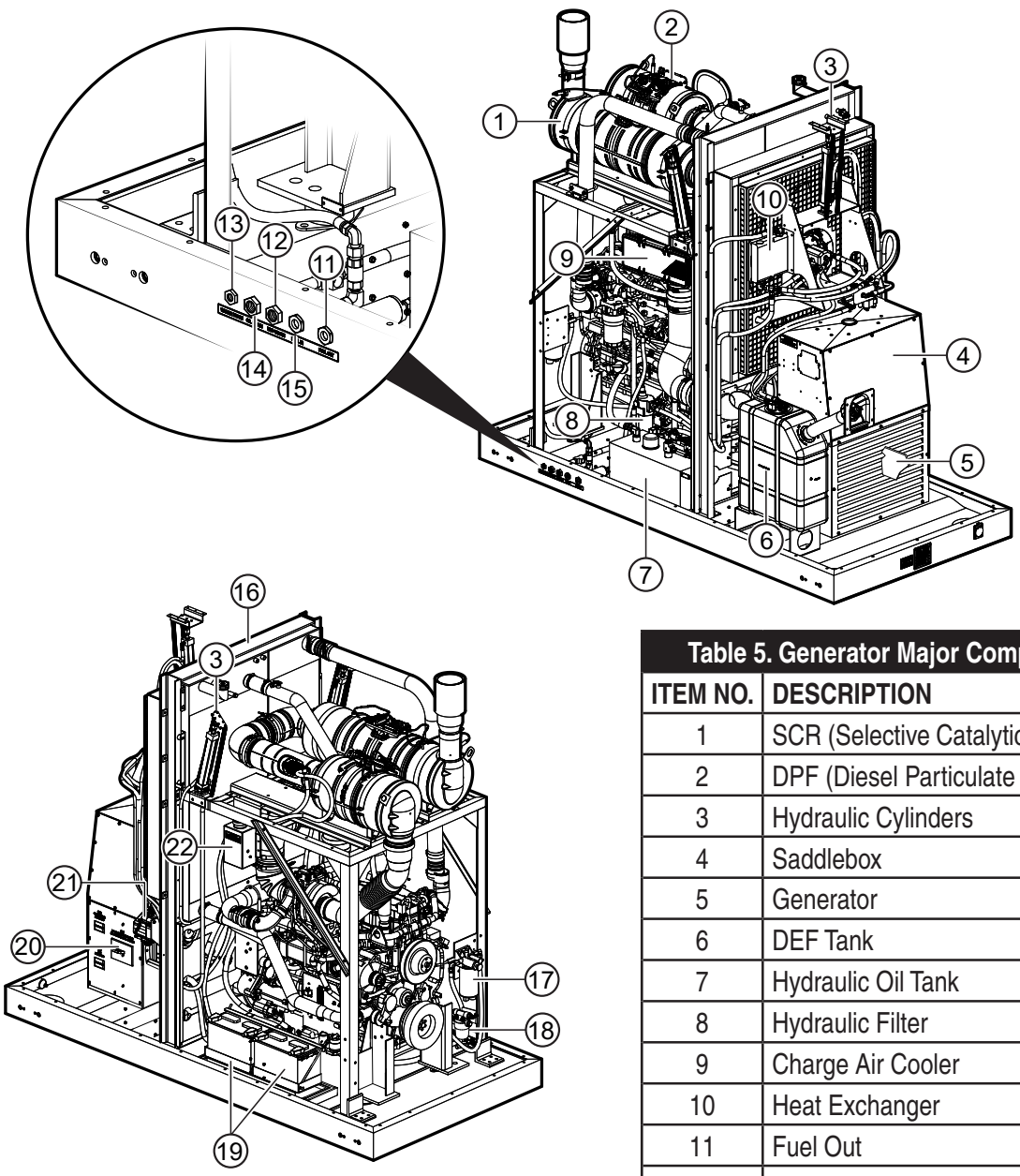


Figure 3. Major Components

Table 5. Generator Major Components	
ITEM NO.	**DESCRIPTION**
1	SCR (Selective Catalytic Reduction)
2	DPF (Diesel Particulate Filter)
3	Hydraulic Cylinders
4	Saddlebox
5	Generator
6	DEF Tank
7	Hydraulic Oil Tank
8	Hydraulic Filter
9	Charge Air Cooler
10	Heat Exchanger
11	Fuel Out
12	Hydraulic Drain
13	Water Drain
14	Oil Drain
15	Fuel In
16	Radiator
17	Fuel Water Separator
18	Fuel Strainer
19	Batteries
20	Circuit Breaker
21	DEF Module
22	Overflow Tank

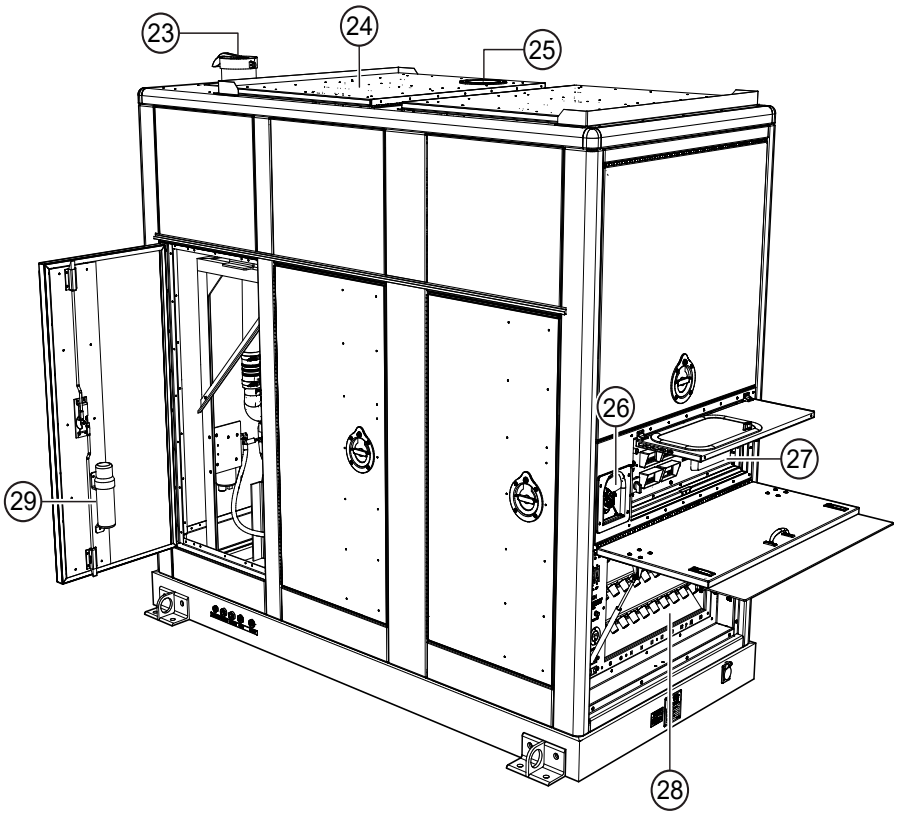


Figure 3. Major Components

Table 6. Generator Major Components	
ITEM NO.	**DESCRIPTION**
23	Rain Cap
24	Roof Intake/Exhaust
25	Radiator Service Cap
26	DEF Tank Filler Port
27	Control Panel
28	Camlok/Voltage Output Panel
29	Manual Holder

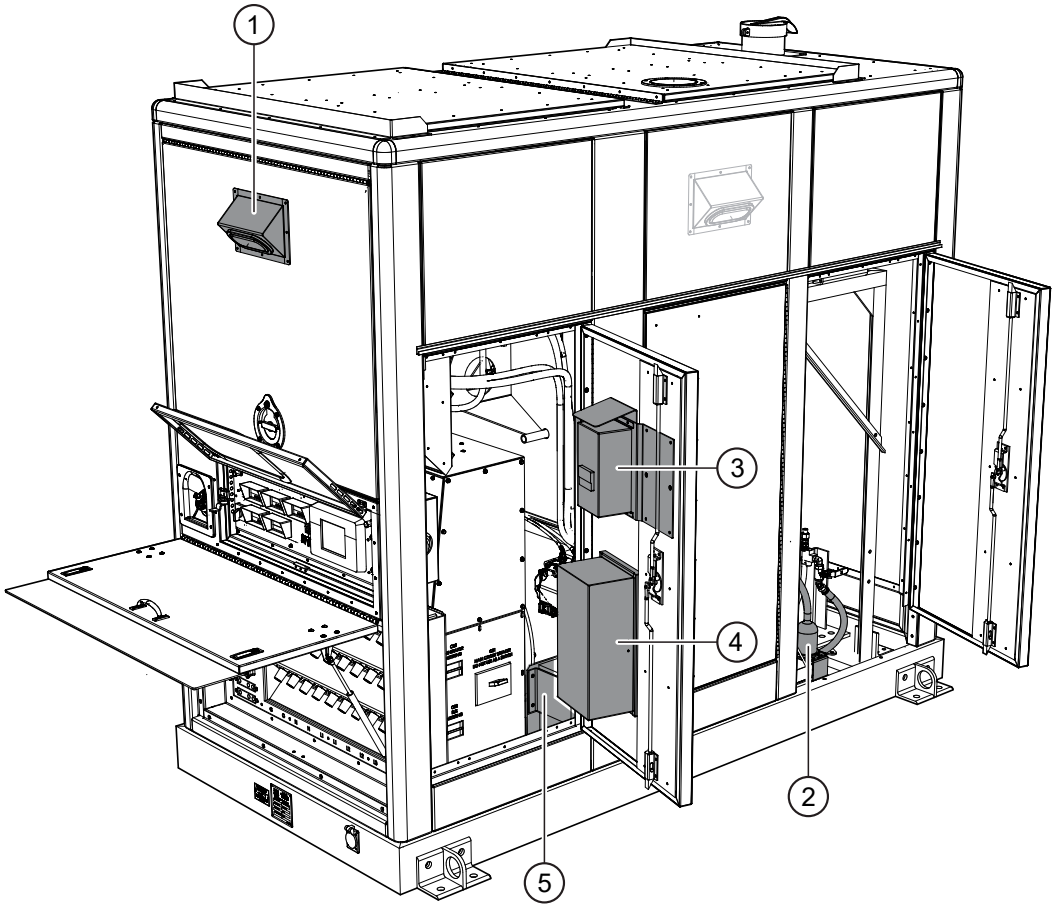


Figure 4. Generator Options

Table 7. Generator Options	
ITEM NO.	**DESCRIPTION**
1	Exterior LED Lights
2	Block Heater
3	Battery Charger
4	Fire Extinguisher
5	Transformer

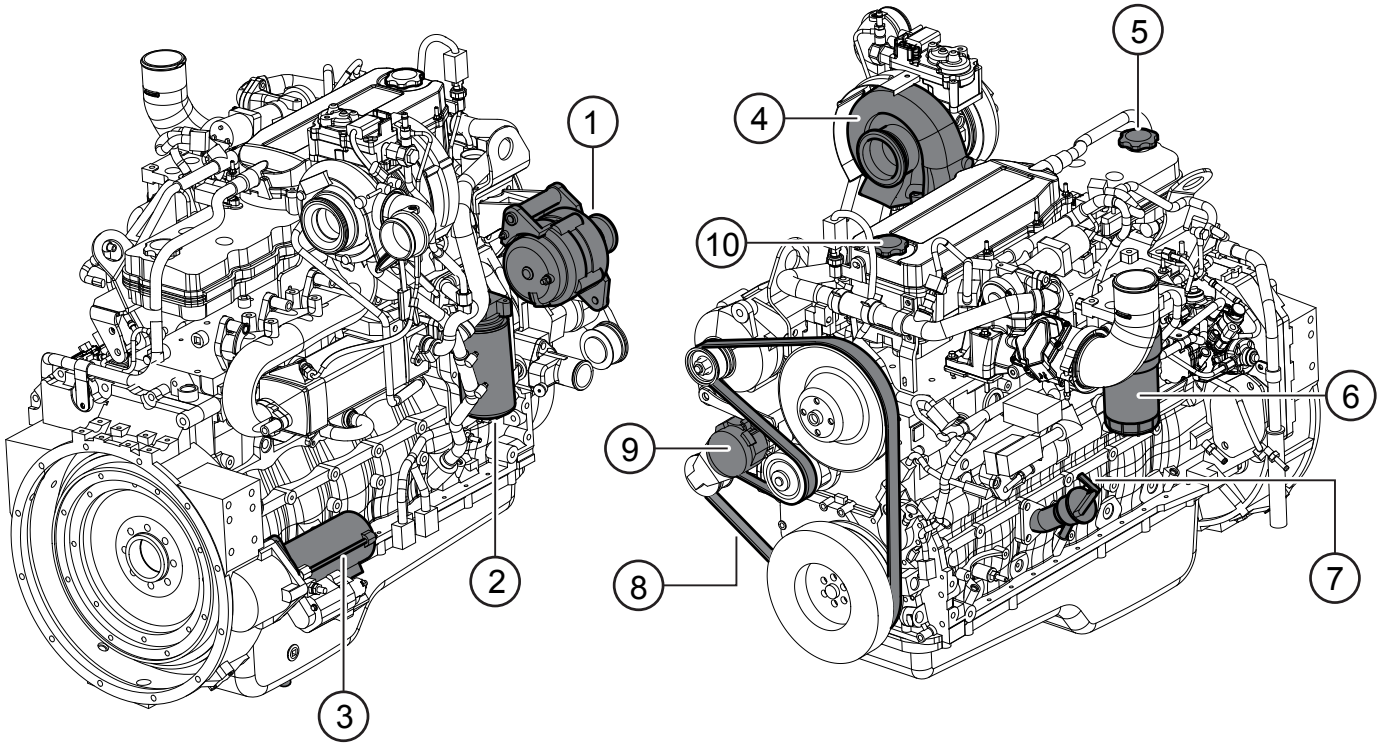


Figure 5. Basic Engine Components

Table 9. Basic Engine Components	
ITEM NO.	**DESCRIPTION**
1	Alternator
2	Oil Filter
3	Starter-Solenoid
4	Turbocharger
5	Oil Filler Port
6	Fuel Filter
7	Oil Dipstick
8	V-Belt
9	Water Pump
10	Oil Filler Port

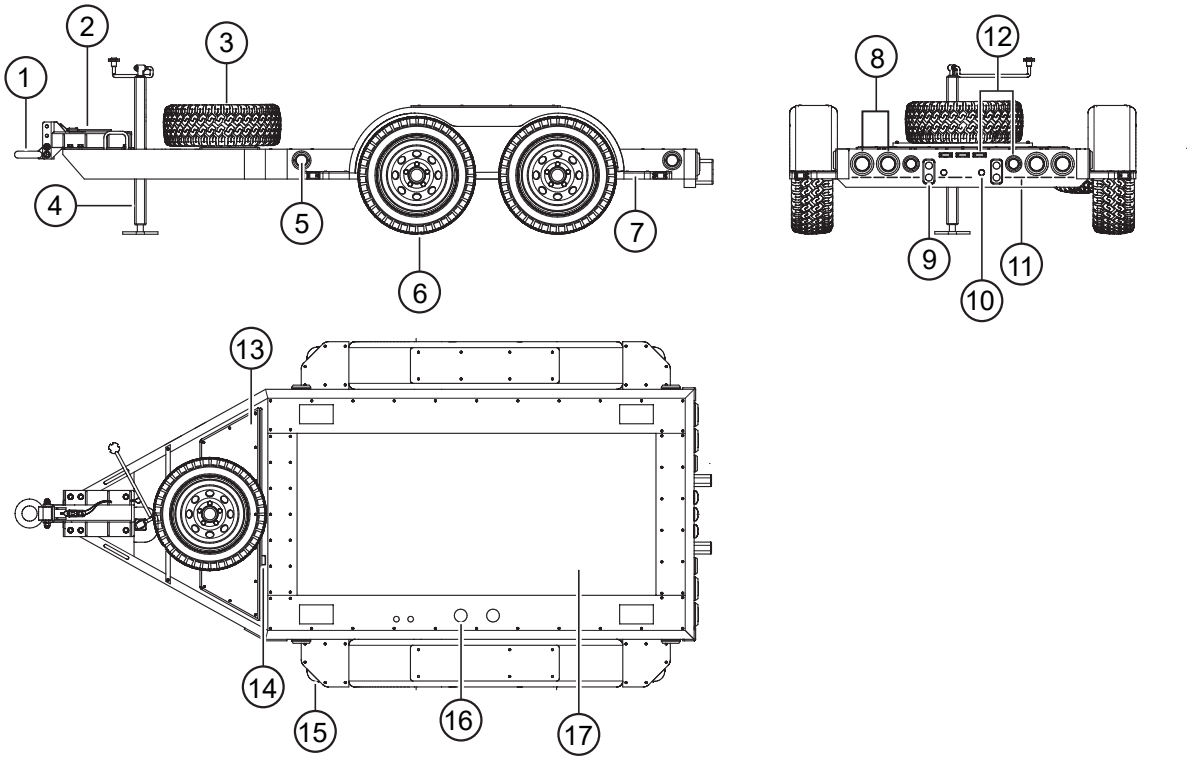


Figure 6. Basic Trailer Components

The definitions below describe the controls and functions of the Trailer (Figure 6).

1. **Pintle Eye Coupler** — Adjustable 3-inch eye coupler rated at 20,000 lbs. (9,072 kg).
2. **Hydraulic Brake Actuator** — Replaceable bolt-on actuator, assists in the stopping of the trailer. Rated at 12,000 lbs (5,443 kg).
3. **Spare Tire** — Tongue mounted spare tire with anti-theft wheel lock and locking mount.
4. **Jackstand** — Tongue mounted swivel jack with flat disc foot, rated 5000 lbs (2,268 kg) lift.
5. **Reflectors** — Side mounted reflectors are mounted on both sides of the trailer to provide high visibility when towing in dark areas.
6. **Tires** — Recommended tire size is LT235/85R16 LR E. Tire load rating is 3,500 lbs/tire.
7. **Reflective Tape** — Provides high visibility when towing in dark areas.
8. **Brake/Turn Lights** — DOT-approved tail, stop, and turn signal lamps.
9. **Bumper Guard** — Protects trailer frame when coming in contact with stationary objects.
10. **License Plate Lights** — Illuminates license plate.
11. **Axle** — Tandem Axle, Gross Axle Weight Rating (GAWR) 6,000 lbs (2,722 kg) Gross Vehicle Weight Rating is 10,000 lbs (4,536 kg).
12. **Rear Bumper Reflectors** — Provides high visibility when towing in dark areas.
13. **Tool Box** — Tongue mounted tool box, lift spare tire to gain access to this compartment.
14. **Tool Box Locking Latch** — Release this latch to gain access to tool box. Pull spare tire upward and back.
15. **Side Running Lamps** — Provides high visibility when towing in dark areas.
16. **Fuel Tank Filler Port** — Fuel filler port, 2-inch (51 mm) neck.
17. **Fuel Tank** — Holds 145 gallons (548 liters) of No. 2 diesel fuel.

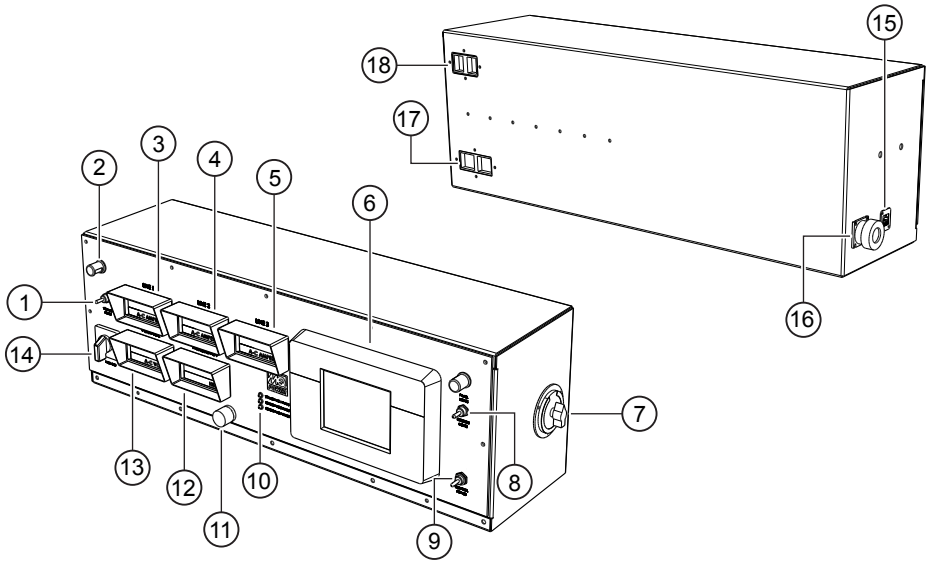


Figure 7. Control Panel

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

1. **Voltage Adjust Switch** — To increase the output voltage, pull upward and hold the switch until the desired voltage is achieved by monitoring the AC voltage display. To decrease the voltage, pull downward.
2. **Panel Lights** — Located on each side of the digital control panel is a panel light. Lights are activated by light switch.
3. **Line 1 AC Amps Display** — Indicates the amount of current the load is drawing from line 1 of the generator.
4. **Line 2 AC Amps Display** — Indicates the amount of current the load is drawing from line 2 of the generator.
5. **Line 3 AC Amps Display** — Indicates the amount of current the load is drawing from line 3 of the generator.
6. **Digital Controller** — Starts and stops the generator and monitors various engine operating parameters.
7. **Light Timer Control** — The interior lights are controlled by an electronic turn dial timer that allows the operator to turn on the lights inside the generator for up to 15 minutes. The lights will automatically shut off when the timer reaches zero.
8. **Light Switch** — In the up position, turns on exterior lights. In the down position, turns on panel lighting. In the center position, turns off all lights.
9. **Controller Power Switch** — Provides power to engine controller.
10. **Voltage Status LEDs** — During operation these status LED's will indicate the phase/voltage of the generator, 3Ø-277/480, 3Ø-120/208 or 1Ø-120/240.
11. **Rubber Stopper** — Protects the control panel from hitting the surface when pulled down.
12. **Frequency Display** — Indicates the frequency of the generator in Hertz.
13. **AC Voltmeter Display** — Indicates the output voltage present at the camlok terminals. This display is used in conjunction with the voltmeter select switch.
14. **Voltmeter Selector Switch** — Place switch in desired position to read line-line or line-neutral voltage. Switch is used in conjunction with AC voltmeter display.
15. **Engine Com Connector** — 9-pin connector for communication to engine via a PC with engine software.
16. **Fan Control Module** — Provides necessary control electronics to operate fan.
17. **DC Output Connector** — Provides DC power to engine interface.
18. **AC Output Connector** — Provides AC power to various electronic assemblies.

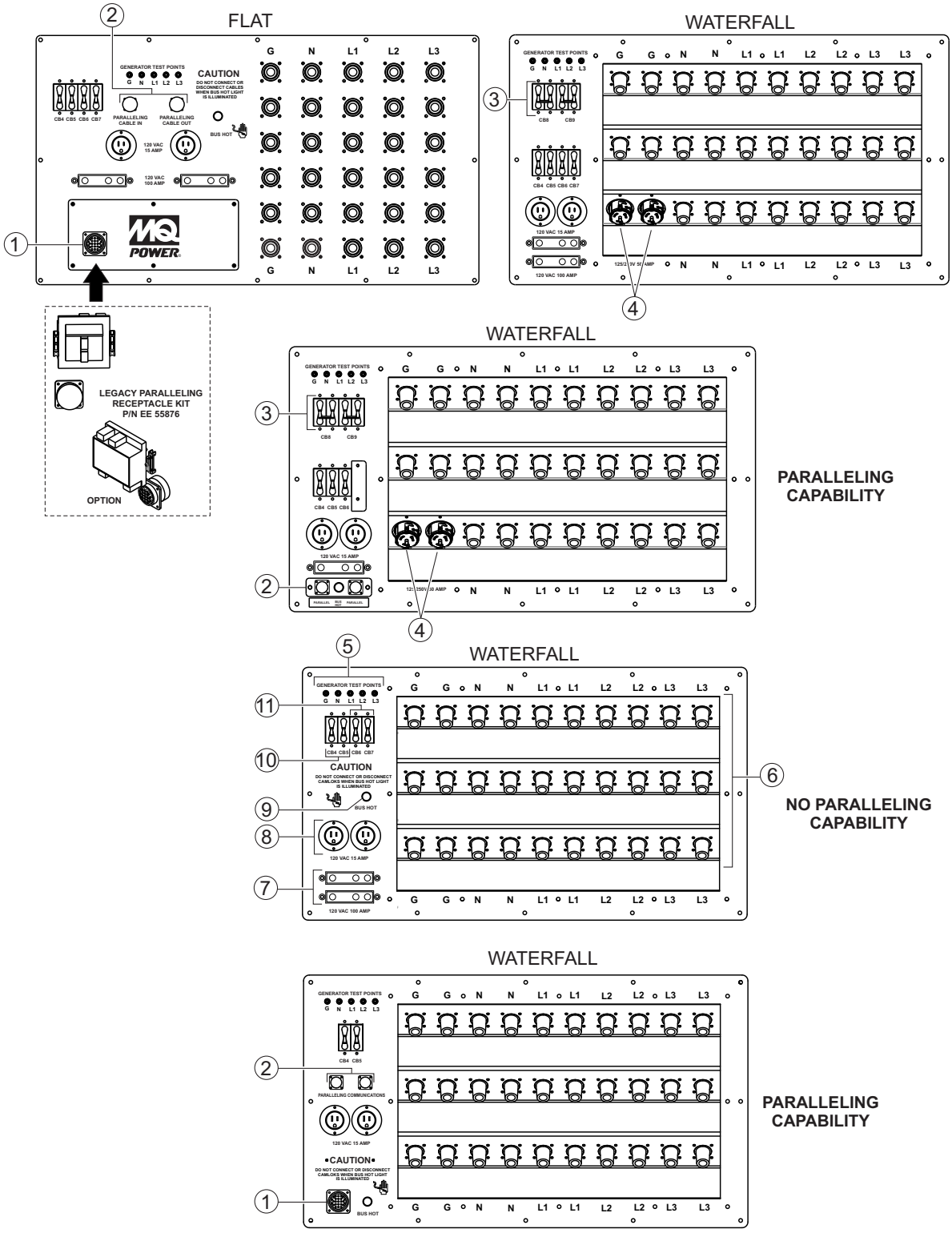


Figure 8. Camlok/Voltage Output Panel

NOTICE

The Camlok/Voltage Output Panel is available in many configurations. Figure 8 represents the most commonly used panels.

The definitions below describe the controls and functions of the Camlok/Voltage Output Panel (Figure 8).

1. **Legacy Paralleling Receptacle** — This 20-pin receptacle allows legacy parallelling capability via Intelligen Controllers.
2. **Paralleling Cable In/Out Receptacles** — These communication connection ports are used when multiple generators are going to be connected.
3. **CB8/CB9 Circuit Breakers** — These circuit breakers protect the 125/250 VAC CS6369 auxiliary output receptacles from overload.
4. **Auxiliary CS6369 Output Receptacles** — These auxiliary twist-lock receptacles provide 250/120 VAC@ 50-amps. These receptacles can **only** be accessed when the voltage selector switch is placed in the **single-phase 240/120V** position
5. **Generator Voltage Test Points** — To determine if the generator's output voltage is present and correct, connect a test meter to these test points during troubleshooting and maintenance.
6. **Camlok Receptacles** — These output voltage connection points (6 pairs) are used for load connection. **ALWAYS** pay close attention when connecting and disconnecting power cables from these camlok receptacles. ***The possibility exists of electrocution, shock or even death if cables are connected or unplugged when the bus hot indicator lamp is lit.***
7. **Bates 120VAC Output Receptacles** — These receptacles provide AC voltage output. Each receptacle is protected by a 100 amp breaker. These receptacles cannot be used when the voltage selector switch is in the 3Ø 277/480 VAC position.
8. **120 VAC Output Receptacles** — These 15-amp receptacles provide 120 VAC output. The maximum allowable combined amps (both receptacles) is 25 amps when the voltage selector switch in the 3Ø 277/480 VAC position.
9. **BUS Hot Indicator Lamp** — When lit, this indicator lamp informs that the voltage bus is active (high voltage). **NEVER** connect or disconnect cables from the camlok or auxiliary receptacles when this indicator is **ON**. The possibility exists of electrocution, shock or even death if cables are connected or unplugged when this indicator is lamp lit.
10. **CB4/CB5 Circuit Breakers** — These circuit breakers protect the 120 VAC auxiliary output receptacles from overload.
11. **CB6/CB7 Circuit Breakers** — These circuit breakers protect the bates output receptacles from overload.

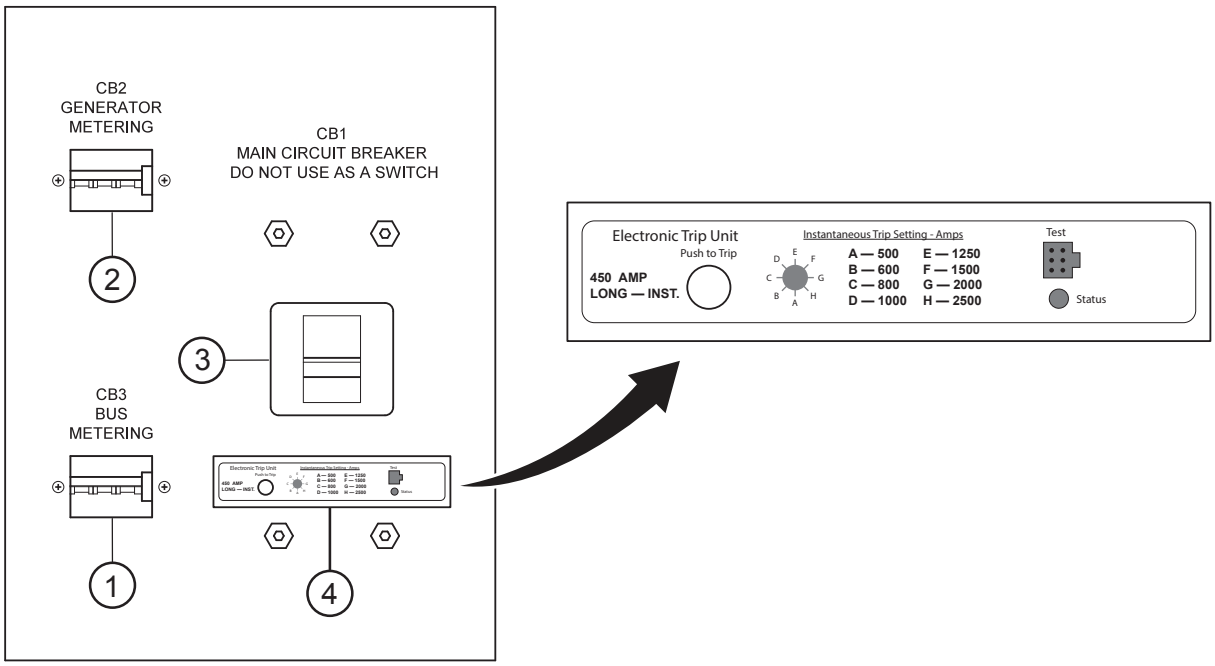


Figure 9. Main Breaker Panel

The definitions below describe the controls and functions of the Main Breaker Panel (Figure 9).

1. **CB3 Circuit Breaker** — This breaker monitors, senses the voltage bus. If breaker trips, signal is sent to controller.
2. **CB2 Circuit Breaker** — This breaker monitors, senses the generator voltage bus. If breaker trips, signal is sent to controller.
3. **Main Circuit Breaker** — This 600 amp breaker protects the camlok receptacles (load) from overload.
4. **Electronic Trip Unit** — This unit protects the generator from in-rush current (load spikes).

NOTICE

When setting the trip point on the electric trip unit, be careful not to set the trip point too high. Setting the trip point too high may cause the main breaker not to trip. This condition could cause serious damage to the equipment, and serious bodily harm even death to operating personnel.

Always be conservative when setting the trip point. The trip setting for this generator is position B 600 amps.

DO NOT adjust the trip point setting when the equipment is in operation.

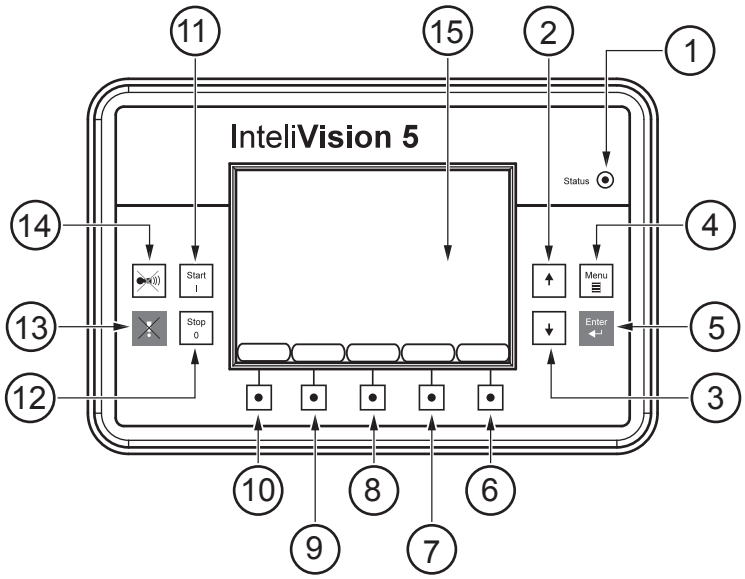


Figure 10. Digital Controller

Refer to Figure 10 for location of controls and indicators.

1. **STATUS LED** — Indicates status of the controller. Lights green when the controller is running.

NAVIGATIONS BUTTONS

2. **ARROW UP Button** — Press button to scroll up through the status menus or programming prompts.
3. **ARROW DOWN Button** — Press button to scroll down through the status menus or programming prompts.
4. **MENU Button** — Press button to jump to menu/sub-menu page or escape from any dialog window.
5. **ENTER Button** — Press button to confirm a value or open a value adjustment within setting dialogs.

CONTEXT BUTTONS

6. **MODE Button** — Press button to jump to the controller mode window.
7. **HISTORY Button** — Press button to jump to history screen.
8. **ALARM Button** — Press button to jump to alarm list
9. **GCB (Generator Circuit Breaker) CONTROL Button** — Press button to close/open GCB.
10. **MCB CONTROL Button** — Not functional in this application.

CONTROL BUTTONS

11. **START Button** — Press button to go idle mode (about an hour) then generator starts. A second press will bypass idle mode and generator goes to full speed immediately.
12. **STOP Button** — Press button to cool the generator for about 5 minutes then the generator will stop. A second press will bypass cool down and will stop the generator immediately.

> ***NOTICE***
>
> **START** and **STOP** buttons work in MAN (manual) or SEM (semi-manual) mode only.

13. **FAULT RESET Button** — Press button to acknowledge faults and alarms (active only in Alarm screen).
14. **HORN RESET Button** — Press button to deactivate the horn (audible alarm).
15. **DISPLAY** — Shows menu, measurements, set points, alarm list, history, and help/other screens.

> ***NOTICE***
>
> For more detailed operating and programming information on the digital controller, refer to the InteliVision 5™ Controller User's Guide.

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 1.0. See Table 10 below when connecting loads.

Table 10. 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 11. 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. Refer to Table 11 to select the correct cable size.

- When connecting a resistance load such as an incandescent lamp or electric heater, a capacity of up to the generator's rated output (kW) can be used.
- When connecting a fluorescent or mercury lamp, a capacity of up to the generator'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 generator'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 a **transfer switch**. Serious damage to the building's electrical system may occur without this transfer switch.

GENERATOR OUTPUT VOLTAGES

A wide range of voltages are available to supply voltage for many different applications. Voltages are selected by using the **voltage selector** switch (Figure 11). To obtain some of the voltages as listed in Table 13 (see below) will require a fine adjustment using the **voltage adjust toggle switch** located on the digital control panel.

Voltage Selector Switch

NOTICE

There are ***three*** different types of voltage selector switches. Reference Figure 11 and Table 12 to determine which type switch is installed on your unit.

Table 12. Voltage Selector Switch Types		
3-Position Switch		
1Ø 120/240 Volt	3Ø 120/208 Volt	3Ø 277/480 Volt
2-Position Switch		
1Ø 120/240 Volt	3Ø 120/208 Volt	N/A
2-Position Switch		
3Ø 120/208 Volt	3Ø 277/480 Volt	N/A

The voltage selector switch (Figure 11) is located on the back side of the Saddle Box Assembly. It has been provided for ease of voltage selection.

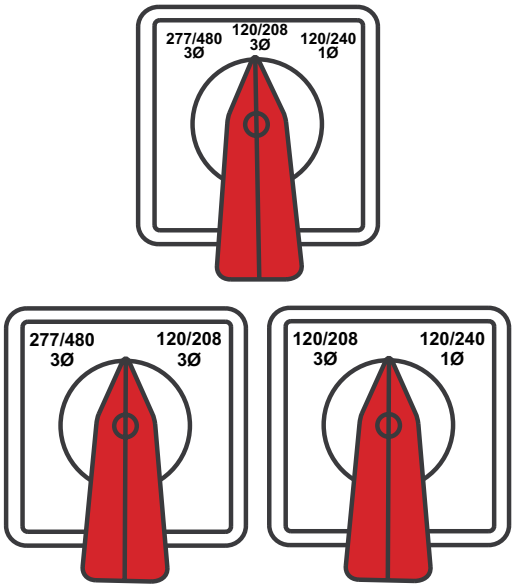


Figure 11. Voltage Selector Switches

⚠ CAUTION

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

Table 13. Voltages Available						
L1 L2 L3 Output Terminal Lugs	**Voltage Selector Switch 3-Phase 120/208V Position**			**Voltage Selector Switch 3-Phase 480/277V Position**		
3Ø **Line-Line**	208V	220V	240V	416V	440V	480V
1Ø **Line-Neutral**	120V	127V	139V	240V	254V	277V
Voltage Selector Switch Single-Phase 240/120V Position						
1Ø **Line-Neutral/ Line-Line**	120V Line-Neutral	N/A	N/A	240V Line-Line	N/A	N/A

NOTICE

Controller has over/under-voltage protection based on 208 V nominal/480 V nominal/240 V nominal voltage.

Generator Amperage

Table 14 shows the **maximum** amps the generator can provide. **DO NOT** exceed the maximum amps as listed.

Table 14. Generator Maximum Amps		
Rated Voltage	**Line Amps**	**Total Amps**
1Ø 240 Volt	538 amps	1076 amps
3Ø 208 Volt	466 amps	1400 amps
3Ø 480 Volt	202 amps	606 amps

MAIN CIRCUIT BREAKER

The generator is equipped with a 3-pole, 600-amp circuit breaker to protect the camlok receptacles from overload. Make sure that the main circuit breaker is in 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 12) on the dipstick. See Table 15 for proper selection of engine oil.

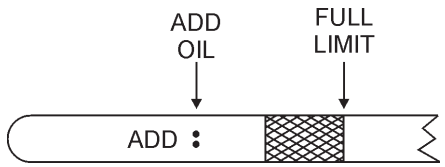


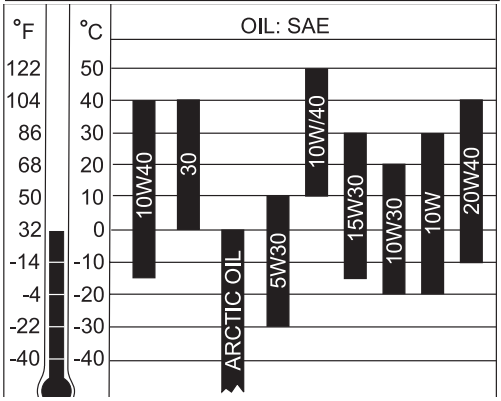
Figure 12. Engine Oil Dipstick

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 **Cummins Engine Owner's Manual**. Oil should be warm before draining.

Other types of motor oils may be substituted if they meet the following requirements:

- API Service Classification CC/SC
- API Service Classification CC/SD
- API Service Classification CC/SE
- API Service Classification CC/SF

Table 15. 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 (Trailer Mounted Generators)

CAUTION

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

This generator has a fuel tank located inside the trailer frame. **ALWAYS** fill the fuel tank with clean fresh **#2 diesel fuel. DO NOT** fill the fuel tank beyond its capacity.

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

Refueling Procedure:

WARNING

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

CAUTION

ALWAYS make sure generator is on firm level ground before refueling to prevent spilling and maximize the amount of fuel that can be pumped into the tank.

1. Place the generator level with the ground. Failure to do so will cause fuel to spill from the tank before reaching full capacity (Figure 13).

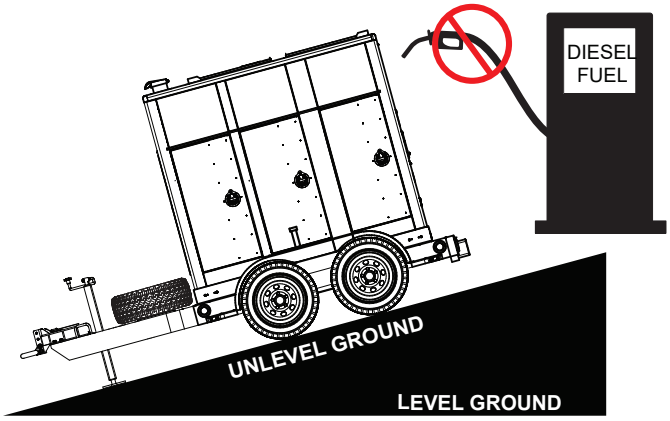


Figure 13. Only Fill on Level Ground

NOTICE

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

2. Remove fuel cap and fill tank (Figure 14).

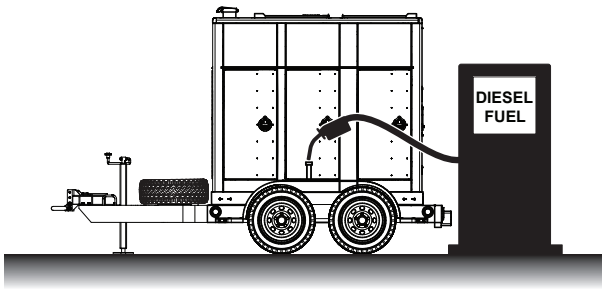


Figure 14. Fueling the Generator

3. Monitor the fuel gauge while filling fuel tank. Stop filling when the fuel gauge indicates full (Figure 15). **DO NOT** wait for fuel to rise in filler neck.

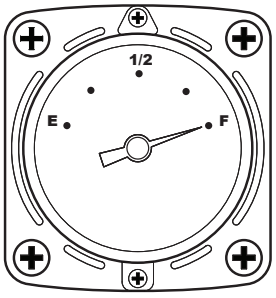


Figure 15. Full Fuel Tank

CAUTION

DO NOT OVERFILL fuel system. Leave room for fuel expansion. Fuel expands when heated (Figure 16).

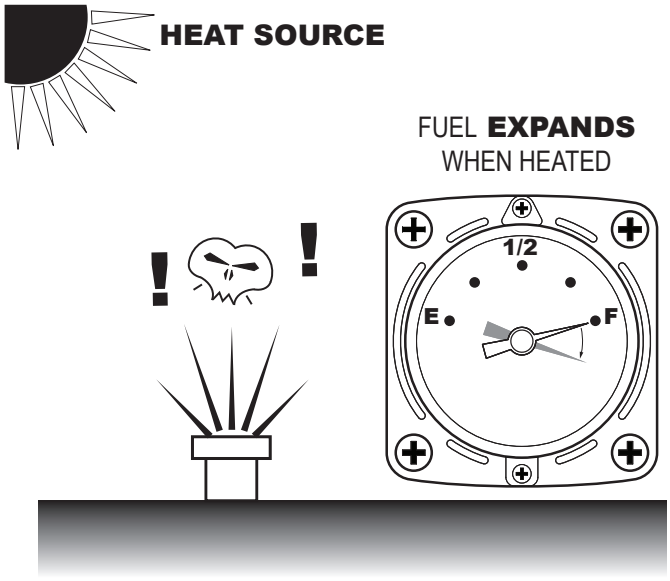


Figure 16. Fuel Expansion

Refilling the Fuel System (Skid Mounted Generators)

NOTICE

If your generator is skid mounted, an external fuel sytem will be required. Connect the fuel lines from the external fuel tank system to the fuel **IN** and **OUT** ports on the generator as shown in Figure 17.

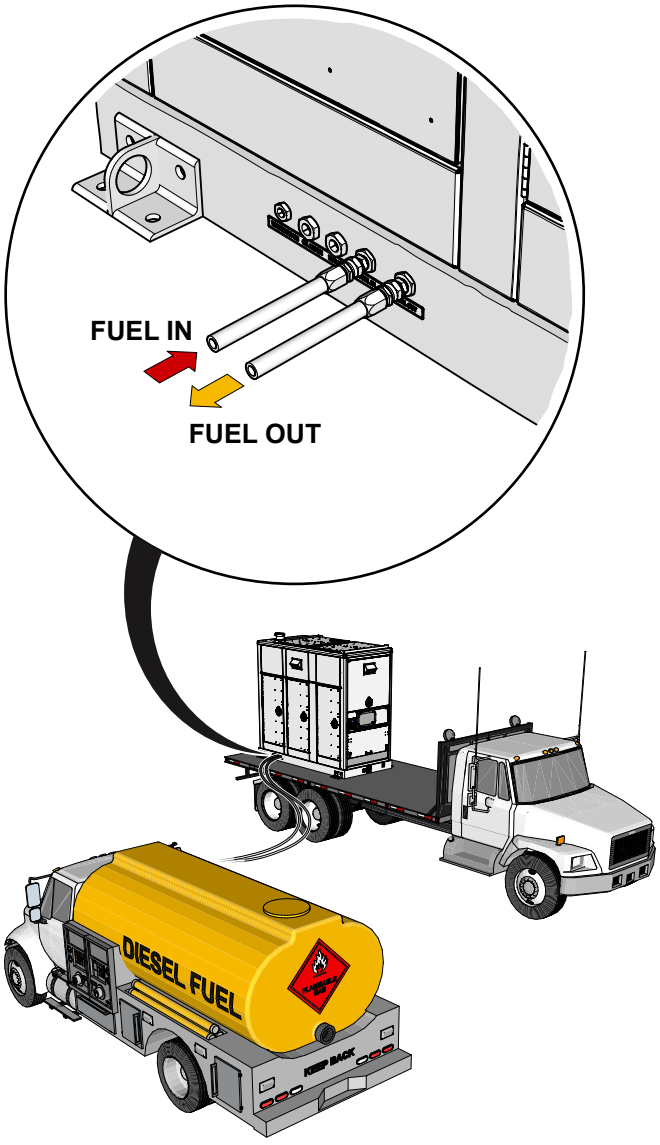


Figure 17. External Fuel Tank (Typical Application)

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 (Figure 18) from the DEF tank.
2. Next add DEF fluid to the tank. **DO NOT** overfill.

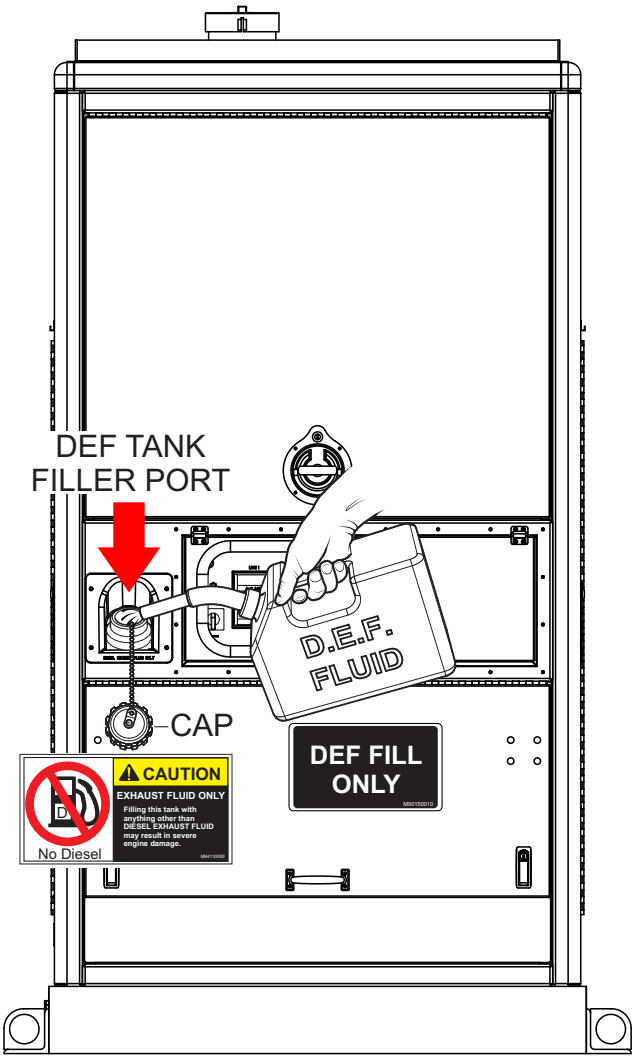


Figure 18. DEF Tank Filling

COOLANT (ANTIFREEZE/SUMMER COOLANT)

Cummins recommends antifreeze/summer coolant, for use in their engines, which can be purchased in concentrate (and mixed with 50% demineralized water) or pre-diluted. See the **Cummins 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 16 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 16. Coolant Capacity

Engine and Radiator	7.8 gal (29.5 liters)
Reserve Tank	6 quarts (6.6 liters)

OPERATION IN FREEZING WEATHER

When operating in freezing weather, be certain the proper amount of antifreeze (Table 17) has been added.

Table 17. Anti-Freeze Operating Temperatures

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

NOTICE

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

CLEANING THE RADIATOR

The engine may overheat if the radiator 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 it in accordance with the **Cummins Engine Owner's Manual**.

FAN BELT TENSION

A slack drive belt may contribute to overheating, or to insufficient charging of the battery, adjust drive belt in accordance with the **Cummins Engine Owner's Manual.**

DRIVE BELT INSPECTION

Inspect the drive belt for damage and wear. Horizontal (across the belt) cracks are acceptable. See Figure 19 below. Vertical (direction of belt ribs) cracks that intersect with horizontal cracks are not acceptable.

If the drive belt is frayed, punctured, or material is missing do not use drive belt.

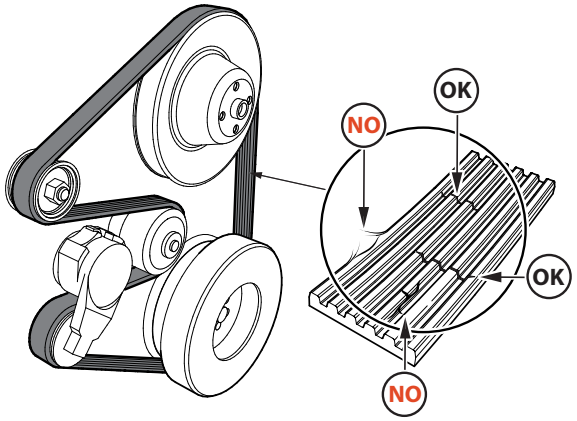


Figure 19. Drive Belt Inspection

⚠ CAUTION

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

BATTERY

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

Check to see whether the battery cables are loose. Poor contact may result in poor starting or malfunction. **Always** keep the terminals firmly tightened. Coat the terminals with an approved battery terminal treatment compound. Replace battery with only recommended type battery.

The battery 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, 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 make sure that the battery cables (Figure 20) are properly connected to the battery terminals as shown below.

⚠ CAUTION

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

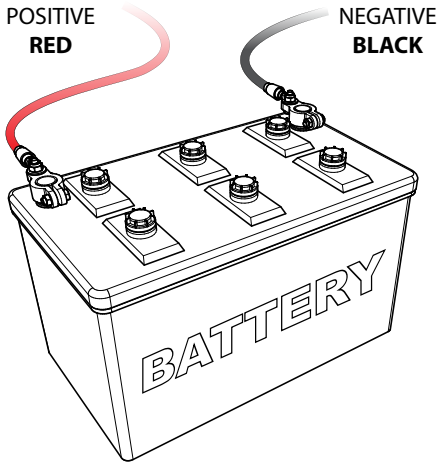


Figure 20. Battery Connections

When connecting the battery do the following:

1. 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.
2. Connect the **red cable** to the positive terminal of the battery and the **black cable** to the negative terminal of the battery.

NOTICE

If the battery cable is connected incorrectly, electrical damage to the generator will occur. Pay close attention to the polarity 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 short instantaneously resulting in alternator failure.

DO NOT put water directly on the alternator. Water in the alternator can cause corrosion and damage.

WIRING

Inspect the generator for bad, 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 fatigue, 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.**

1. Place the Control Power switch (Figure 21) on the digital control panel in the up position (ON).

Figure 21. Control Power Switch (ON)

2. Place the voltage selector switch (Figure 22) in the desired voltage setting position. The corresponding Voltage Status LED on the control panel will light to indicate the selected voltage (Figure 23).

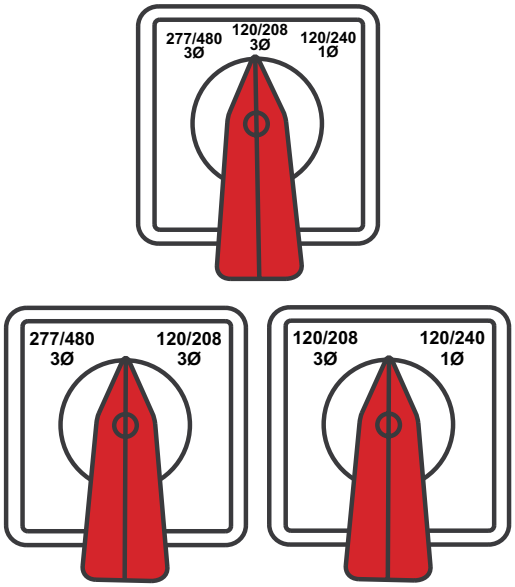


Figure 22. Voltage Selector Switch 120/208 3Ø Position

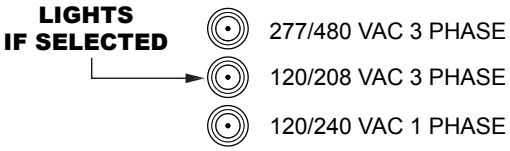


Figure 23. Voltage Status LEDs

NOTICE

If it is necessary to prime engine before starting (such as after changing a fuel filter or running out of fuel), please reference the maintenance section in this manual "Priming The Engine".

3. Verify that all three circuit breakers (Figure 24) are in the **ON** position prior to starting the engine.

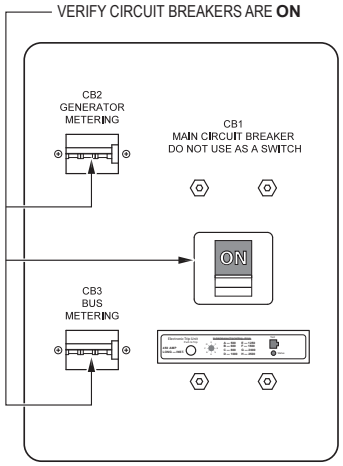


Figure 24. Circuit Breakers (ON)

4. If unit is to be used in parallel with another unit, interconnect the units. Interconnect the output buses with suitable power cables to carry full load capacity. Special male-to-male Camlok cables will be needed. For 480 V mode, it is recommended that one 4/0 cable per phase, neutral and ground be used. For 208V mode, use two 4/0 cables per phase and neutral and one 4/0 cable for ground. Also connect the parallel communication cables.

5. Connect the load to the receptacles on the Camlok/ Voltage Output Panel. When the camloks are inserted into the outlet connector, rotate clockwise until they are locked in place. Make sure the camloks are connected securely.

6. Press the **MODE** button (Figure 25) on the Digital Controller Display and select manual mode (MAN) with the arrow keys. Press **ENTER** key when MAN is highlighted on the screen.

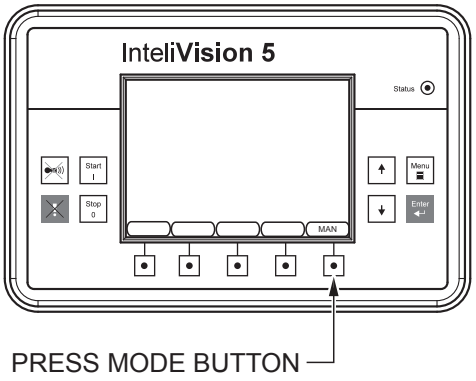


Figure 25. Mode Button (Manual)

STARTING (MANUAL)

1. Press the **START** button (Figure 26) on the controller to start the engine.

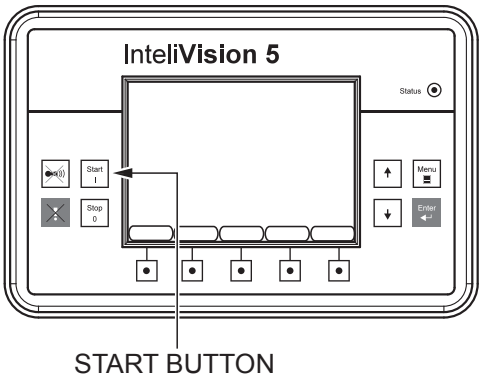


Figure 26. START Button

2. The engine will go to idle mode.
3. Listen for any abnormal noises. If any abnormalities exist, shut down the engine and correct the problem.
4. To bypass idle mode, press the **START** button again. The generator should go to full speed.

NOTICE

If **START** button is not pressed again, the engine will remain in idle mode for about an hour then will go to full speed.

5. Verify that the no-load frequency reading on the control panel frequency display is approximately 60 Hz (1800 rpm).
6. Verify that the voltage reading on the control panel AC voltmeter display matches the voltage selector switch position that was selected prior to startup.
7. Press the GCB control button on the controller (Figure 27) to close circuit breaker.

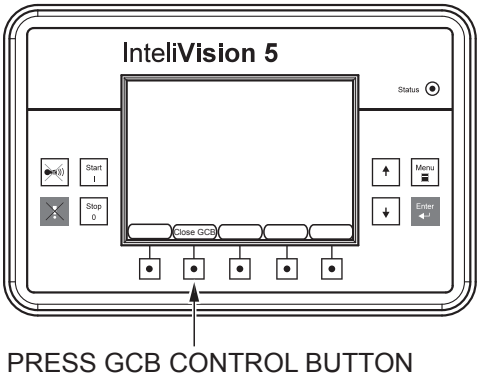


Figure 27. Generator Circuit Breaker (Closed)

8. Verify that the **BUS HOT** light (Figure 28) on the Camlok/Voltage Output Panel is **ON**. Voltage is now available at the receptacles.

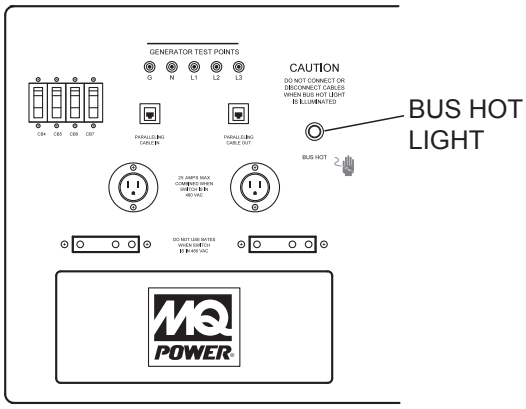


Figure 28. BUS HOT Light

9. If paralleling to another unit and the bus was already energized from another unit (BUS HOT light already on), pressing to close GCB button once would initiate a synchronizing mode. The light above the button will begin flashing, bring the generator into phase and automatically close the breaker.

   Once the breaker closes, the light above the button would then become solid and the generators would now be in parallel. As load is applied, units will share the load proportionally.

CLOSING THE ENCLOSURE DOORS

1. Close the enclosure doors once the generator has started (Figure 29). Top vents stay open for proper ventilation.

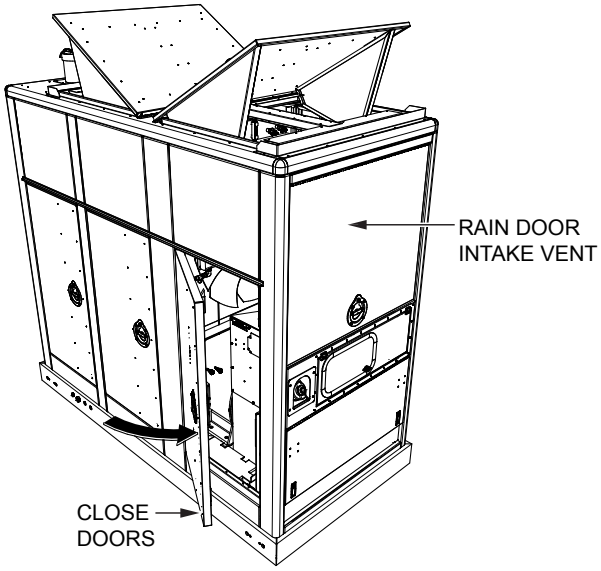


Figure 29. Engine Enclosure Doors

2. If access to the controls or other components is necessary while the engine is running, make sure the doors are not left open for an extended period of time.
3. To protect the unit from rain, the top intake vent can be closed by opening the upper front vent door on the generator enclosure. The front vent will automatically close the upper roof intake vent. The upper exhaust vent will remain open.

NORMAL SHUTDOWN PROCEDURE

To shutdown the generator, use the following procedure:

⚠ WARNING

NEVER stop the engine suddenly except in an emergency.

1. Press the GCB control button on the controller (Figure 30) to open circuit breaker.
2. Let the engine cool by running it at full speed for 3-5 minutes with no load applied.
3. Press the **STOP** button (Figure 31) on the controller. The engine will go to idle mode.

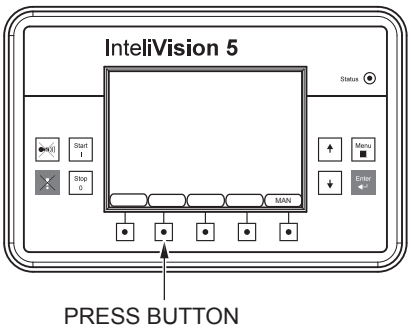


Figure 30. Generator Circuit Breaker (Open)

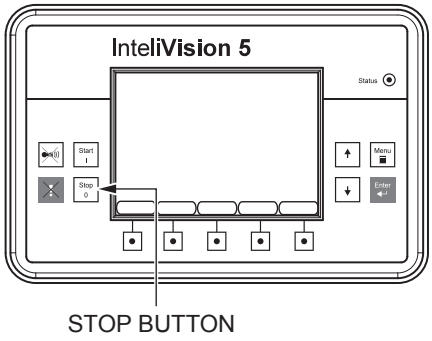


Figure 31. STOP Button

4. Press the **STOP** button again to shut down the engine.

NOTICE

If **STOP** button is not pressed again, the engine will remain in idle mode for about an hour then will shut down.

5. Place the Control Power switch (Figure 32) on the control panel to the OFF position.

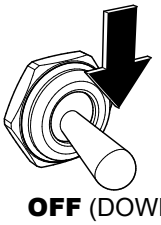


Figure 32. Control Power Switch (OFF)

EMERGENCY SHUTDOWN PROCEDURE

1. Press the **STOP** button twice (Figure 31) on the controller to shut down the engine.
2. Place the main circuit breaker (Figure 30) in the **OFF** position.

PROTECTIVE DEVICES

Protection devices and emergency stop devices are designed as standard components for protection of the generator against trouble during operation. The LCD on the Digital Controller will inform the user when a fault has occurred.

When a major fault is detected, such as low oil pressure, high water temperature, and overspeed, the engine automatically shuts down. Check the display for the fault and correct the problem.

For minor faults, the engine will continue working. Stop the engine and remedy the cause of the problem. The Digital Controller will display the cause of the fault.

Before inspecting or troubleshooting the generator, press the **OFF** button on the Digital Controller. Place the main circuit breaker in the **OFF** position and allow sufficient time for adequate cooling.

After automatic shutdown, always inspect the generator and eliminate any problems that might have caused the shutdown before attempting to restart the generator.

When ready to restart, check and make sure that no alarms are shown in the Alarm List on the Digital Controller. Restart the generator as outlined in the Startup section of this manual.

Refer to the InteliVision 5™ Controller User's Guide for detailed information of faults and display information.

⚠ CAUTION

To prevent damage to the equipment and severe bodily harm, even death, please follow all lock-out safety procedures when performing maintenance.

Use Table 18 as a general maintenance guideline when servicing your engine. For more detail engine maintenance information, refer to the engine owner's manual supplied with your engine.

Table 18. Engine Maintenance Schedule

DESCRIPTION	OPERATION	INTERVAL					
		DAILY[3]	250 HOURS OR 3 MONTHS[3]	500 HOURS OR 6 MONTHS[1,2,3]	1000 HOURS OR 1 YEAR[3]	2000 HOURS OR 2 YEARS[2,3]	5000 HOURS OR 4 YEARS[3]
Air Intake Piping	Check	X					
Engine Lubricating Oil Level	Check	X					
Air Tank and Reservoirs	Drain	X					
Crankcase and Breather Tube	Inspect	X					
Engine Coolant Level	Check	X					
Fuel -Water Separator	Drain	X					
Air Cleaner Restriction	Check		X				
Air Compressor Mounting Hardware	Check		X				
Charge-Air Cooler	Check		X				
Charge-Air Piping	Check		X				
Radiator Hoses	Check		X				
Air Intake Piping	Inspect		X				
Fan, Cooling	Check		X				
Coolant Level	Check		X				
Drive Belts	Check		X				
Engine Coolant - Antifreeze	Check			X			
Fuel Filter (Spin-On Type)	Replace			X			
Lubricating Oil and Filters	Change			X			
Radiator Pressure Cap	Check			X			
Cooling Fan Belt Tensioner	Check				X		
Fan Hub, Belt-Driven	Check				X		
Air Compressor Discharge Line	Check					X	
Cooling System	Drain					X	
Vibration Damper, Rubber	Check					X	
Vibration Damper, Viscous	Check					X	
Overhead Set	Adjust						X

1. The lubricating oil and lubricating oil filter interval can be adjusted based on application, fuel consumption, gross vehicle weight, and idle time.
2. Antifreeze check interval is every oil change or 500 hours or 6 months, whichever occurs first. The operator must use heavy-duty, year-round antifreeze that meets the chemical composition of ASTM D6210. The antifreeze change interval is 2 years or 2000 hours whichever occurs first. Antifreeze is essential for freeze, overheat, and corrosion protection.
3. Follow the manufacturer's recommended maintenance procedures for the starter, alternator, generator, batteries, electrical components, exhaust brake, charge air cooler, radiator, air compressor, air cleaner, refrigerant compressor, and fan clutch.

GENERAL INSPECTION

Prior to each use, the generator should be cleaned and inspected for deficiencies. Check for loose, missing or damaged nuts, bolts, and other fasteners. Also check for fuel, oil, and coolant leaks. Use Table 18 as a general maintenance guideline. For engine maintenance, refer to the engine maintenance manual.

AIR FILTER

Inspect or replace the primary and secondary air filters every 500 hours.

This Cummins diesel engine is equipped with a replaceable, high-density paper air cleaner element (Figure 34).This air cleaner is also equipped with an inner element (secondary) that is used as a backup filter should the primary element becomes damaged.

Check the air cleaner daily or before starting the engine and Replace the air cleaner element every 500 hours.

1. Release the four latches (Figure 33) that secures the cover to the air cleaner body.

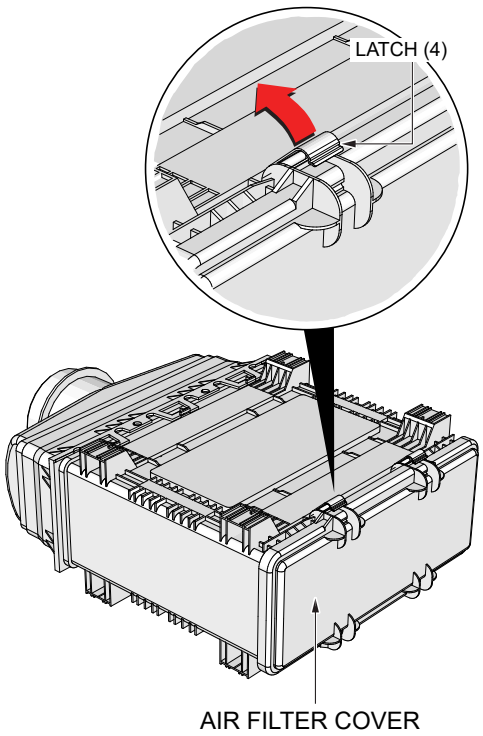


Figure 33. Air Filter Cover

2. Remove the air filter cover and set aside.
3. Remove both the primary and secondary air filter elements (Figure 34) from the case/body.

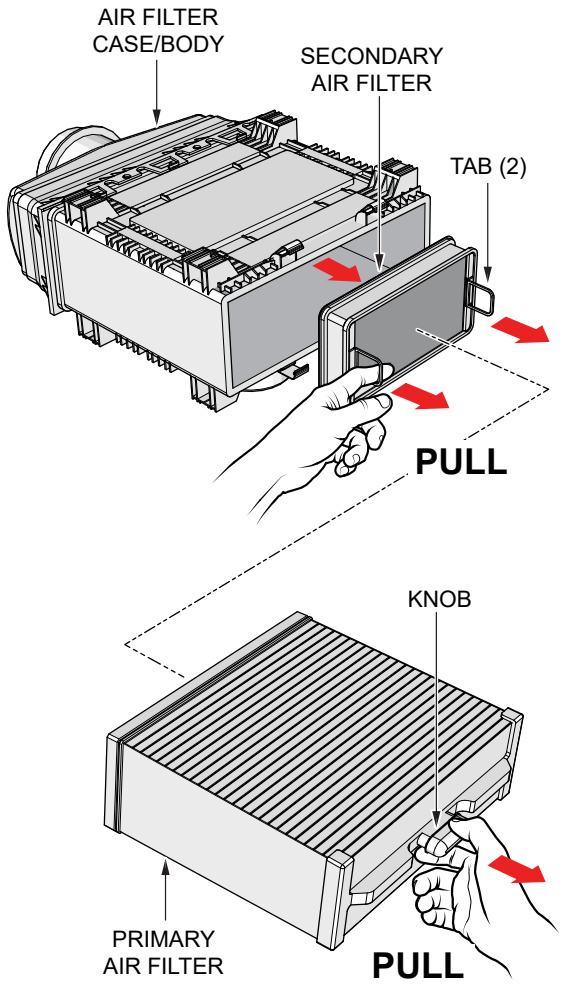


Figure 34. Removing Air Filter Elements

4. Check both the primary and secondary air filter elements for heavy buildup of dirt and debris.

> ***NOTICE***
>
> Operating the engine with loose or damaged air filter components could allow unfiltered air into the engine causing premature wear and failure.

5. If the primary air filter element (paper air filter) is dirty, replace it. **DO NOT** attempt to clean it.

NOTICE

DO NOT use ***excessive*** air pressure or the paper air filter element will be damaged and will need to be replaced. If air filters are excessively dirty (oily). Replace air filters, **DO NOT** clean.

⚠ CAUTION

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

6. To clean the secondary air filter element (paper air filter) as referenced in (Figure 35), tap the filter element several times on a hard surface to remove dirt, or blow compressed air not to exceed 30 psi (207 kPa, 2.1 kgf/cm^2 through the filter element from the inside out.

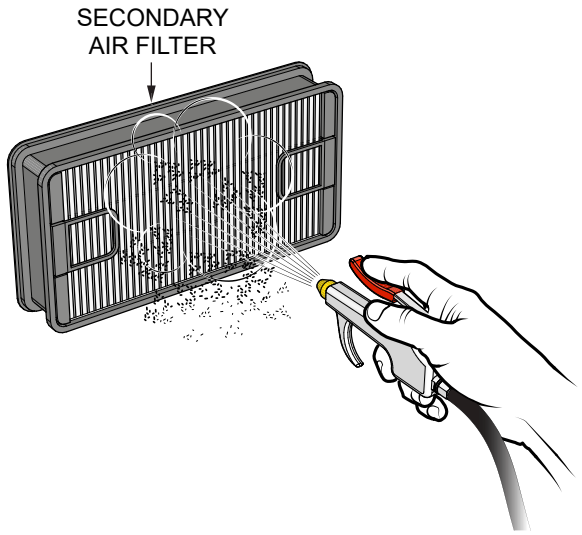


Figure 35. Cleaning Secondary Air Filter

7. Replace both elements if they are damaged or ***excessively dirty***.
8. Using a mild detergent and a damp cloth, clean the inside of the air cleaner case/body as referenced in Figure 36.

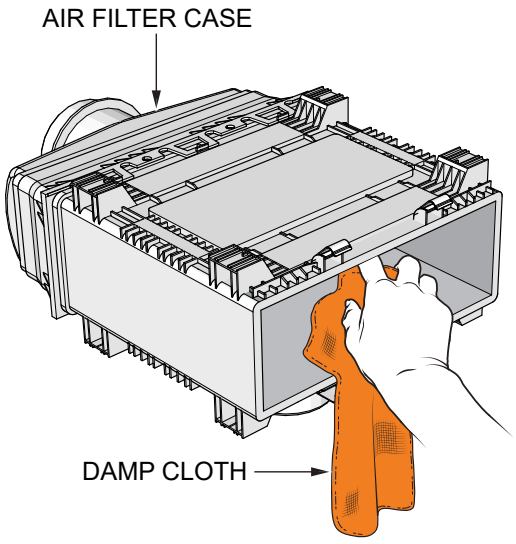


Figure 36. Cleaning Air Filter Body

9. Reinstall the primary and secondary air filter elements back into air cleaner body and secure cover with latches (4) as referenced in Figure 37.

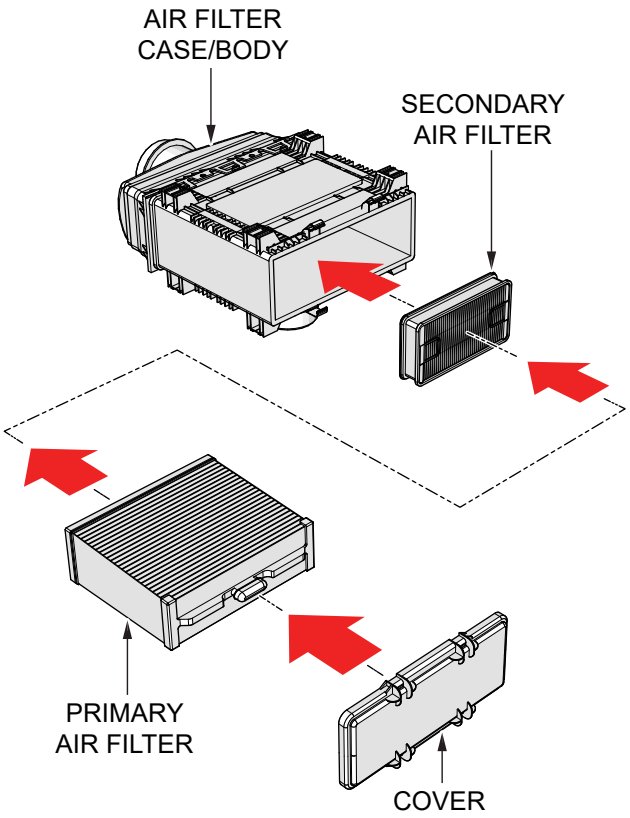


Figure 37. Air Filter Re-Assembly

Air Filter Dust Indicator

NOTICE

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

The air filter indicator (Figure 38) is attached to the air filter. When the air filter element is clogged, air intake restriction becomes greater and the air filter indicator signal shows **RED.** When indicator is red, replace filter immediately. After changing the air filter, ***press*** the air filter indicator button to reset.

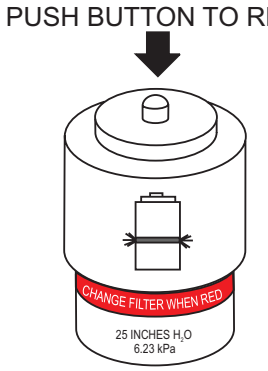


Figure 38. Air Filter Dust Indicator

NOTICE

The air filter should be changed more frequently in dusty operating conditions.

NOTICE

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

REPLACING FUEL FILTER

Replace the fuel filter cartridge with a new one every 500 hours.

1. Clean the area around the lubricating fuel; filter head.
2. Using an fuel filter wrench (Figure 39**A**), remove engine fuel filter.

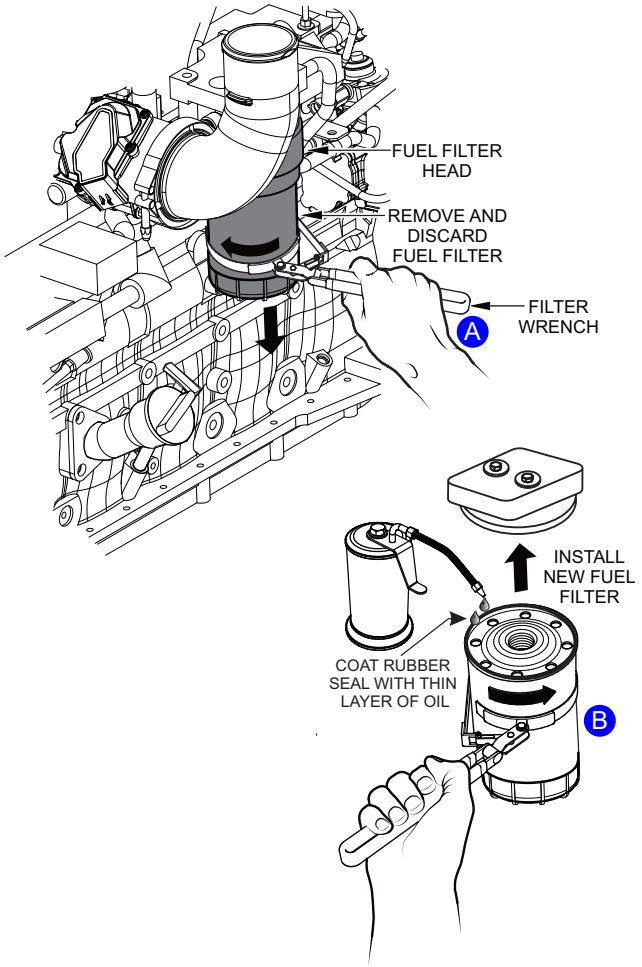


Figure 39. Engine Fuel Filter Removal

3. Coat the rubber seal (gasket) surface of fuel filter (Figure 39**B**) with clean 15W-40 engine oil.
4. Install new fuel filter (main) first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using the filter wrench.

CLEANING FUEL STRAINER

Inspect fuel strainer ***daily***. Clean if necessary.

1. Using a wrench, turn the nut at the bottom of the fuel strainer counterclockwise to remove the bowl from the fuel strainer head.

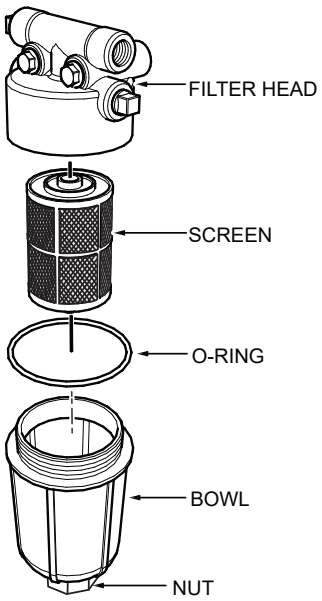


Figure 40. Cleaning Fuel Strainer

2. Pour the contents inside the bowl into a suitable container.
3. Next, wipe the inside of the bowl with a clean cloth to remove any foregn matter or debris that may have accumulated.
4. Visually inspect the fuel strainer (screen). If screen is clogged with debris or foreighn matter, clean screen using carburetor or choke cleaner.
5. If necessary, use compressed air (Figure 41) to remove any debris that still might be attached to the screen. Air pressure should not exceed 10 psi (69 kPa, 0.7 kgf/cm^2).

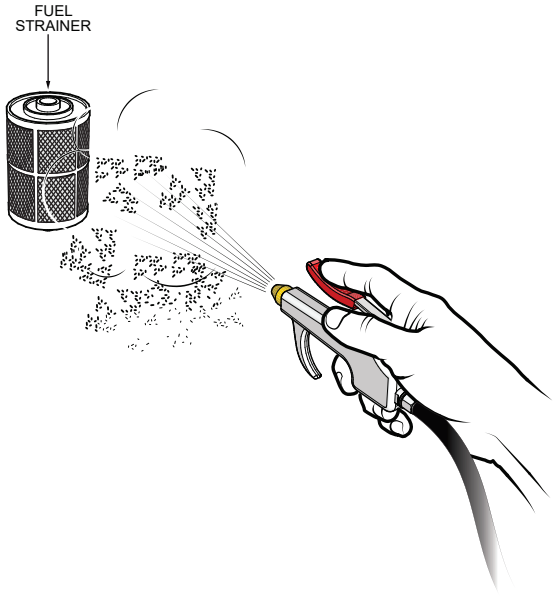


Figure 41. Fuel Strainer Screen

6. If strainer screen is damaged, replace it.
7. Reinstall fuel strainer and bowl back onto fuel strainer head.

DRAINING FUEL WATER SEPARATOR

Inspect fuel water separator ***daily***. Clean if necessary.

1. Over a period of time sediment and foreign matter may have accumulated inside the fuel water separator.
2. To drain the contents (fluid) inside the separator, simply turn the drain plug knob counterclockwise (Figure 42**A**) to ***open*** the drain plug.
3. Place a suitable container underneath the separator for the sediment and foreign matter to drain into (Figure 42**B**).

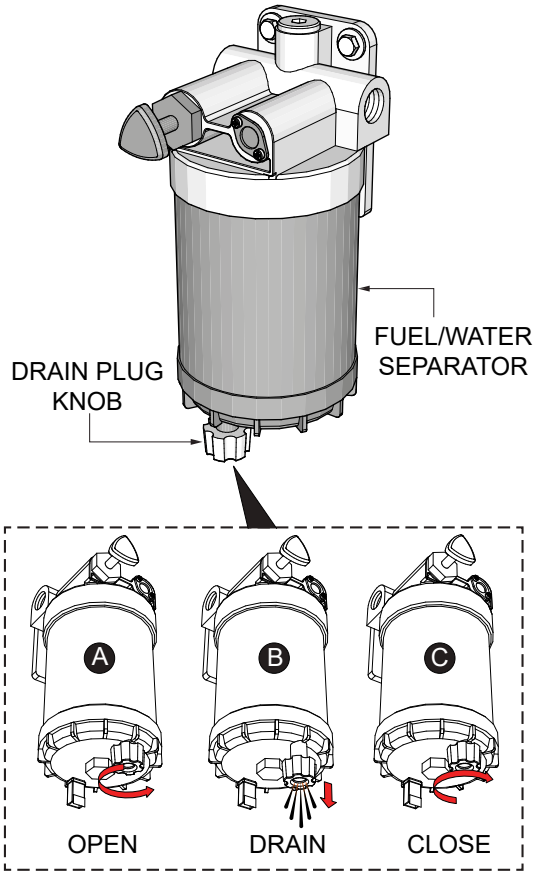


Figure 42. Fuel Water Separator (Draining)

4. When all fluid and foreign matter has been drained from the separator, turn the drain plug knob clockwise (Figure 42**C**) to close the the drain plug.

REPLACING FUEL WATER SEPARATOR

1. Replacement of the fuel water separator is easy, simply turn the cartridge counterclockwise and remove from head assembly.

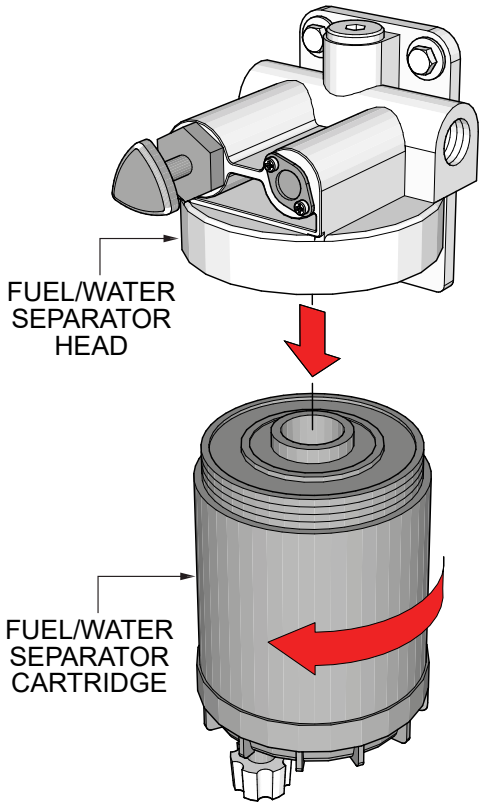


Figure 43. Fuel Water Separator (Replacement)

2. Clean the filter head assembly and install the new water separator.

AIR REMOVAL, BLEED THE SYSTEM

NOTICE

If air enters the fuel injection system of a diesel engine, starting becomes impossible. After running out of fuel, or after disassembling the fuel system, bleed the system. For more detailed information, for more detailed information refer to the Cummins Owner's Manual, "Bleeding the Fuel System".

1. Using an allen wrench, loosen the air bleeder screw as shown in Figure 44.

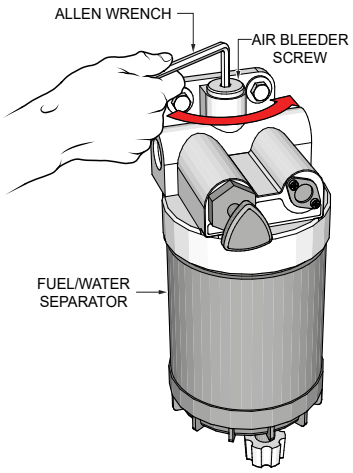


Figure 44. Air Bleeder Screw

2. Turn the air bleed knob counterclockwise (Figure 45). This will release the knob so that primming (purging of air) can begin.

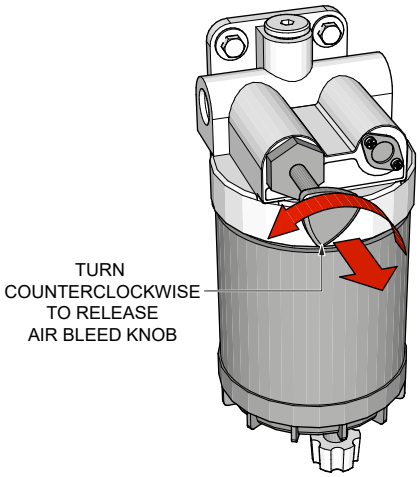


Figure 45. Air Bleed Knob (Released)

3. Next, **PUSH** the air bleed knob (Figure 46) in and out until the fuel system has been completely purged (removal of air) the knob is spring loaded.

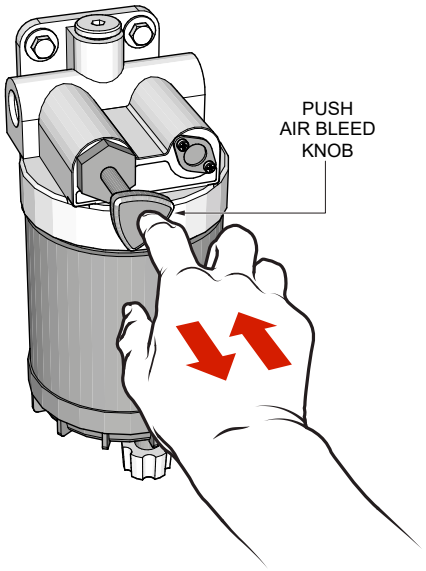


Figure 46. Air Bleed Knob (Active)

4. Once the fuel system has been purged (removal of air), turn the air bleed knob clockwise (Figure 47), this will lock the knob.

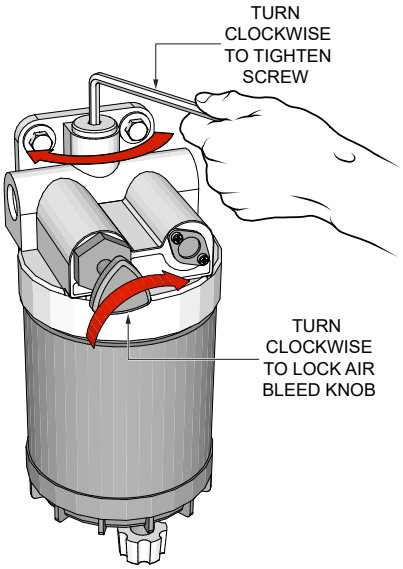


Figure 47. Air Bleed Knob (Locked)

FUEL ADDITION

Add diesel fuel (the grade may vary according to season and locations). Only use ***Ultra Low Sulfur*** diesel fuel when refilling fuel tank.

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 necessary.

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

If necessary, drain the fuel inside the fuel tank completely. Using a spray washer (Figure 48) wash out any deposits or debris that have accumulated inside the fuel tank.

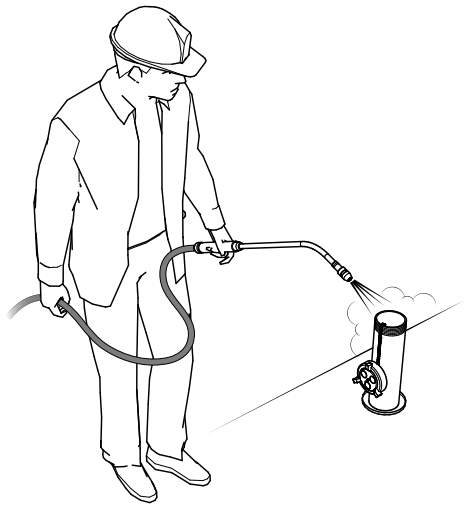


Figure 48. Fuel Tank Cleaning

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 and other foreign matter.

CHECK OIL LEVEL

Check engine oil level ***daily***.

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. The oil level must be between the two notches on the dipstick.

1. Pull the engine oil dipstick from its holder and wipe it clean.
2. Reinsert the dipstick, then remove the dipstick from its holder. Check the oil level shown on the dipstick (Figure 49).

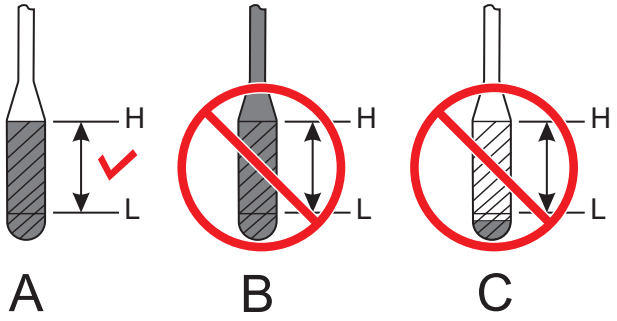


Figure 49. Dipstick Engine Oil Level

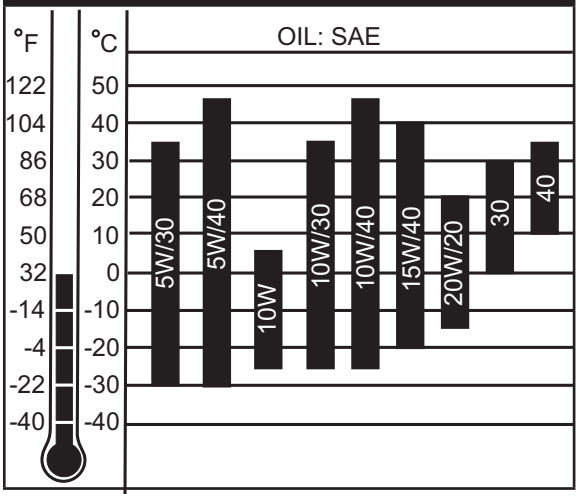
3. Verify that the engine oil level is maintained between the **H** and **L** markings on the dipstick as referenced in Figure 49**A.**
4. If the engine oil level is low (Figure 49**C**), remove the oil filler cap and fill to a safe operating level (max) as indicated by the dipstick (Figure 49**A**). (See Recommended Viscosity Grades, Table 19).

NOTICE

When adding engine oil **DO NOT** overfill (Figure 49**B**).

5. Allow enough time for any added oil to make its way to the oil pan before rechecking.

Table 19. Oil Selection Chart



DRAINING ENGINE OIL

1. Run the engine until the engine coolant reaches a temperature of 140° (60°C) Turn the engine off.
2. Remove the oil dipstick from its holder.
3. Next, remove the coolant drain plug located at the base of the skid as shown in Figure 50 and allow the oil to drain into a suitable container.

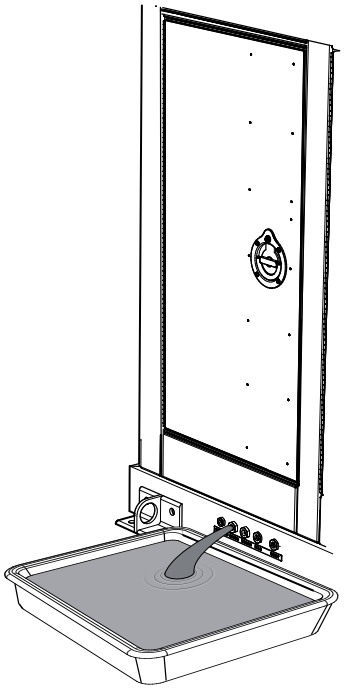


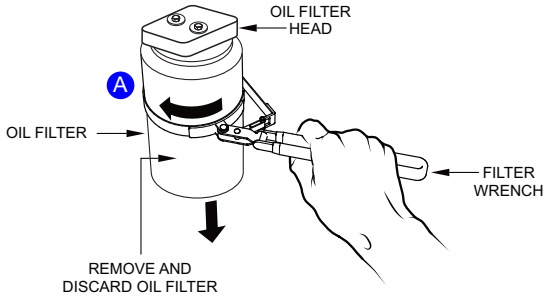
Figure 50. Draining Engine Oil

4. After engine oil has been completely drained, reinstall drain plug and tighten securely.

ENGINE OIL FILTER REPLACEMENT

Replace engine oil filter every 250 hours.

1. Using an oil filter wrench (Figure 51**A**), remove engine oil filter.
2. Clean the area around the lubricating oil filter head.



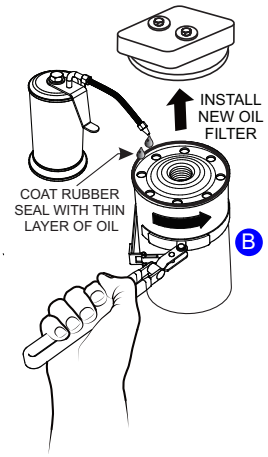


Figure 51. Engine Oil Filter Removal

3. Coat the rubber seal gasket on the engine oil filter (Figure 51**B**) with clean 15W-40 engine oil.
4. Install new oil filter (main) first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using the filter wrench.
5. Fill engine crankcase with high quality detergent oil classified "For Service CI-4". Fill to the upper limit of dipstick. **DO NOT** overfill. Reference for engine crankcase oil capacity.
6. Run the engine for several minutes. Watch for oil leakage. Shut the engine down and allow it to sit for several minutes. Top off the oil to the upper limit on the dipstick.

DRAINING HYDAULIC OIL

1. To drain the hydraulic fluid, remove the hydraulic fluid drain plug located at the base of the skid as shown in Figure 52 and allow the fluid to drain into a suitable container.

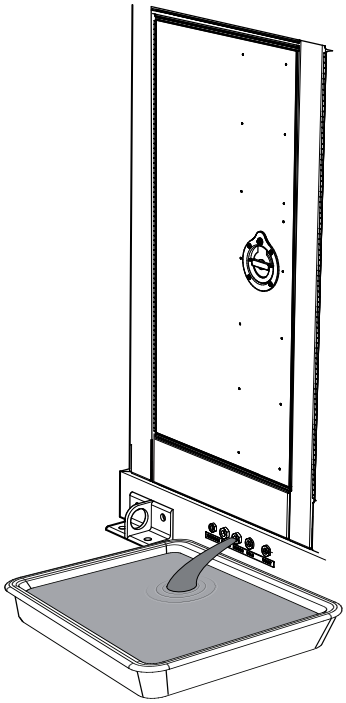


Figure 52. Draining Hydraulic Fluid

HYDRAULIC OIL FILTER REPLACEMENT

Replace hydraulic oil filter every 6 months.

2. Using an oil filter wrench (Figure 53**A**), remove hydraulic oil filter.
3. Clean the area around the hydraulic oil filter head and wipe up any fluid that might have spilled.
4. Coat the rubber seal gasket on the hydraulic oil filter (Figure 53**B**) with clean 15W-40 engine oil.
5. Install new hydraulic filter first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using the filter wrench.

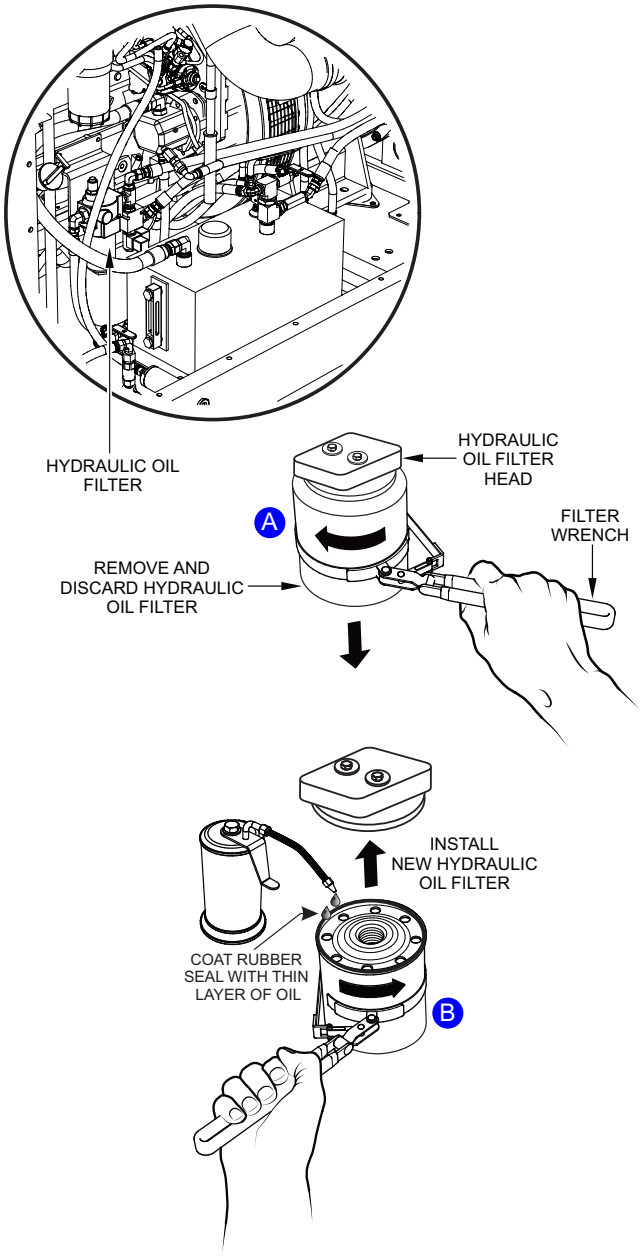


Figure 53. Hydraulic Oil Filter Removal

WARNING

DO NOT remove the pressure cap from the radiator when the engine is hot! Wait until the coolant temperature is below 120°F (50°C) before removing pressure cap.

Heated coolant spray or steam can cause severe scalding and personal injury.

1. Remove the radiator pressure cap (Figure 54) only if the coolant temperature is below 120°F (50°C).

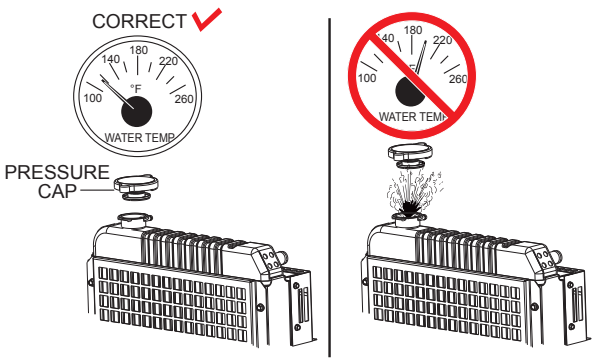


Figure 54. Radiator Pressure Cap Removal

2. Remove the coolant drain plug located at the base of the skid as shown in Figure 55 and allow the coolant to drain into a suitable container.

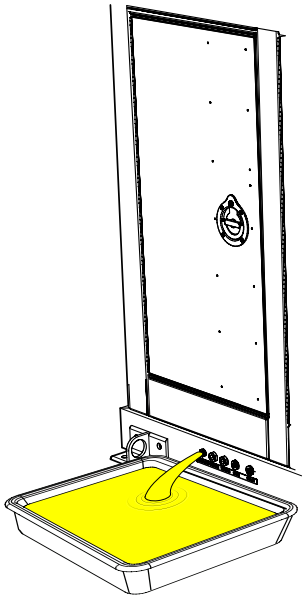


Figure 55. Draining Engine Coolant

3. After engine coolant has been completely drained, reinstall drain plug and tighten securely.

FLUSHING RADIATOR

WARNING

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

1. Remove radiator cap.
2. Open coolant drain plug located at the base of the skid and drain coolant into a suitable container.
3. If equipped, remove the overflow tank. Drain and clean overflow tank.
4. Replace the overflow tank if necessary.
5. Check hoses for softening and kinks. Check clamps for signs of leakage.
6. 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.
7. Replace with coolant as recommended by the engine manufacturer.
8. Reinstall drain plug and tighten securely. Tighten drain cock and close radiator cap tightly.
9. Reinstall radiator cap.

RADIATOR CLEANING

The radiator (Figure 56) 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 56. Radiator Cleaning

COOLANT (ANTIFREEZE/SUMMER COOLANT/ WATER)

Cummins recommends antifreeze/summer coolant for use in their engines, which can be purchased in concentrate (and mixed with 50% demineralized water) or pre-diluted. See the **Cummins Operation and Maintenance 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.

DEF TANK SUPPLY MODULE FILTER

Replace DEF Supply Module Filter every 4500 hours.

1. Remove cap (Figure 57) at the bottom of DEF supply module to gain access to the paper filter.

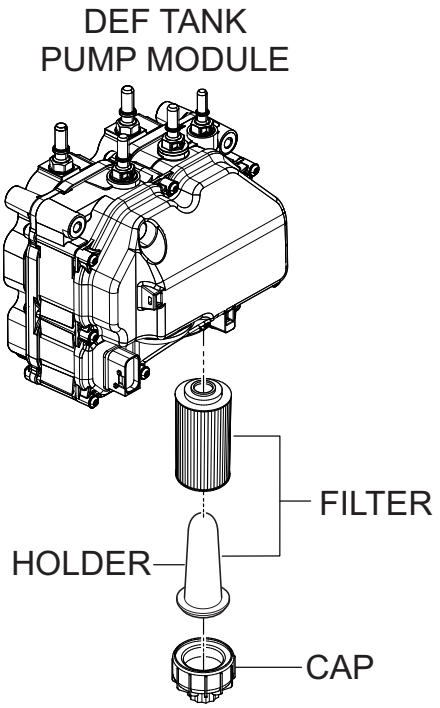


Figure 57. DEF Supply Module Filter

2. Discard the old filter.
3. Install the new filter onto the holder.
4. Insert filter and holder back into DEF supply module.
5. Reinstall cap.

GENERATOR STORAGE

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

1. Drain the fuel tank completely. Treat with a fuel stabilizer if necessary.
2. Completely drain the oil from the crankcase and refill, if necessary, with fresh oil.
3. Clean the entire generator, inside and outside.
4. Disconnect the battery.
5. Make sure engine coolant is at proper level.
6. Cover the generator and store in a clean, and dry place.

EMISSION CONTROL

The emission control system employed with the diesel engine consists of a ***Diesel Particulate Filter*** (**DPF**) and a ***Selective Catalytic Reduction*** (**SCR**) that meet the requirement for EPA Tier 4 (Final) regulations.

Selective Catalytic Reduction (**SCR**) is an advanced active emissions control technology system that injects a liquid-reductant agent through a special catalyst into the exhaust stream of a diesel engine. The reductant source is usually automotive-grade urea, otherwise known as Diesel Exhaust Fluid (**DEF**). The DEF sets off a chemical reaction that converts nitrogen oxides into nitrogen, water and tiny amounts of carbon dioxide (CO2), natural components of the air we breathe, which is then expelled through the vehicle tailpipe.

SCR technology is designed to permit nitrogen oxide (NOx) reduction reactions to take place in an oxidizing atmosphere. It is called "selective" because it reduces levels of NOx using ammonia as a reductant within a catalyst system. The chemical reaction is known as "reduction" where the DEF is the reducing agent that reacts with NOx to convert the pollutants into nitrogen, water and tiny amounts of CO2. The DEF can be rapidly broken down to produce the oxidizing ammonia in the exhaust stream.

The ***Diesel Particulate Filter*** (**DPF**) is a device designed to remove diesel particulate matter or soot from the exhaust gas of a diesel engine. These exhaust emissions pose serious environmental and health risks. It is important to maintain and service the DPF on a periodic basis.

EMISSION CARBON CHECK

Deposition of carbon (soot, unburned fuel) in the exhaust pipe line and muffler could cause not only system derates but also could lead to fires.

To reduce soot and unburned fuel, run the unit at rated power until the exhaust gas become mostly colorless every 250 hours operation time. More carbon will be generated when the unit operates at less then 30% of rated power. In this case, perform the above procedures more frequently.

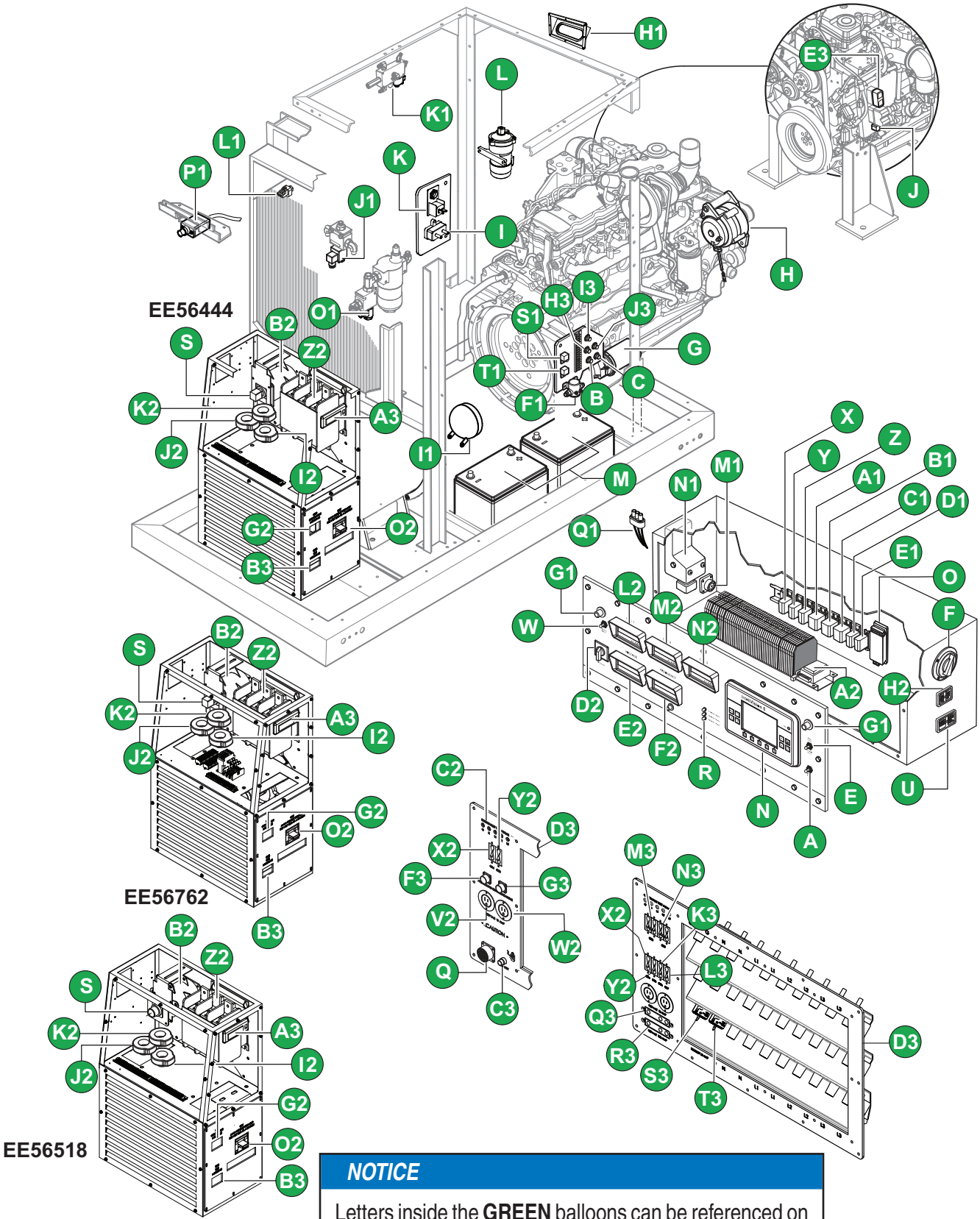
NOTICE

Applying a large load suddenly to the unit when the carbon deposition is generated in the exhaust system could produce sparks and will lead to abnormal combustion. Therefore, apply load gradually and observe the exhaust gas color during the process.

Troubleshooting (Generator)		
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 voltage regulator defective?	Replace if necessary.
	Defective Rotating Rectifier?	Check and replace.
	Defective Exciter Field?	Check and replace.
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.

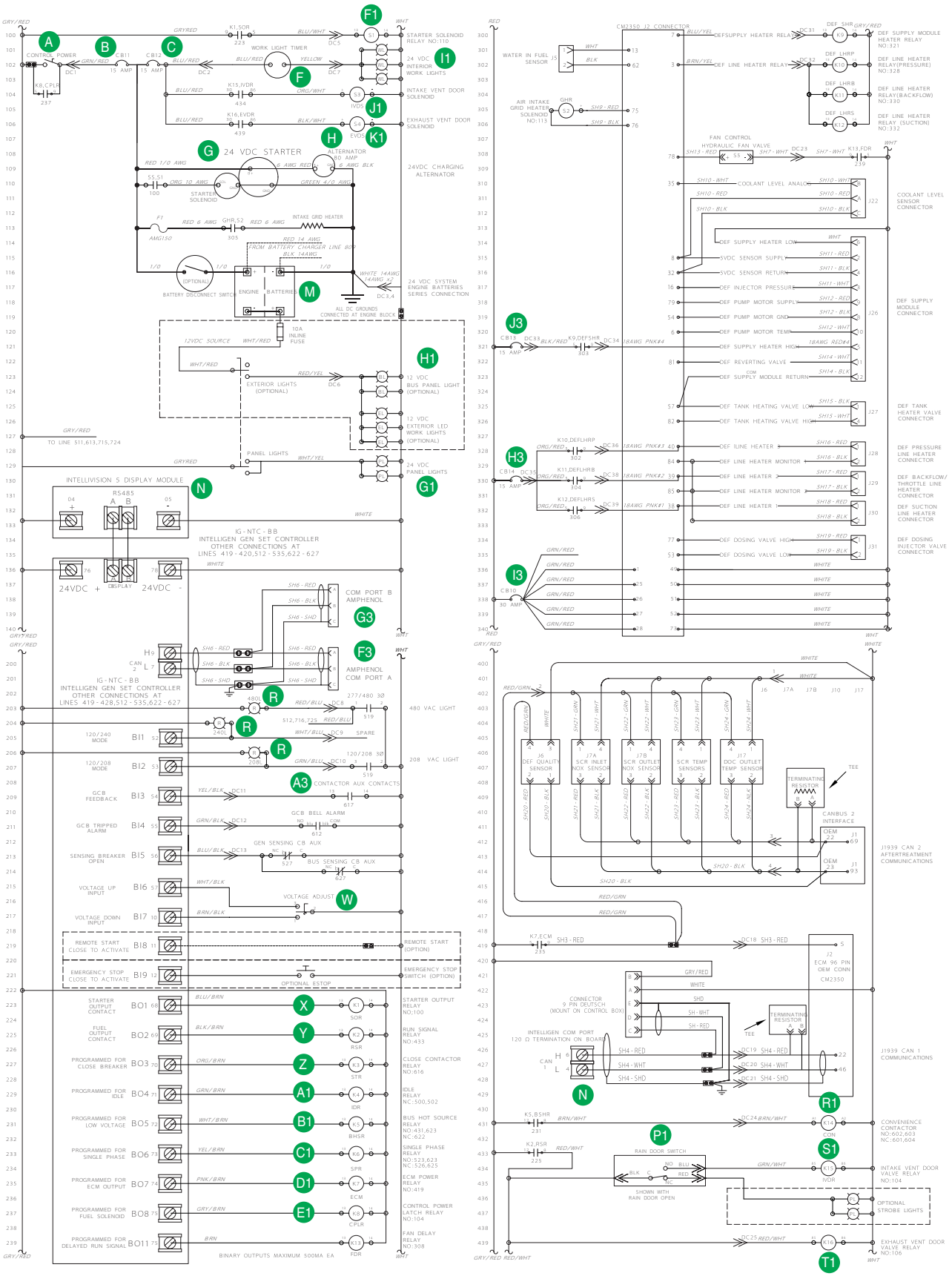
Troubleshooting (Engine)		
Symptom	**Possible Problem**	**Solution**
Engine will not start or start is delayed, although engine can be turned over.	No Fuel reaching injection pump?	Add fuel. Check entire fuel system.
	Defective fuel pump?	Replace fuel pump.
	Fuel filter clogged?	Replace fuel filter and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

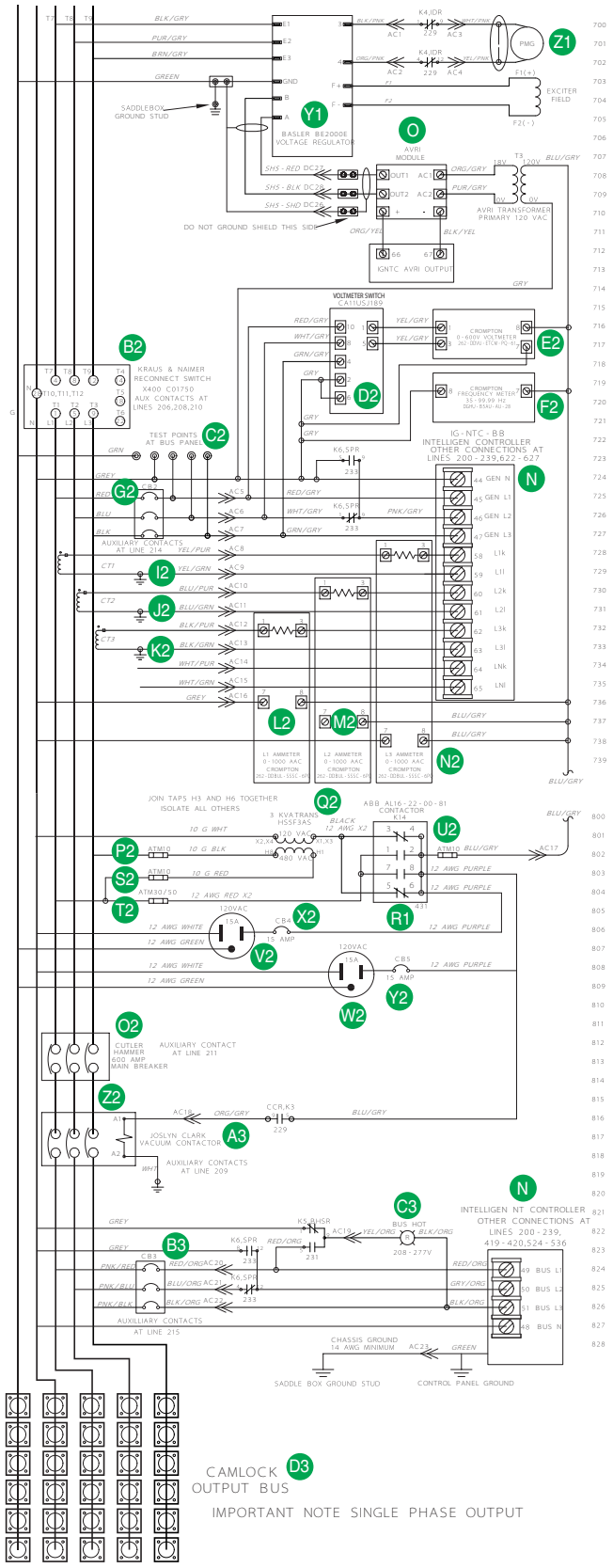
Troubleshooting (Intelivision 5 Controller)		
Symptom	**Possible Problem**	**Solution**
Wrong Display HW	SW and HW mismatch?	Correct firmware has to be programmed.
Invalidate configuration table Error	Configuration table is invalid?	Controller configuration has to be reprogrammed or upgraded.
Unsupported controller Error	Controller is not supported?	Controller upgrade necessary.
Unsupported cfg. table format Error	Controller configuration table is not supported?	InteliVision 5 firmware upgrade is necessary.
Mismatch parameters length Error	Controller parameters mismatch?	Controller configuration upgrade is necessary.
Mismatch const values length Error	Controller constants mismatch?	Controller configuration upgrade is necessary.
Mismatch values length Error	Controller values mismatch?	Controller configuration upgrade is necessary.
Mismatch val states length Error	Controller values states mismatch?	Controller configuration upgrade is necessary.
Controller was not detected Error	Controller is not connected or communication via RS485 is interrupted?	Communication is lost or RS485 line A and B are swapped.
Communication Error	Controller is detected; RS485 communication level is not defined correctly?	RS485 line is not terminated properly, environment disturbance is present or RS485 line is too long.
Screen template missing Error	Unsupported controller firmware, missing InteliVision 5 support?	Upgrade controller firmware.
Screen template version Error	Unsupported controller screen?	InteliVision 5 firmware has to be updated.
Font not valid Error	Corrupted display font?	Display firmware/font programming is necessary.
	Font programming was not done properly?	Display firmware/font programming is necessary.
Font format not supported Error	Unsupported font?	InteliVision 5 font or firmware is necessary.
Bitmaps not valid Error	Unsupported format?	Firmware upgrade is necessary.
Bitmaps format not supported Error	Unsupported bitmaps format?	Firmware upgrade is necessary.
Default lang. not supported Error	Default/Defined language error/not supported?	Language change or code page change is necessary.



NOTICE

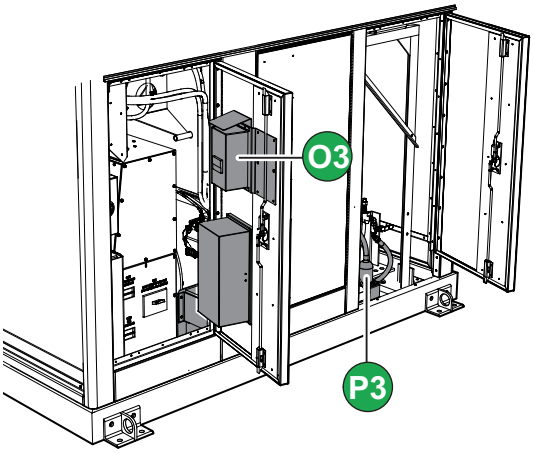
Letters inside the **GREEN** balloons can be referenced on the associated "Generator Wiring Diagrams".

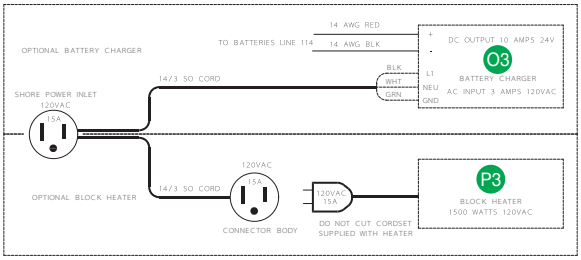




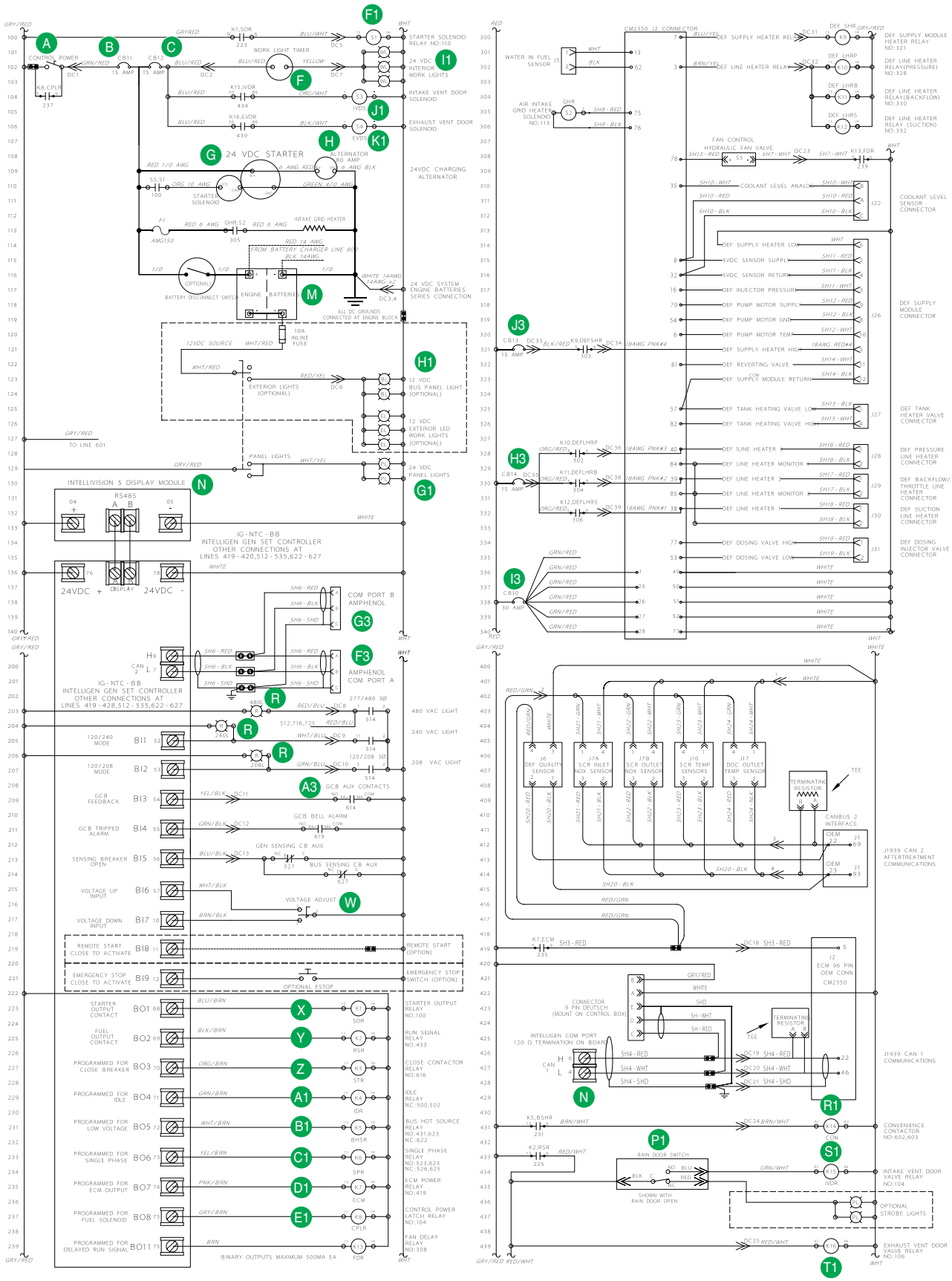
NOTICE

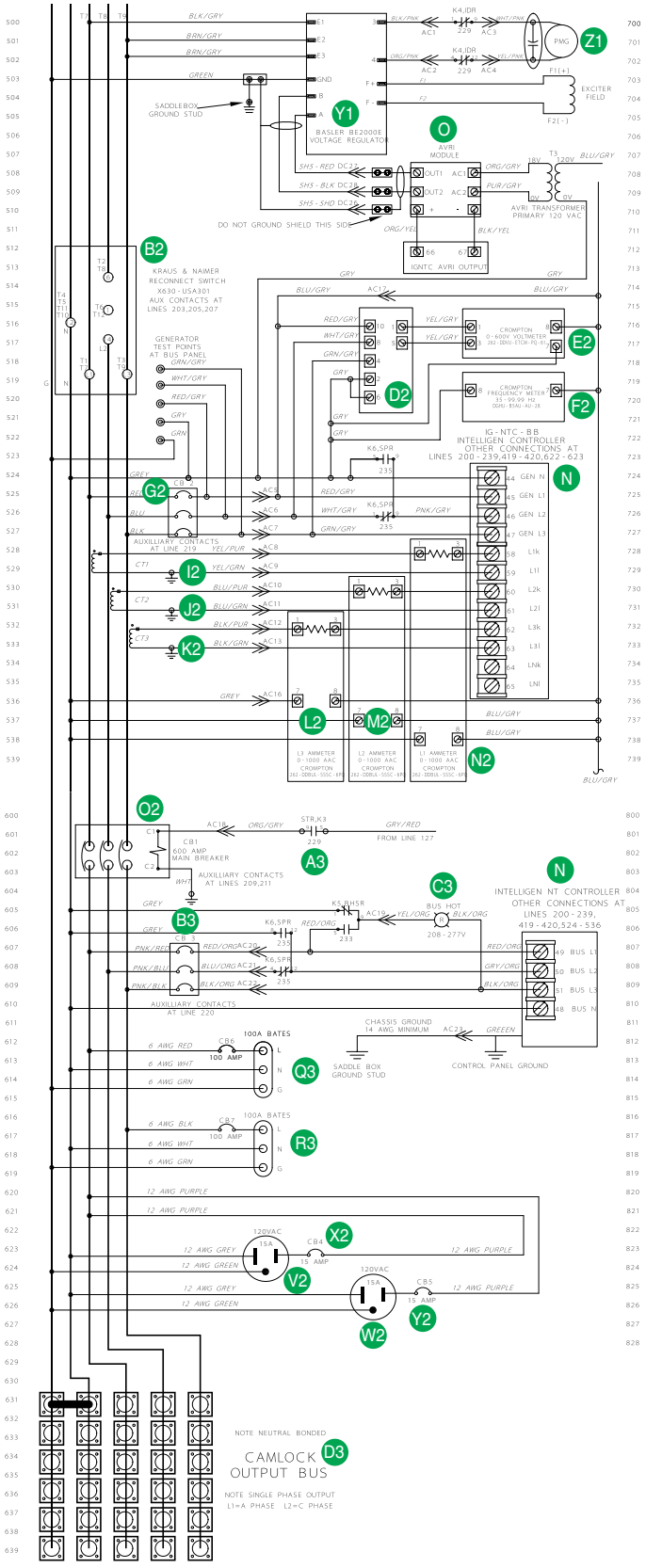
Letters inside the **GREEN** balloons can be referenced on the "Generator Wiring Diagram Locator". Battery Charger and Block Heater locations are shown below.

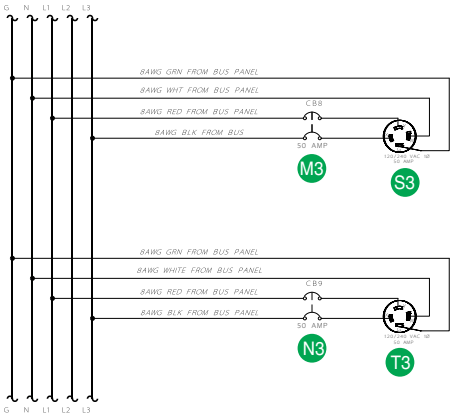




IMPORTANT NOTES:
ALL CONTROL WIRES TO BE MTW TYPE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE SIZES SHALL BE 16AWG UNLESS STATED OTHERWISE
POWER CABLES SHALL BE 4/0 AWG PPC TYPE CABLE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE COLOR CODE = STRIPE COLOR/BASE COLOR


A
B
C
F1
F
I1
J1
K1
G 24 VDC STARTER
H ALTERNATOR 160 AMP
24VDC CHARGING ALTERNATOR
M
24 VDC SYSTEM ENGINE BATTERIES SERIES CONNECTION
H1
12 VDC BUS PANEL LIGHT (OPTIONAL)
12 VDC EXTERIOR LED WORK LIGHTS (OPTIONAL)
G1
N
INTELLIVISION 5 DISPLAY MODULE
IG-NTC-BB INTELLIGEN GEN SET CONTROLLER OTHER CONNECTIONS AT LINES 419-420,512-535,622-627
G3
F3
R
A3
W
R1
P1
S1
T1
H3
I3
J3
CM2350 J2 CONNECTOR
WATER IN FUEL SENSOR
AIR INTAKE GRID HEATER SOLENOID NO:113
FAN CONTROL HYDRAULIC FAN VALVE
COOLANT LEVEL SENSOR CONNECTOR
DEF SUPPLY MODULE CONNECTOR
DEF TANK HEATER VALVE CONNECTOR
DEF PRESSURE LINE HEATER CONNECTOR
DEF BACKFLOW/ THROTTLE LINE HEATER CONNECTOR
DEF SUCTION LINE HEATER CONNECTOR
DEF DOSING INJECTOR VALVE CONNECTOR
DEF SUPPLY MODULE HEATER RELAY NO:321
DEF LINE HEATER RELAY(PRESSURE) NO:328
DEF LINE HEATER RELAY(BACKFLOW) NO:330
DEF LINE HEATER RELAY (SUCTION) NO:332
J1939 CAN 2 AFTERTREATMENT COMMUNICATIONS
J1939 CAN 1 COMMUNICATIONS
CONVENIENCE CONTACTOR NO:602,603
INTAKE VENT DOOR VALVE RELAY NO:104
EXHAUST VENT DOOR VALVE RELAY NO:106
OPTIONAL STROBE LIGHTS
RAIN DOOR SWITCH
STARTER OUTPUT RELAY NO;100
RUN SIGNAL RELAY NO:433
CLOSE CONTACTOR RELAY NO:616
IDLE RELAY NC:500,502
BUS HOT SOURCE RELAY NO:431,623 NC:622
SINGLE PHASE RELAY NO:523,623 NC:526,625
ECM POWER RELAY NO:419
CONTROL POWER LATCH RELAY NO:104
FAN DELAY RELAY NO:308
BINARY OUTPUTS MAXIMUM 500MA EA



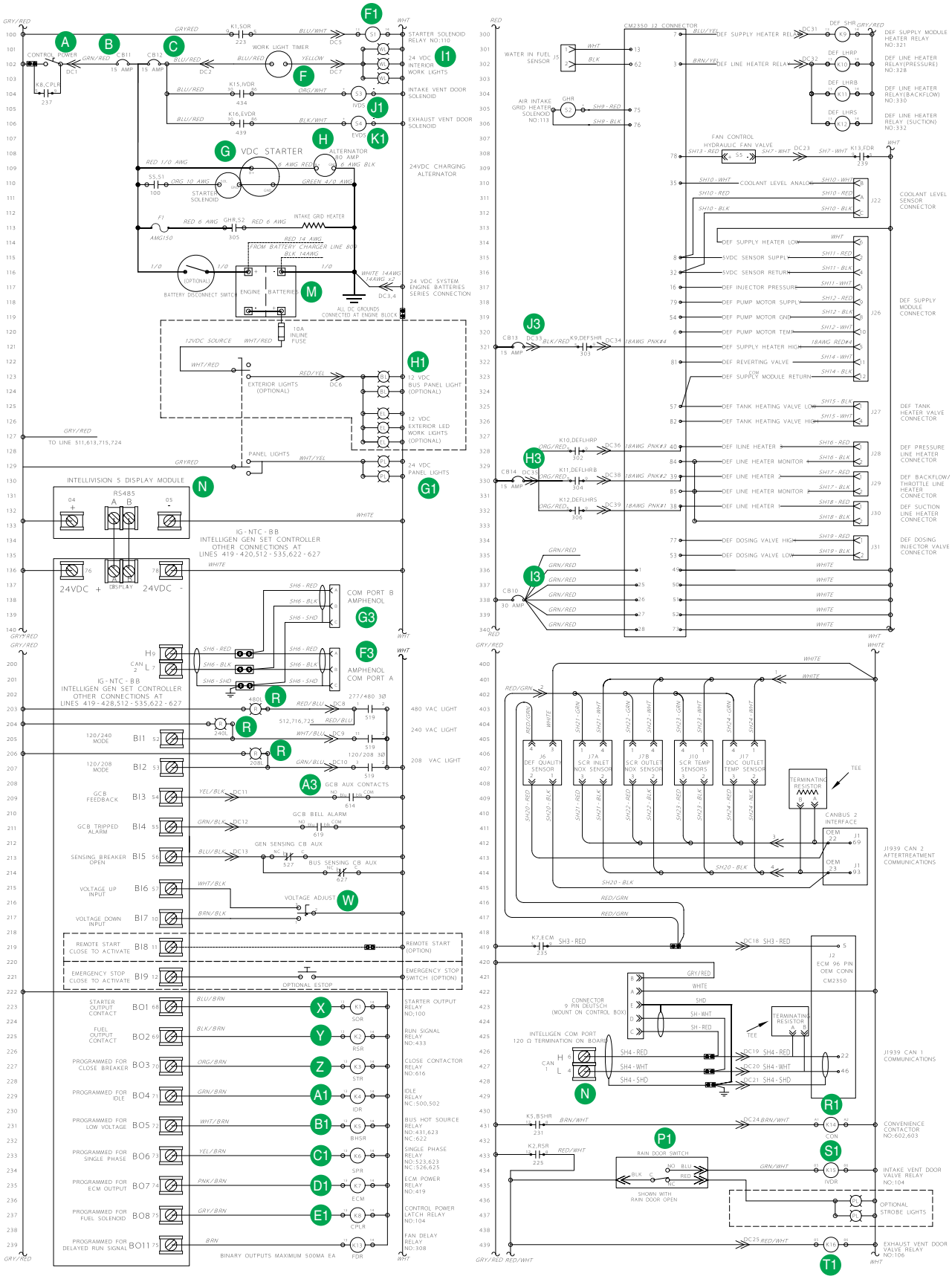


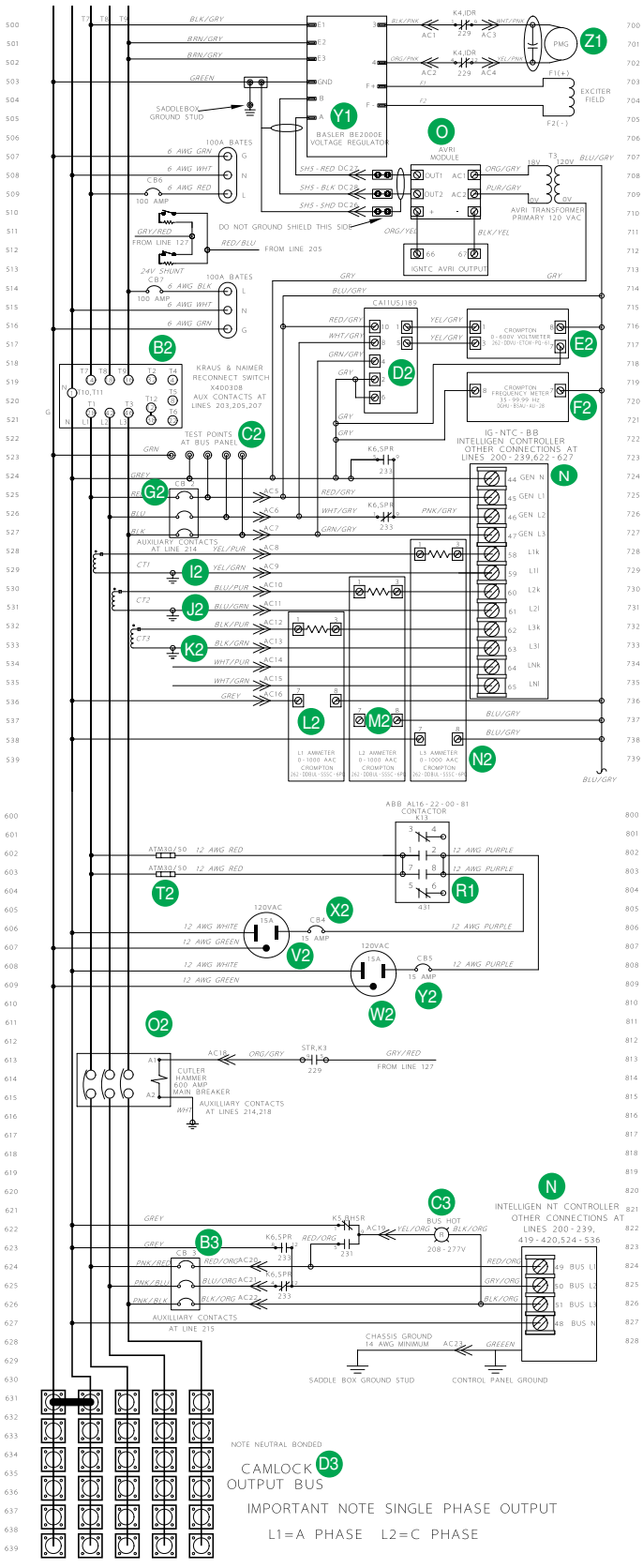
OPTIONAL 50 AMP CONNECTORS
MOUNT ON EXPANSION PANEL ON OUTPUT BUS

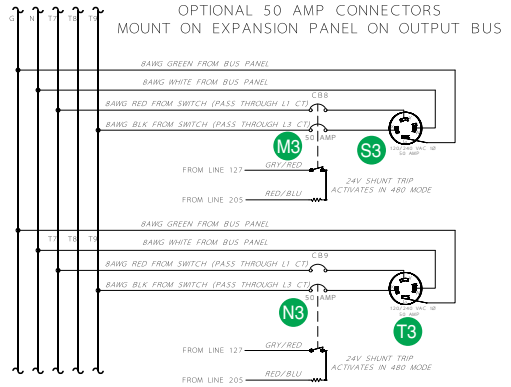
NOTICE

Letters inside the **GREEN** balloons can be referenced on the "Generator Wiring Diagram Locator".

IMPORTANT NOTES:
ALL CONTROL WIRES TO BE MTW TYPE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE SIZES SHALL BE 16AWG UNLESS STATED OTHERWISE
POWER CABLES SHALL BE 4/0 AWG PPC TYPE CABLE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE COLOR CODE = STRIPE COLOR/BASE COLOR

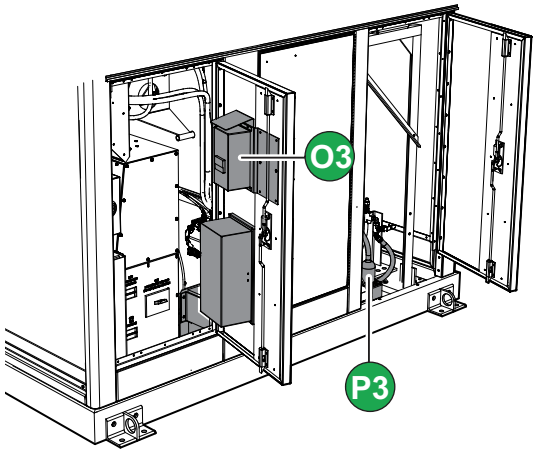

F1
A
B
C
CONTROL POWER
DC1
CR1
15 AMP
CR2
15 AMP
DC2
K1,SOR
223
WORK LIGHT TIMER
DC5
STARTER SOLENOID RELAY NO:110
I1
24 VDC INTERIOR WORK LIGHTS
F
DC7
K15,IVDR
434
INTAKE VENT DOOR SOLENOID
J1
IVDS
K16,EVDR
439
EXHAUST VENT DOOR SOLENOID
H
K1
EVDS
G
VDC STARTER
ALTERNATOR
320 AMP
24VDC CHARGING ALTERNATOR
STARTER SOLENOID
GREEN 4/0 AWG
INTAKE GRID HEATER
GHR,S2
305
AMG150
FROM BATTERY CHARGER LINE BLK
BATTERY DISCONNECT SWITCH
(OPTIONAL)
ENGINE
BATTERIES
M
24 VDC SYSTEM ENGINE BATTERIES SERIES CONNECTION
ALL DC GROUNDS CONNECTED AT ENGINE BLOCK
10A INLINE FUSE
12VDC SOURCE
H1
12 VDC BUS PANEL LIGHT (OPTIONAL)
EXTERIOR LIGHTS (OPTIONAL)
DC6
12 VDC EXTERIOR LED WORK LIGHTS (OPTIONAL)
TO LINE 511,613,715,724
PANEL LIGHTS
24 VDC PANEL LIGHTS
G1
INTELLIVISION 5 DISPLAY MODULE
N
RS485
A B
24VDC +
DISPLAY
24VDC -
IG - NTC - BB
INTELLIGEN GEN SET CONTROLLER
OTHER CONNECTIONS AT
LINES 419 - 420,512 - 535,622 - 627
COM PORT B AMPHENOL
G3
F3
AMPHENOL COM PORT A
CAN 2
H9
L7
R
480L
277/480 3Ø
480 VAC LIGHT
240L
120/240 MODE
BI1
240 VAC LIGHT
208L
120/208 MODE
BI2
120/208 3Ø
208 VAC LIGHT
A3
GCB AUX CONTACTS
GCB FEEDBACK
BI3
GCB BELL ALARM
GCB TRIPPED ALARM
BI4
GEN SENSING CB AUX
SENSING BREAKER OPEN
BI5
BUS SENSING CB AUX
VOLTAGE UP INPUT
BI6
VOLTAGE ADJUST
W
VOLTAGE DOWN INPUT
BI7
REMOTE START CLOSE TO ACTIVATE
BI8
REMOTE START (OPTION)
EMERGENCY STOP CLOSE TO ACTIVATE
BI9
EMERGENCY STOP SWITCH (OPTION)
OPTIONAL ESTOP
STARTER OUTPUT CONTACT
BO1
X
STARTER OUTPUT RELAY NO:100
FUEL OUTPUT CONTACT
BO2
Y
RUN SIGNAL RELAY NO:433
PROGRAMMED FOR CLOSE BREAKER
BO3
Z
CLOSE CONTACTOR RELAY NO:616
PROGRAMMED FOR IDLE
BO4
A1
IDLE RELAY NC:500,502
PROGRAMMED FOR LOW VOLTAGE
BO5
B1
BUS HOT SOURCE RELAY NO:431,623 NC:622
PROGRAMMED FOR SINGLE PHASE
BO6
C1
SINGLE PHASE RELAY NO:523,623 NC:526,625
PROGRAMMED FOR ECM OUTPUT
BO7
D1
ECM POWER RELAY NO:419
PROGRAMMED FOR FUEL SOLENOID
BO8
E1
CONTROL POWER LATCH RELAY NO:104
PROGRAMMED FOR DELAYED RUN SIGNAL
BO11
FAN DELAY RELAY NO:308
BINARY OUTPUTS MAXIMUM 500MA EA
CM2350 J2 CONNECTOR
WATER IN FUEL SENSOR
AIR INTAKE GRID HEATER SOLENOID NO:113
DEF SUPPLY HEATER RELAY
DEF SUPPLY MODULE HEATER RELAY NO:321
DEF LINE HEATER RELAY
DEF LINE HEATER RELAY(PRESSURE) NO:328
DEF LHRB
DEF LINE HEATER RELAY(BACKFLOW) NO:330
DEF LHRS
DEF LINE HEATER RELAY (SUCTION) NO:332
FAN CONTROL HYDRAULIC FAN VALVE
K13,FDR
239
COOLANT LEVEL ANALOG
COOLANT LEVEL SENSOR CONNECTOR
DEF SUPPLY HEATER LOW
5VDC SENSOR SUPPLY
5VDC SENSOR RETURN
DEF INJECTOR PRESSURE
DEF PUMP MOTOR SUPPLY
DEF PUMP MOTOR GND
DEF PUMP MOTOR TEMP
DEF SUPPLY HEATER HIGH
DEF REVERTING VALVE
DEF SUPPLY MODULE RETURN
DEF SUPPLY MODULE CONNECTOR
DEF TANK HEATING VALVE LOW
DEF TANK HEATING VALVE HIGH
DEF TANK HEATER VALVE CONNECTOR
J3
CB13
15 AMP
K9,DEFSHR
309
18AWG PNK#4
18AWG RED#4
K10,DEFLHRP
302
DEF ILINE HEATER
DEF LINE HEATER MONITOR
DEF LINE HEATER 2
DEF LINE HEATER MONITOR 2
DEF LINE HEATER 1
DEF PRESSURE LINE HEATER CONNECTOR
H3
CB14
15 AMP
K11,DEFLHRB
304
18AWG PNK#2
DEF BACKFLOW/ THROTTLE LINE HEATER CONNECTOR
K12,DEFLHRS
306
18AWG PNK#1
DEF SUCTION LINE HEATER CONNECTOR
DEF DOSING VALVE HIGH
DEF DOSING VALVE LOW
DEF DOSING INJECTOR VALVE CONNECTOR
I3
CB10
30 AMP
J6 DEF QUALITY SENSOR
J7A SCR INLET NOX SENSOR
J7B SCR OUTLET NOX SENSOR
J10 SCR TEMP SENSORS
J17 DOC OUTLET TEMP SENSOR
TERMINATING RESISTOR
TEE
CANBUS 2 INTERFACE
OEM 22
OEM 23
J1939 CAN 2 AFTERTREATMENT COMMUNICATIONS
K7,ECM
235
J2 ECM 96 PIN OEM CONN CM2350
CONNECTOR 9 PIN DEUTSCH (MOUNT ON CONTROL BOX)
INTELLIGEN COM PORT 120 Ω TERMINATION ON BOARD
J1939 CAN 1 COMMUNICATIONS
K5,RSHR
231
R1
CONVENIENCE CONTACTOR NO:602,603
P1
K2,RSR
225
RAIN DOOR SWITCH
SHOWN WITH RAIN DOOR OPEN
S1
INTAKE VENT DOOR VALVE RELAY NO:104
IVDR
OPTIONAL STROBE LIGHTS
EXHAUST VENT DOOR VALVE RELAY NO:106
T1

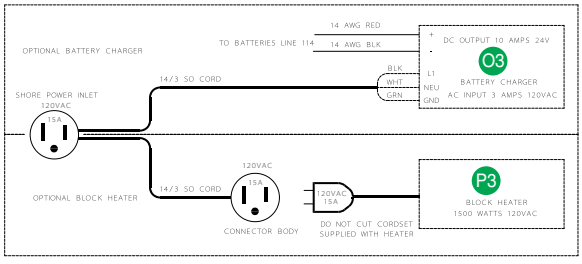




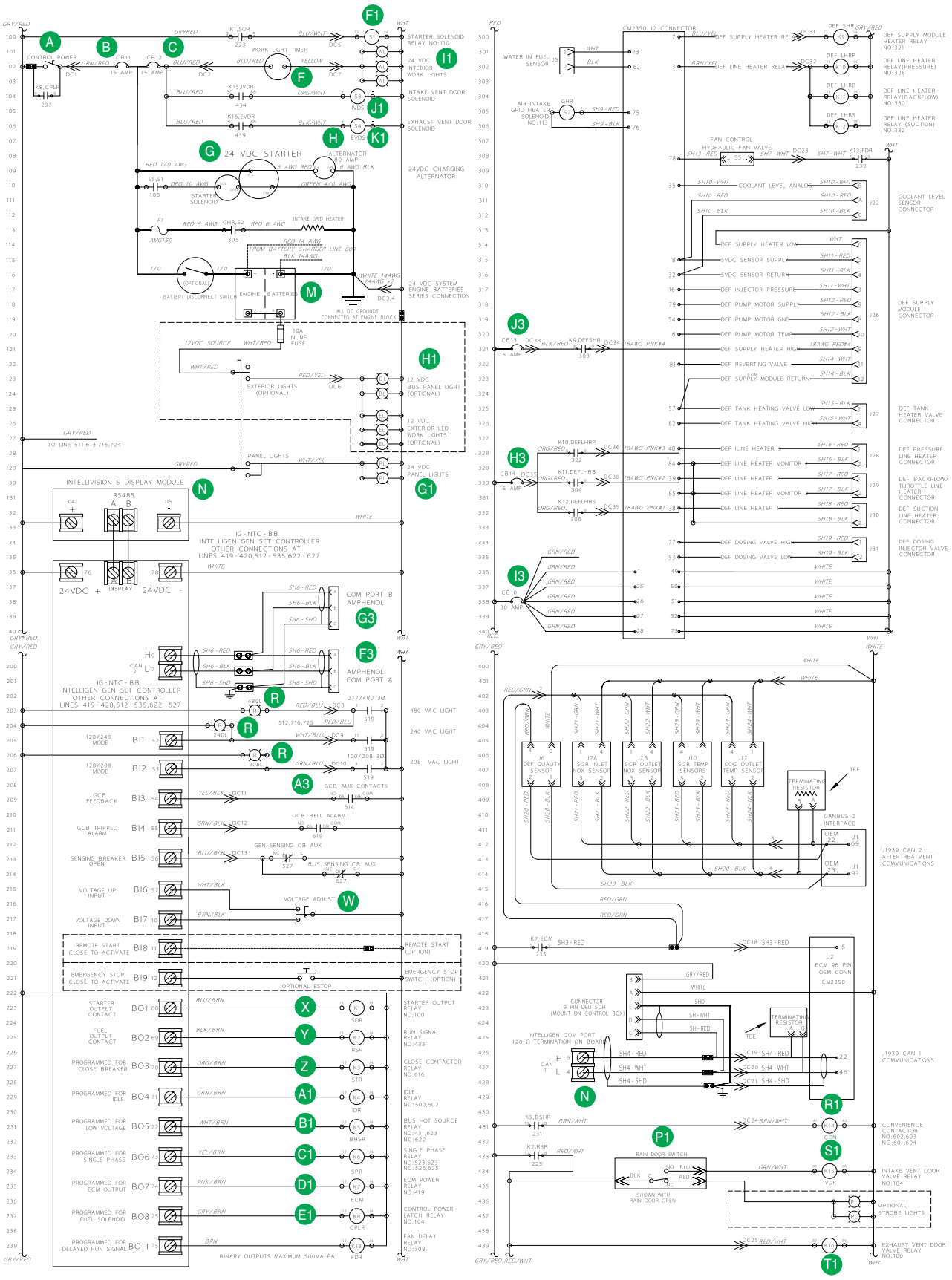
NOTICE

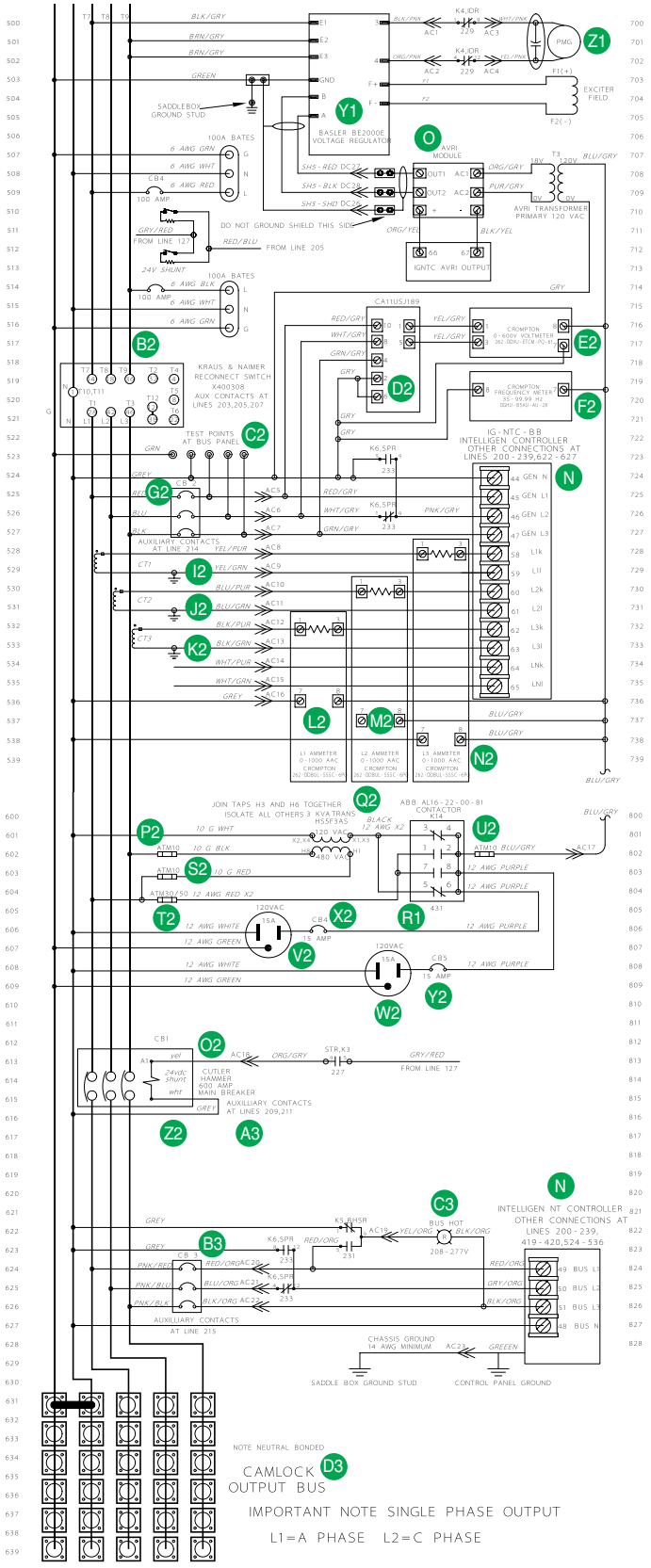
Letters inside the **GREEN** balloons can be referenced on the "Generator Wiring Diagram Locator". Battery Charger and Block Heater locations are shown below.

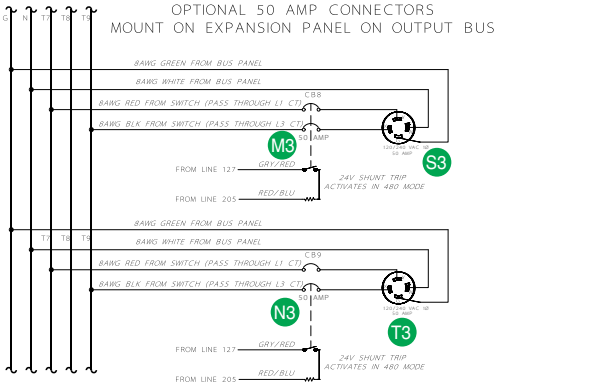




IMPORTANT NOTES:
ALL CONTROL WIRES TO BE MTW TYPE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE SIZES SHALL BE 16AWG UNLESS STATED OTHERWISE
POWER CABLES SHALL BE 4/0 AWG PPC TYPE CABLE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE COLOR CODE = STRIPE COLOR/BASE COLOR

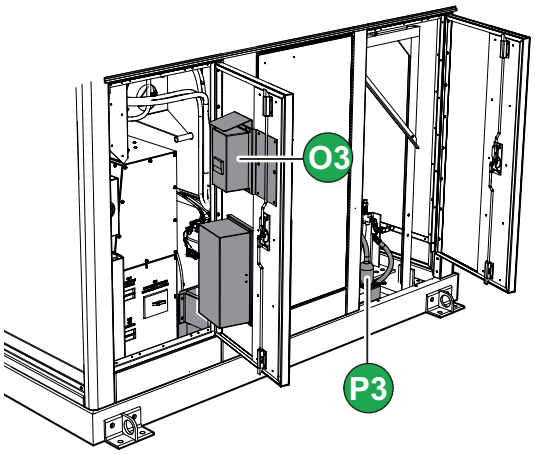

A
B
C
F1
F
I1
J1
K1
G
24 VDC STARTER
H
24VDC CHARGING ALTERNATOR
M
24 VDC SYSTEM ENGINE BATTERIES SERIES CONNECTION
H1
12 VDC BUS PANEL LIGHT (OPTIONAL)
12 VDC EXTERIOR LED WORK LIGHTS (OPTIONAL)
G1
24 VDC PANEL LIGHTS
N
INTELLIVISION 5 DISPLAY MODULE
IG-NTC-BB INTELLIGEN GEN SET CONTROLLER OTHER CONNECTIONS AT LINES 419-420,512-535,622-627
G3
COM PORT B AMPHENOL
F3
AMPHENOL COM PORT A
R
480 VAC LIGHT
240 VAC LIGHT
208 VAC LIGHT
A3
GCB AUX CONTACTS
W
VOLTAGE ADJUST
REMOTE START (OPTION)
EMERGENCY STOP SWITCH (OPTION)
X
Y
Z
A1
B1
C1
D1
E1
STARTER OUTPUT RELAY NO:100
RUN SIGNAL RELAY NO:433
CLOSE CONTACTOR RELAY NO:616
IDLE RELAY NC:500,502
BUS HOT SOURCE RELAY NO:431,623 NC:622
SINGLE PHASE RELAY NO:523,623 NC:526,625
ECM POWER RELAY NO:419
CONTROL POWER LATCH RELAY NO:104
FAN DELAY RELAY NO:308
BINARY OUTPUTS MAXIMUM 500MA EA
J3
H3
I3
P1
S1
R1
T1
CM2350 J2 CONNECTOR
DEF SUPPLY MODULE HEATER RELAY NO:321
DEF LINE HEATER RELAY(PRESSURE) NO:328
DEF LINE HEATER RELAY(BACKFLOW) NO:330
DEF LINE HEATER RELAY (SUCTION) NO:332
COOLANT LEVEL SENSOR CONNECTOR
DEF SUPPLY MODULE CONNECTOR
DEF TANK HEATER VALVE CONNECTOR
DEF PRESSURE LINE HEATER CONNECTOR
DEF BACKFLOW/ THROTTLE LINE HEATER CONNECTOR
DEF SUCTION LINE HEATER CONNECTOR
DEF DOSING INJECTOR VALVE CONNECTOR
J1939 CAN 2 AFTERTREATMENT COMMUNICATIONS
J1939 CAN 1 COMMUNICATIONS
CONVENIENCE CONTACTOR NO:602,603 NC:601,604
INTAKE VENT DOOR VALVE RELAY NO:104
OPTIONAL STROBE LIGHTS
EXHAUST VENT DOOR VALVE RELAY NO:106

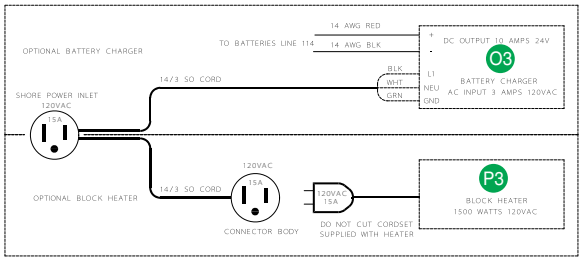




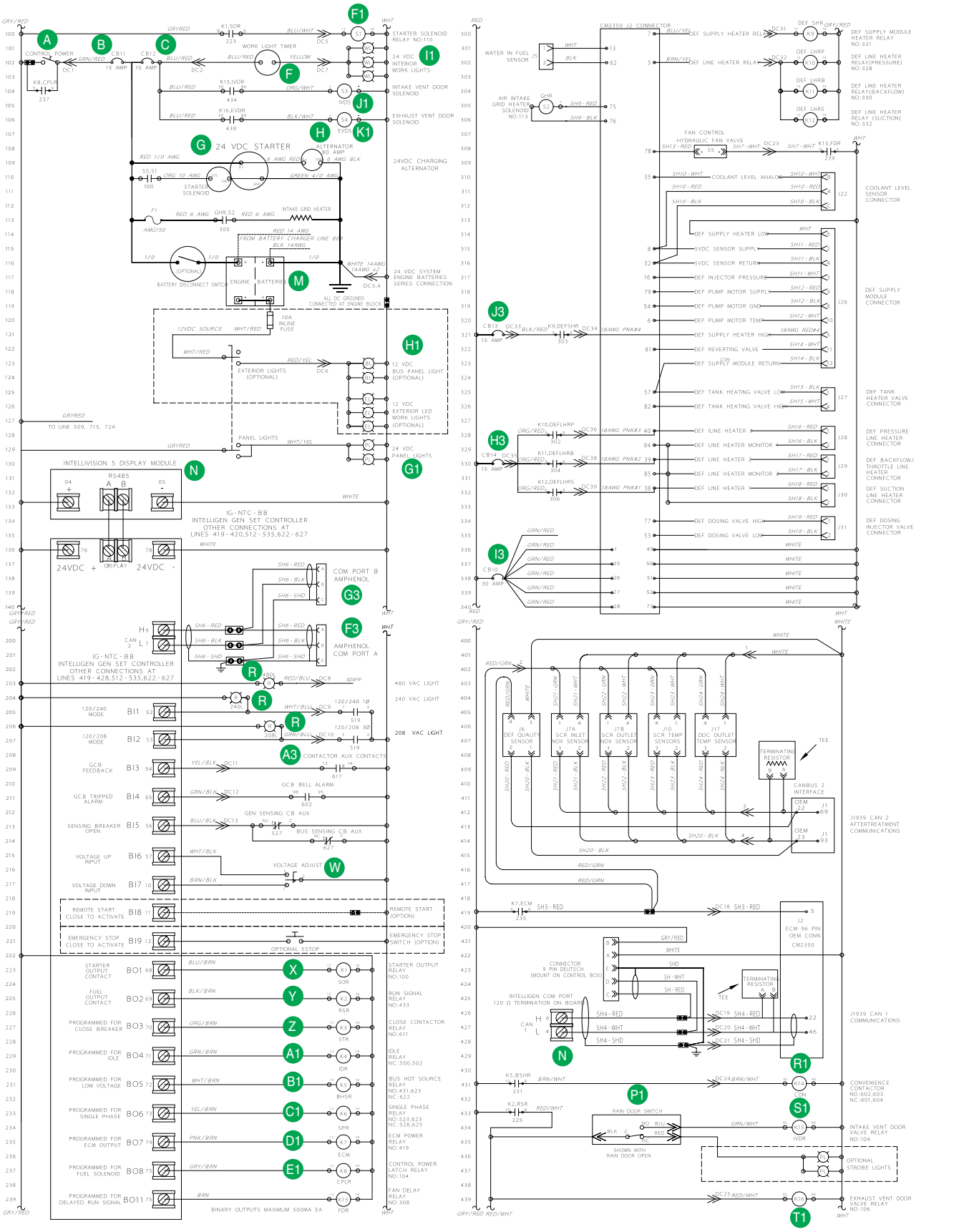
NOTICE

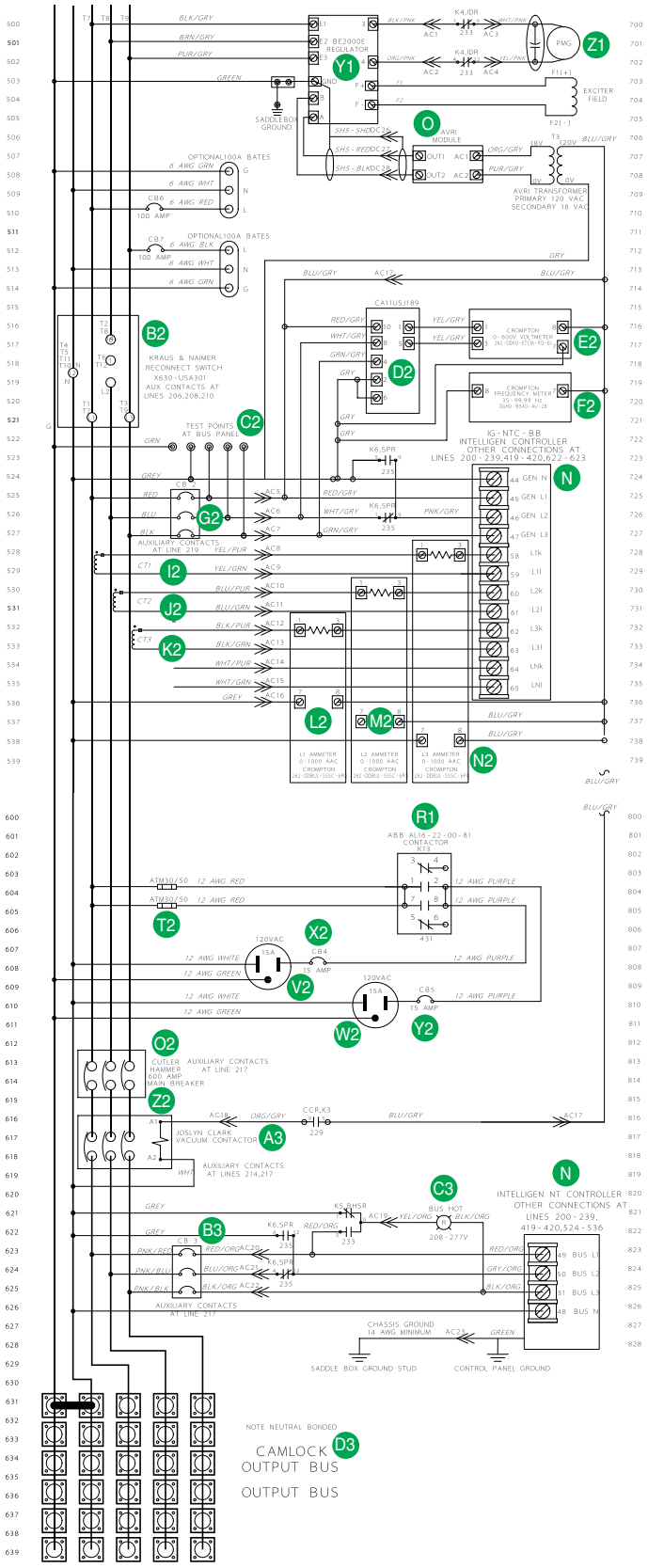
Letters inside the **GREEN** balloons can be referenced on the "Generator Wiring Diagram Locator". Battery Charger and Block Heater locations are shown below.

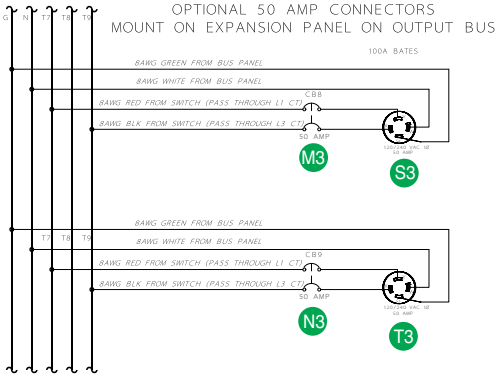




IMPORTANT NOTES:
ALL CONTROL WIRES TO BE MTW TYPE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE SIZES SHALL BE 16AWG UNLESS STATED OTHERWISE
POWER CABLES SHALL BE 4/0 AWG PPC TYPE CABLE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE COLOR CODE = STRIPE COLOR/BASE COLOR


CONTROL POWER
WORK LIGHT TIMER
STARTER SOLENOID RELAY NO:110
24 VDC INTERIOR WORK LIGHTS
INTAKE VENT DOOR SOLENOID
EXHAUST VENT DOOR SOLENOID
24 VDC STARTER
ALTERNATOR 80 AMP
24VDC CHARGING ALTERNATOR
STARTER SOLENOID
INTAKE GRID HEATER
BATTERY DISCONNECT SWITCH
ENGINE
BATTERIES
24 VDC SYSTEM ENGINE BATTERIES SERIES CONNECTION
ALL DC GROUNDS CONNECTED AT ENGINE BLOCK
10A INLINE FUSE
12VDC SOURCE
EXTERIOR LIGHTS (OPTIONAL)
12 VDC BUS PANEL LIGHT (OPTIONAL)
12 VDC EXTERIOR LED WORK LIGHTS (OPTIONAL)
PANEL LIGHTS
24 VDC PANEL LIGHTS
INTELLIVISION 5 DISPLAY MODULE
RS485
IG-NTC-BB INTELLIGEN GEN SET CONTROLLER OTHER CONNECTIONS AT LINES 419-420,512-535,622-627
24VDC +
24VDC -
COM PORT B AMPHENOL
AMPHENOL COM PORT A
480 VAC LIGHT
240 VAC LIGHT
208 VAC LIGHT
CONTACTOR AUX CONTACTS
GCB BELL ALARM
GEN SENSING CB AUX
BUS SENSING CB AUX
VOLTAGE ADJUST
REMOTE START (OPTION)
EMERGENCY STOP SWITCH (OPTION)
STARTER OUTPUT RELAY NO:100
RUN SIGNAL RELAY NO:433
CLOSE CONTACTOR RELAY NO:611
IDLE RELAY NC:500,502
BUS HOT SOURCE RELAY NO:431,623 NC:622
SINGLE PHASE RELAY NO:523,623 NC:526,625
ECM POWER RELAY NO:419
CONTROL POWER LATCH RELAY NO:104
FAN DELAY RELAY NO:308
BINARY OUTPUTS MAXIMUM 500MA EA
CM2350 J2 CONNECTOR
WATER IN FUEL SENSOR
AIR INTAKE GRID HEATER SOLENOID NO:113
DEF SUPPLY HEATER RELAY
DEF LINE HEATER RELAY
DEF SUPPLY MODULE HEATER RELAY NO:321
DEF LINE HEATER RELAY(PRESSURE) NO:328
DEF LINE HEATER RELAY(BACKFLOW) NO:330
DEF LINE HEATER RELAY (SUCTION) NO:332
FAN CONTROL HYDRAULIC FAN VALVE
COOLANT LEVEL SENSOR
COOLANT LEVEL SENSOR CONNECTOR
DEF SUPPLY HEATER LOW
5VDC SENSOR SUPPLY
5VDC SENSOR RETURN
DEF INJECTOR PRESSURE
DEF PUMP MOTOR SUPPLY
DEF PUMP MOTOR GND
DEF PUMP MOTOR TEMP
DEF SUPPLY HEATER HIGH
DEF REVERTING VALVE
DEF SUPPLY MODULE RETURN
DEF SUPPLY MODULE CONNECTOR
DEF TANK HEATING VALVE LOW
DEF TANK HEATING VALVE HIGH
DEF TANK HEATER VALVE CONNECTOR
DEF ILINE HEATER
DEF LINE HEATER MONITOR
DEF LINE HEATER 2
DEF LINE HEATER MONITOR 2
DEF LINE HEATER 1
DEF PRESSURE LINE HEATER CONNECTOR
DEF BACKFLOW/ THROTTLE LINE HEATER CONNECTOR
DEF SUCTION LINE HEATER CONNECTOR
DEF DOSING VALVE HIGH
DEF DOSING VALVE LOW
DEF DOSING INJECTOR VALVE CONNECTOR
J6 DEF QUALITY SENSOR
J7A SCR INLET NOX SENSOR
J7B SCR OUTLET NOX SENSOR
J10 SCR TEMP SENSORS
J17 DOC OUTLET TEMP SENSOR
TERMINATING RESISTOR
CANBUS 2 INTERFACE
J1939 CAN 2 AFTERTREATMENT COMMUNICATIONS
J2 ECM 96 PIN OEM CONN CM2350
CONNECTOR 9 PIN DEUTSCH (MOUNT ON CONTROL BOX)
INTELLIGEN COM PORT 120 Ω TERMINATION ON BOARD
J1939 CAN 1 COMMUNICATIONS
CONVENIENCE CONTACTOR NO:602,603 NC:601,604
RAIN DOOR SWITCH
SHOWN WITH RAIN DOOR OPEN
INTAKE VENT DOOR VALVE RELAY NO:104
OPTIONAL STROBE LIGHTS
EXHAUST VENT DOOR VALVE RELAY NO:106





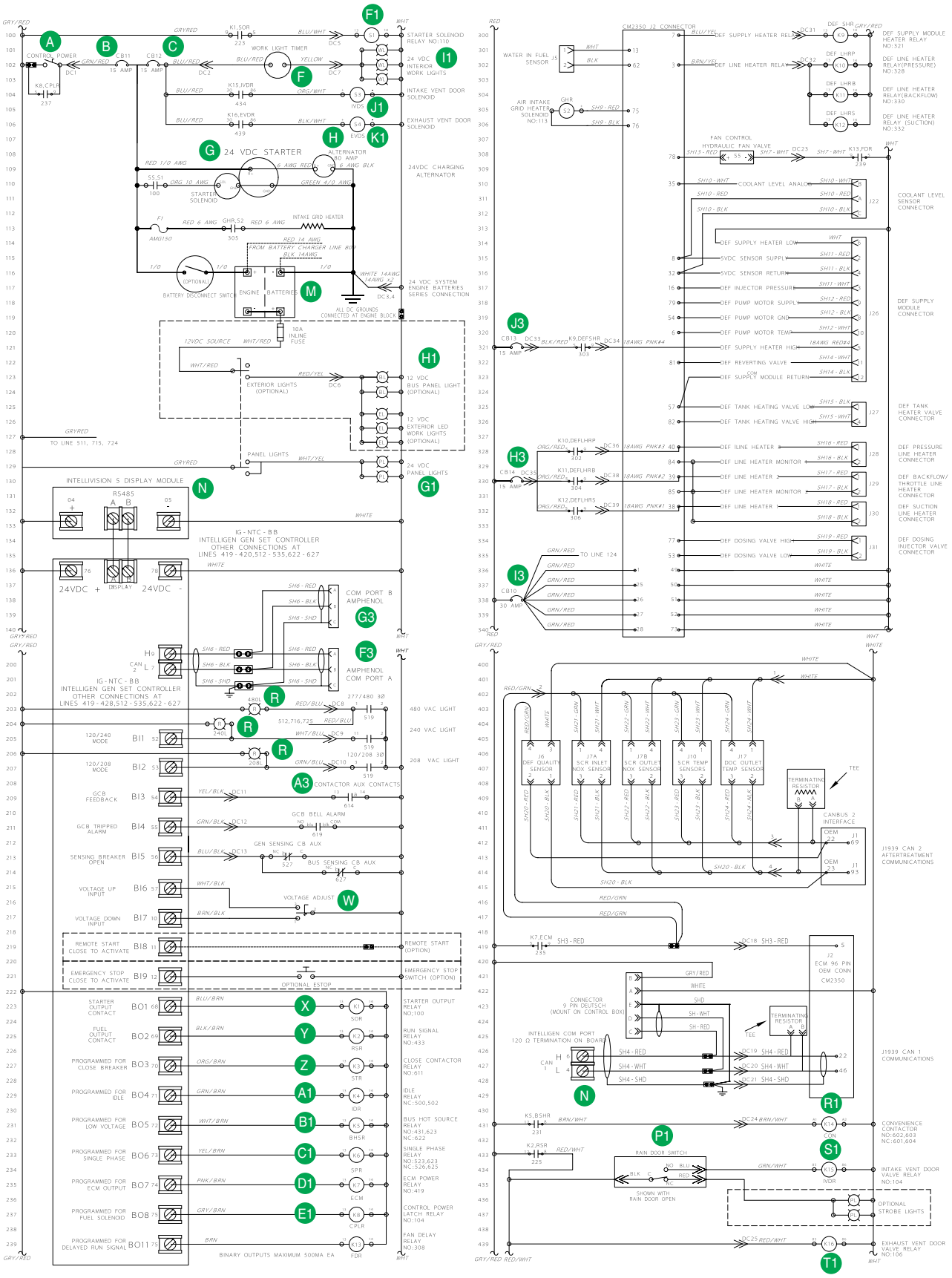
NOTICE

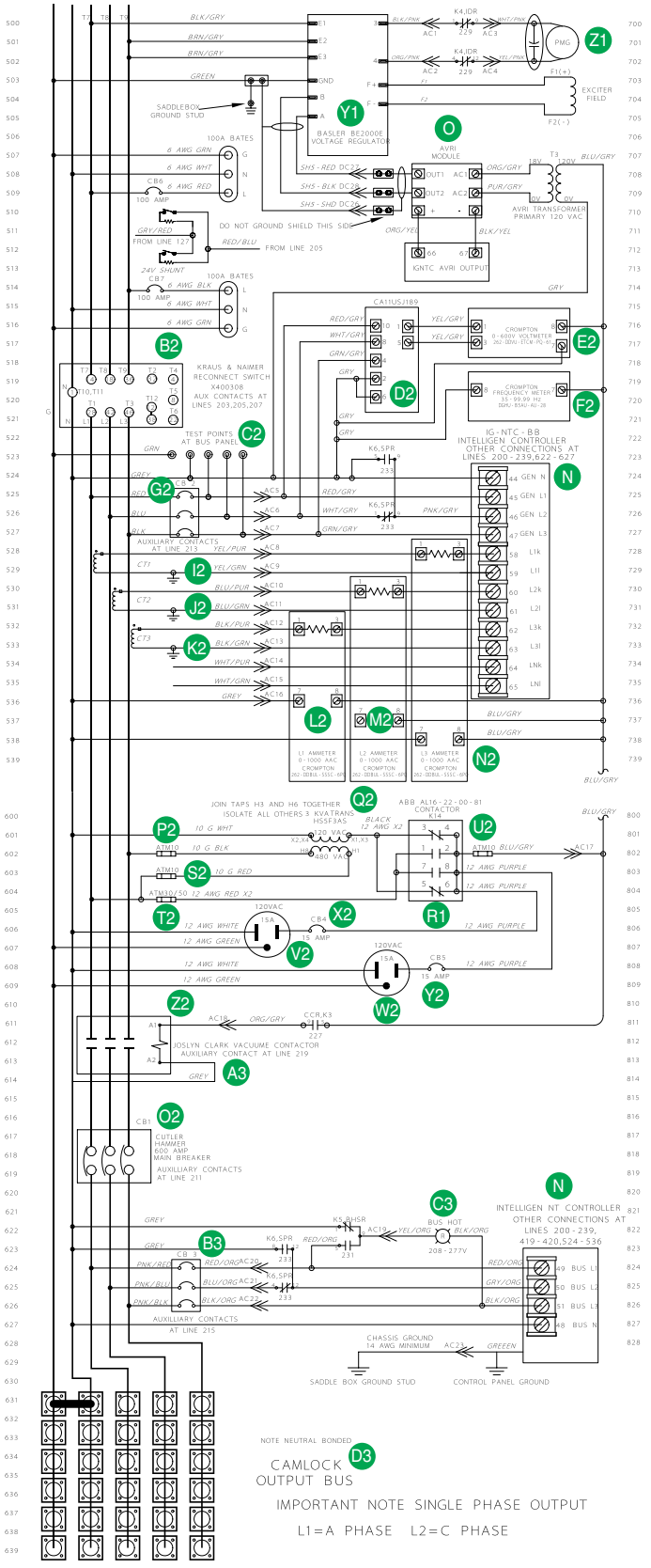
Letters inside the **GREEN** balloons can be referenced on the "Generator Wiring Diagram Locator".

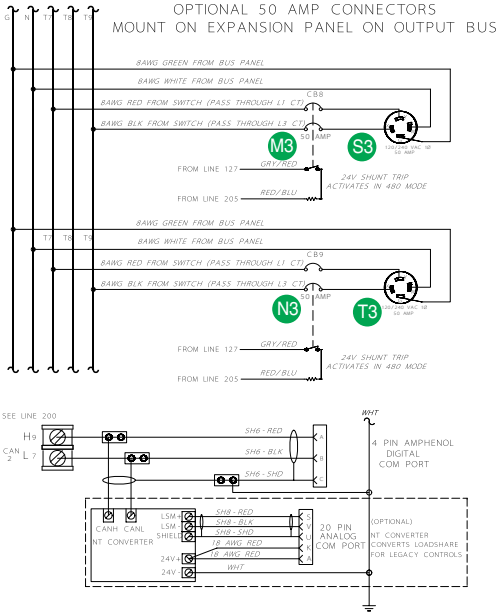
IMPORTANT NOTES:

ALL CONTROL WIRES TO BE MTW TYPE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE SIZES SHALL BE 16AWG UNLESS STATED OTHERWISE
POWER CABLES SHALL BE 4/0 AWG PPC TYPE CABLE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE COLOR CODE = STRIPE COLOR/BASE COLOR

GENERATOR WIRING DIAGRAM EE60365

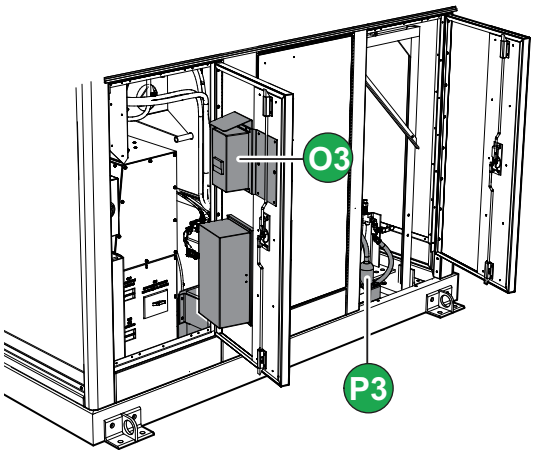


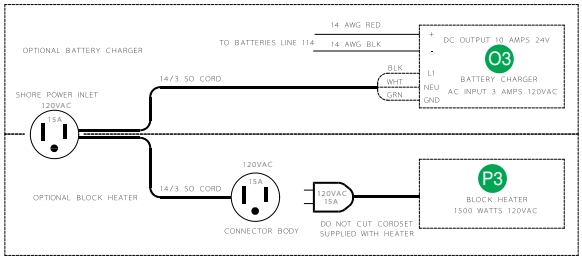




NOTICE

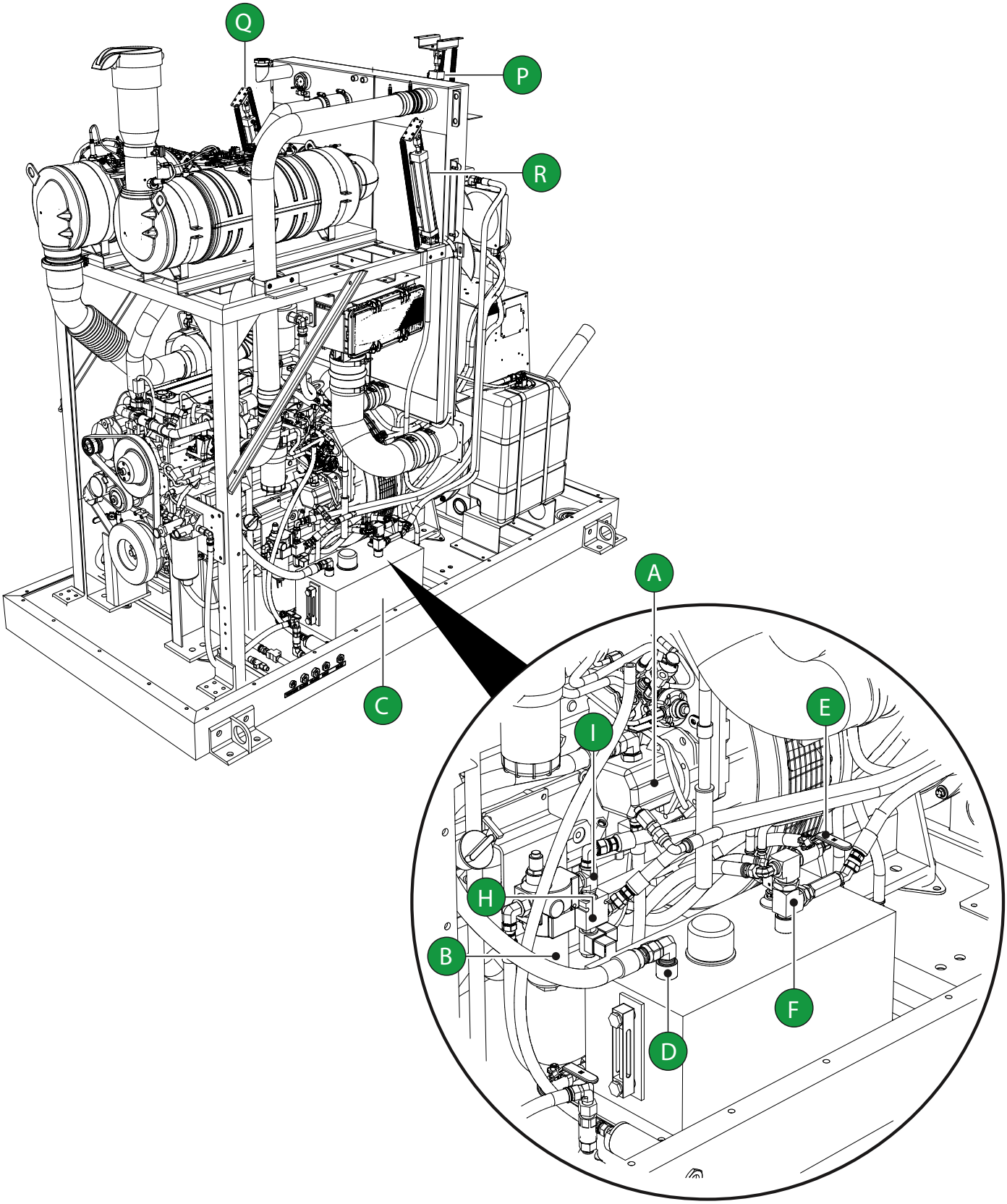
Letters inside the **GREEN** balloons can be referenced on the "Generator Wiring Diagram Locator". Battery Charger and Block Heater locations are shown below.

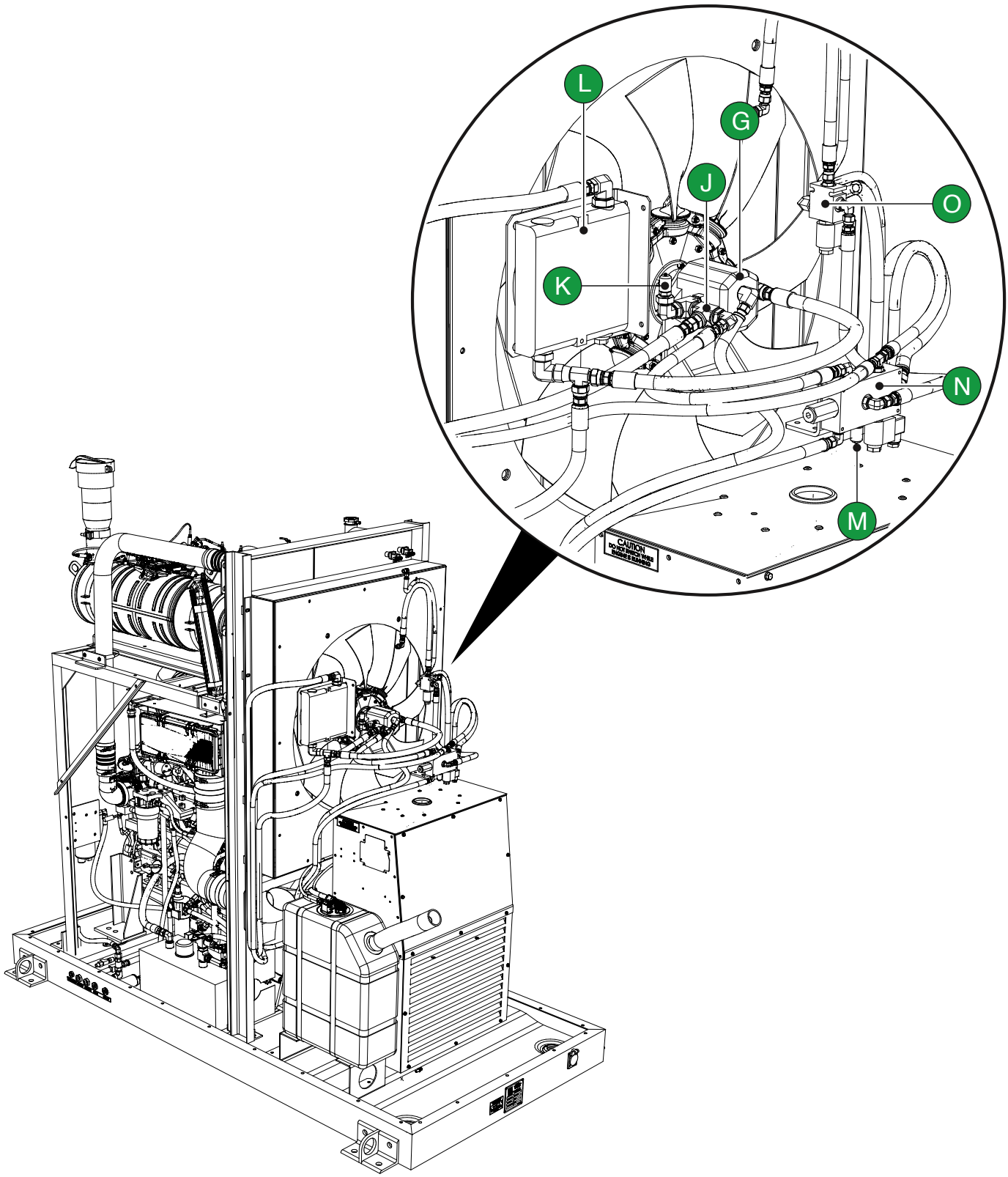


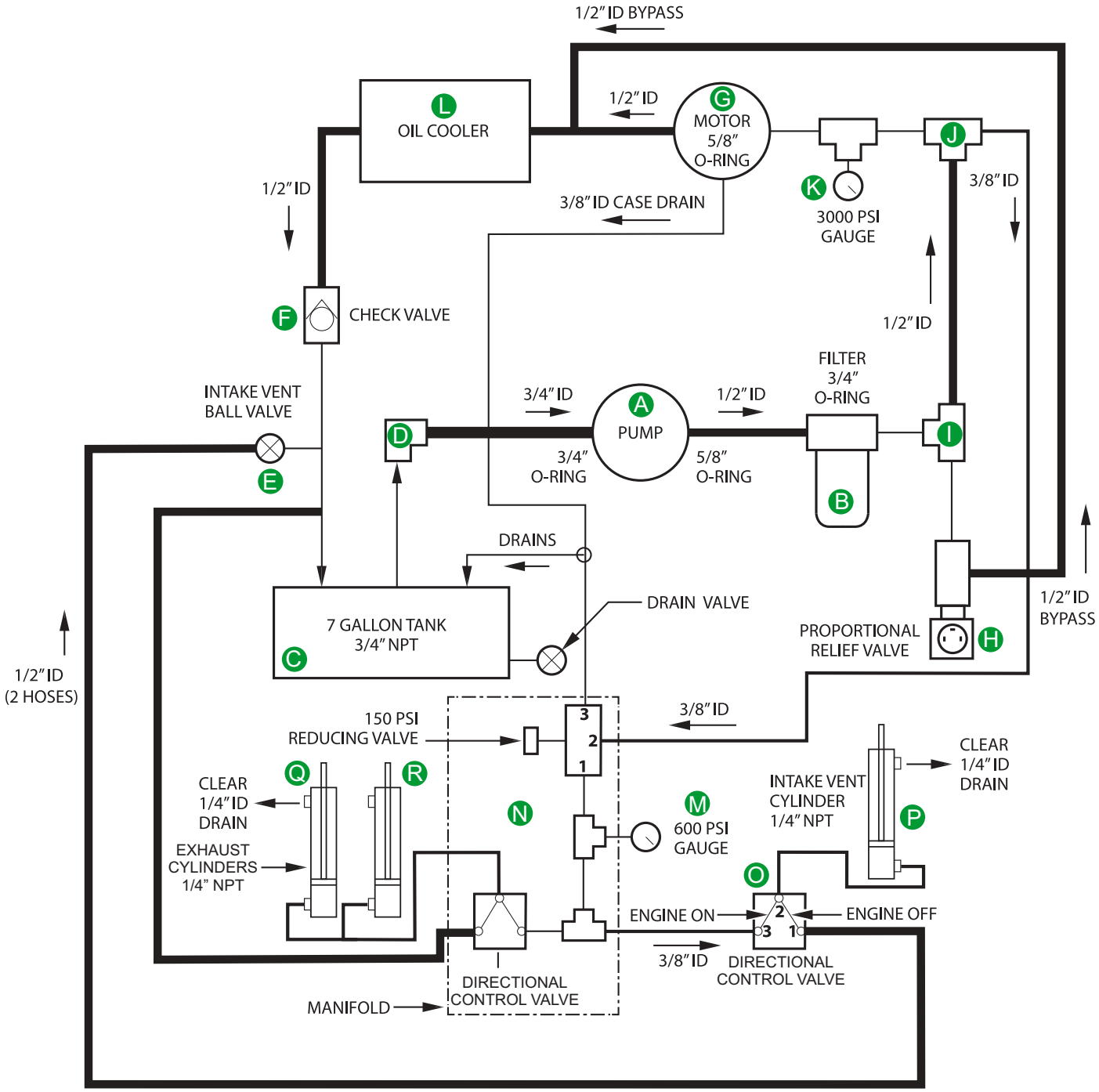


IMPORTANT NOTES:

ALL CONTROL WIRES TO BE MTW TYPE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE SIZES SHALL BE 16AWG UNLESS STATED OTHERWISE
POWER CABLES SHALL BE 4/0 AWG PPC TYPE CABLE MARKED FOR UL AND CSA APPROVAL
CONTROL WIRE COLOR CODE = STRIPE COLOR/BASE COLOR


Q
P
R
A
C
I
E
H
B
F
D


L
G
J
O
K
N
M


1/2" ID BYPASS
L
OIL COOLER
1/2" ID
G
MOTOR
5/8"
O-RING
J
K
3000 PSI
GAUGE
3/8" ID
1/2" ID
3/8" ID CASE DRAIN
F
CHECK VALVE
1/2" ID
FILTER
3/4"
O-RING
INTAKE VENT
BALL VALVE
3/4" ID
A
PUMP
1/2" ID
D
I
3/4"
O-RING
5/8"
O-RING
E
B
DRAINS
DRAIN VALVE
7 GALLON TANK
3/4" NPT
C
PROPORTIONAL
RELIEF VALVE
H
1/2" ID
BYPASS
1/2" ID
(2 HOSES)
3/8" ID
150 PSI
REDUCING VALVE
3
2
1
CLEAR
1/4" ID
DRAIN
Q
R
N
M
600 PSI
GAUGE
INTAKE VENT
CYLINDER
1/4" NPT
P
CLEAR
1/4" ID
DRAIN
EXHAUST
CYLINDERS
1/4" NPT
O
ENGINE ON
ENGINE OFF
3/8" ID
DIRECTIONAL
CONTROL VALVE
DIRECTIONAL
CONTROL VALVE
MANIFOLD

OPERATION MANUAL

HERE'S HOW TO GET HELP

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

UNITED STATES

Multiquip Inc.

(310) 537- 3700
6141 Katella Avenue Suite 200
Cypress, CA 90630
E-MAIL: mq@multiquip.com
WEBSITE: www.multiquip.com

CANADA

Multiquip

(450) 625-2244
4110 Industriel Boul.
Laval, Quebec, Canada H7L 6V3
E-MAIL: infocanada@multiquip.com

UNITED KINGDOM

Multiquip (UK) Limited Head Office

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

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

The information and specifications included in this publication were in effect at the time of approval for printing. Illustrations, descriptions, references and technical data contained in this manual are for guidance only and may not be considered as binding. Multiquip Inc. reserves the right to discontinue or change specifications, design or the information published in this publication at any time without notice and without incurring any obligations.

MULTIQUIP®