OPERATION MANUAL

MULTIQUIP®

MQ POWER

WHISPERWATT™ SERIES

MODEL DCA70SSJU4i

60Hz GENERATOR

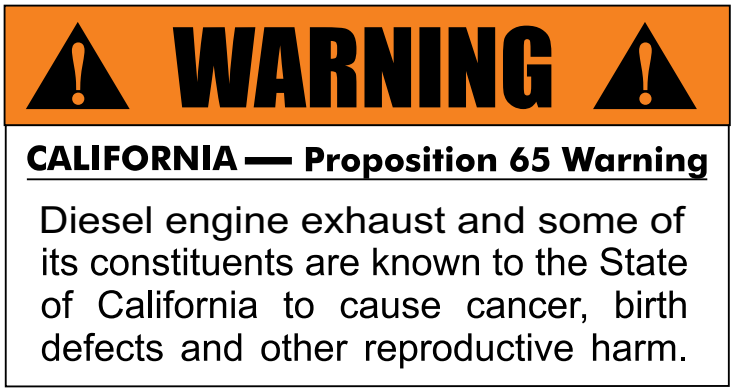
(JOHN DEERE 4045HFG92 DIESEL ENGINE)

Revision #3 (07/02/26)

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

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.*

DCA70SSJU4i
60 Hz Generator

Proposition 65 Warning 2
Reporting Safety Defects..... 3
Table of Contents..... 4
Safety Information 6–11
Generator/Engine Specifications..... 12
Generator Dimensions..... 13
Trailer Dimensions/Specifications 14
Installation 16–17
General Information..... 18
Generator Major Components..... 19
Trailer Major Components 20
Engine Control Unit (Ecu)..... 21
Engine/Generator Control Panel 22
Output Terminal Panel Familiarization..... 23–25
Load Application 26
Generator Outputs..... 27
Generator Outputs/Gauge Reading..... 28
Output Terminal Panel Connections..... 29–30
600 VAC Connections (Option) 31
Inspection/Setup..... 32–35
Generator Start-Up Procedure (Manual Mode) 36–37
Generator Start-Up Procedure (Auto Mode)..... 38
Generator Shut-Down Procedures 39
Generator/Engine Maintenance..... 40–46
Trailer Maintenance..... 47–49
Trailer Guidelines 50–64
Troubleshooting Diagnostics 66
Troubleshooting Generator..... 67
Troubleshooting Engine..... 68–69
Generator Wiring Diagram..... 70
600 VAC Auto Transformer Wiring Diagram (Option) . 71
Engine Wiring Diagram..... 72
Battery Charger Wiring Diagram 73
Water Heating Element Wiring Diagram..... 74

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

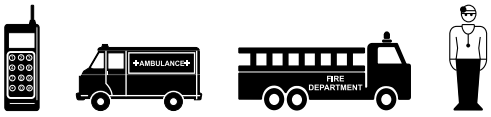
- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized 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.

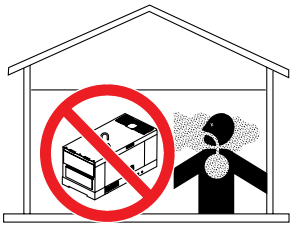
NOTICE

- **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.**

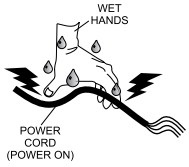


- Backfeed to a utility system can cause **electrocution** and/or property damage. **NEVER** connect the generator to a building's electrical system without a transfer switch or other approved device. All installations should be performed by a **licensed electrician** in accordance with all applicable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

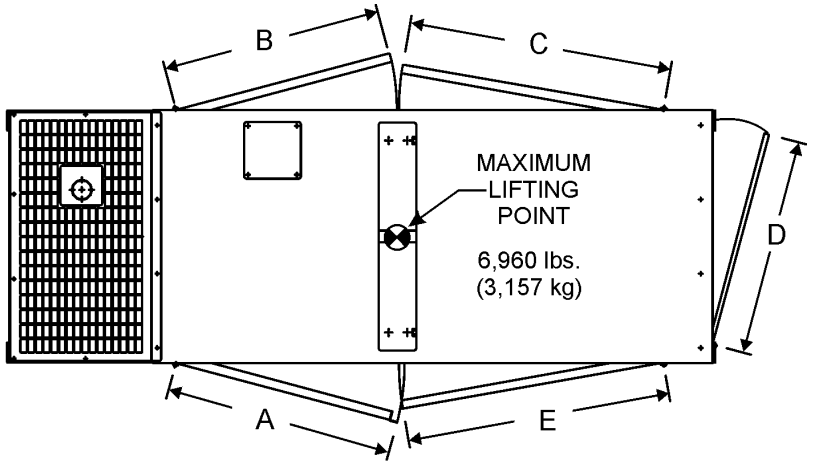
Table 1. Generator Specifications		
Model	DCA70SSJU4i	
Type	Revolving field, self ventilated, open protected type synchronous generator	
Armature Connection	**Star with Neutral**	**Zigzag**
Phase	3Ø	3Ø
Standby Output	61.6 kW (77 kVA)	44 kW
Prime Output	56 kW (70 kVA)	40 kW
3Ø Voltage (L-L/L-N) Voltage Selector Switch at 3Ø 240/139	208Y/120, 220Y/127, 240Y/139	N/A
3Ø Voltage (L-L/L-N) Voltage Selector Switch at 3Ø 480/277	416Y/240, 440Y/254, 480Y/277	N/A
1Ø Voltage (L-L/L-N) Voltage Selector Switch at 1Ø 240/120	N/A	240/120
Power Factor	0.8	1.0
Frequency	60 Hz	
Speed	1800 rpm	
Aux. AC Power	Single Phase, 60 Hz	
Aux. Voltage/Output	4.8 Kw (2.4 kW x 2)	
Dry Weight	3,594 lbs. (1,630 kg)	
Wet Weight	4,410 lbs. (2,000 kg)	

Table 2. Engine Specifications		
Model	John Deere 4045HFG92 Interim Tier 4	
Type	Water-cooled, direct injection, turbo-charged air cooled EGR	
No. of Cylinders	4 cylinders	
Bore x Stroke	4.17 in. x 5.00 in. (106 mm x 127 mm)	
Displacement	275 cu. in. (4.5 liter)	
Rated Output	97 HP at 1800 rpm	
Starting	Electric	
Coolant Capacity	5.9 gal. (22.4 liters)[1]	
Lube Oil Capacity	3.9 gal. (14.7 liters)[2]	
Lubricating Type Oil	API service class CJ-4 SAE 15W-40	
Fuel Type	#2 Diesel Fuel (Ultra low sulfur diesel fuel only)	
Fuel Leak Warning Capacity	25.9 gal. (98 liters)	
Fuel Tank Capacity	103 gal. (390 liters)	
Fuel Consumption	4.3 gal. (16.2 L)/hr at **full load**	3.4 gal. (12.7 L)/hr at **3/4 load**
	2.7 gal. (10.1 L)/hr at **1/2 load**	2.0 gal. (7.4 L)/hr at **1/4 load**
Battery	27 (CCA 0°F 800A) X 1	

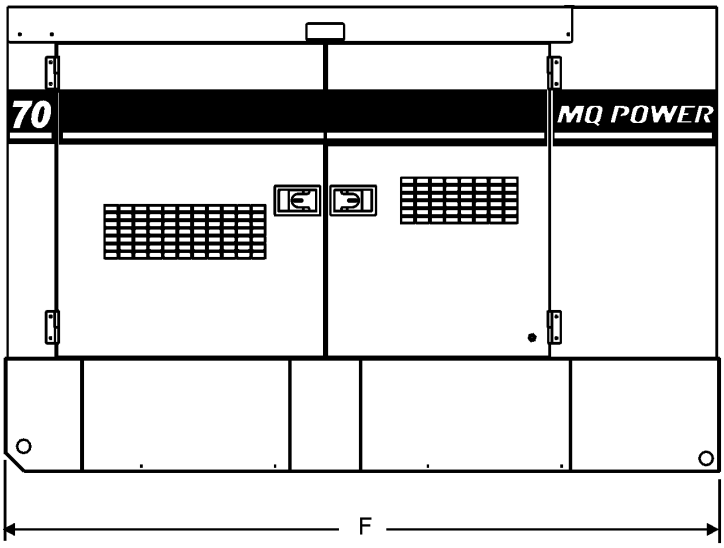
[1] Includes engine and radiator hoses

[2] Includes filters

TOP VIEW



SIDE VIEW



FRONT VIEW

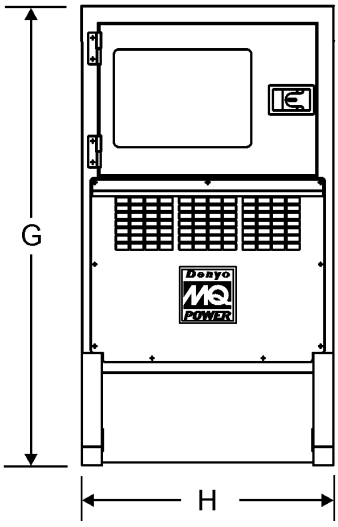


Figure 1. Dimensions

Table 3. Generator Dimensions			
Reference Letter	**Dimension in. (mm)**	**Reference Letter**	**Dimension in. (mm)**
A	39.25 (997)	E	39.25 (997)
B	32.80 (883)	F	105.12 (2,670)
C	39.25 (997)	G	68.30 (1,735)
D	32.28 (820)	H	37.40 (950)

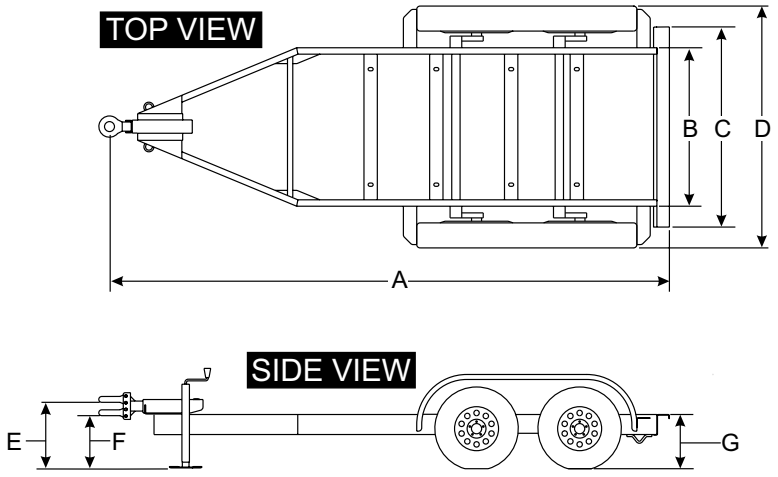


Figure 2. Trailer Dimensions

Table 4. Trailer Dimensions			
Reference Letter	**Dimension in. (mm)**	**Reference Letter**	**Dimension in. (mm)**
A	169.4 (4,938)	E	24.2 (615)
B	47.5 (1,207)	F	20.2 (513)
C	60 (1,524)	G	20.35 (517)
D	72.5 (1,842)		

Table 5. TRLR70USH Trailer Specifications	
Gross Vehicle Weight Rating (GVWR)	7,000 lbs. (3,175 kg)
Gross Axle Weight Rating (GAWR) Each	3,500 lbs. (1,588 kg)
Actuator Rating	8,000 lbs. (3,629 kg)
Coupler Types	Adjustable 2-inch Ball Coupler
	Adjustable 2-5/16-inch Ball Couple
	Adjustable 3-inch Pintle-eye Coupler
Tire Size	ST205/75D15 LR-C
Tire Load Rating	1,820 lbs./825 kg (ea.)
Wheel Bolt Pattern	5 Lug on 4.5 in.
Hydraulic Brakes (Standard)	Hydraulic-actuated Drum Brakes (all axles)
Electric Brakes (Option)	Electric-actuated Drum Brakes (all axles)
Bolt-on Electric Brake Coupler Plate	Option
Electric Breakaway Safety Device electric-actuated brakes)	Option
Tongue Mounted Swivel Jack (Standard)	3,000 lbs. (1,361 kg)
Tongue Bolt-On Jack (Option)	8,000 lbs. (3,629 kg) Option
Axle	Tandem
Suspension	Torsion
Lights	D.O.T. Approved Tail Lamps, Stop Lamps, Turn Signal Lamps, Side Marker Lamps
Weight (Approximate)	960 lbs. (435 kg)

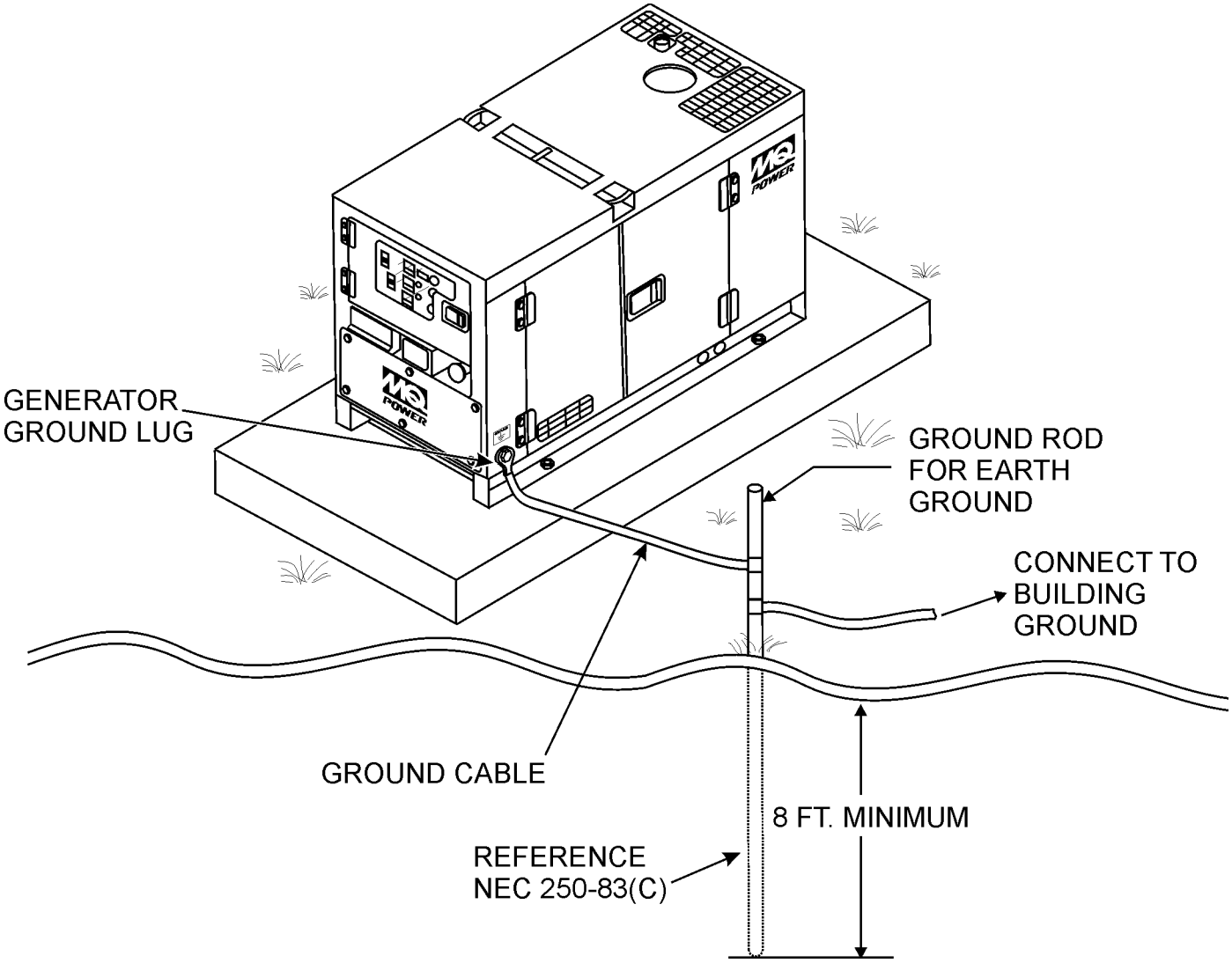


Figure 3. Typical Generator Grounding Application

OUTDOOR INSTALLATION

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

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

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

⚠ CAUTION

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

INDOOR INSTALLATION

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

MOUNTING

The generator must be mounted on a solid foundation (such as concrete) and set firmly on the foundation to isolate vibration of the generator when it is running. The generator must set at least 6 inches above the floor or grade level (in accordance to NFPA 110, Chapter 5-4.1). **DO NOT** remove the metal skids on the bottom of the generator. They are to resist damage to the bottom of the generator and to maintain alignment.

GENERATOR GROUNDING

To guard against electrical shock and possible damage to the equipment, it is important to provide a good **EARTH** ground (Figure 3).

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

NEC articles 250-64(b) and 250-66 set the following grounding requirements:

1. Use one of the following wire types to connect the generator to earth ground.
   a. Copper - 8 AWG (5.3 mm^2)
   b. Aluminum - 6 AWG (8.4 mm^2)
2. When grounding the generator (Figure 2) connect the ground cable between the lock washer and the nut on the generator and tighten the nut fully. Connect the other end of the ground cable to earth ground.
3. NEC article 250-52(c) specifies that the earth ground rod should be buried a minimum of 8 ft. into the ground.

NOTICE

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

NOTICE

This generator has a permanent bonding conductor between the generator stator windings and the frame.

GENERATOR

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

OPERATING PANEL

The "Operating Panel" is provided with the following:

- ECU Controller
- Gauge Unit Assembly
  - Oil Pressure Gauge
  - Water Temperature Gauge
  - Charging Voltmeter
  - Fuel Gauge
  - Tachometer
- Panel Light/Panel Light Switch
- Hour Check Button
- Auto Start/Stop Switch
- Fuel Leak Detected Alarm Lamp

CONTROL PANEL

The "Control Panel" is provided with the following:

- Frequency Meter (Hz)
- AC Ammeter (Amps)
- AC Voltmeter (Volts)
- Ammeter Change-Over Switch
- Voltmeter Change-Over Switch
- Voltage Regulator
- 3-Pole, 200 amp Main Circuit Breaker
- "Control Box" (located behind Control Panel)
  - Automatic Voltage Regulator
  - Current Transformer
  - Over-Current Relay
  - Starter Relay

OUTPUT TERMINAL PANEL

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

- Three 120/240V output receptacles (CS-6369), 50A
- Three auxiliary circuit breakers, 50A
- Two 120V output receptacles (GFCI), 20A
- Two GFCI circuit breakers, 20A
- Eight output terminal lugs (3Ø power)
- Ground lug
- Battery Charger (Option)
- Water Heating Element (Option)
- Camlock Connector (Option)
- 600 VAC Output, Auto-Transformer (Option)

OPEN DELTA EXCITATION SYSTEM

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

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

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

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

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

ENGINE

This generator is powered by a 4 cylinder, 4-cycle water cooled, direct injection, turbocharged, air cooled and EGR John Deere 4045HFG92 diesel engine. This engine is designed to meet every performance requirement for the generator. Reference Table 2 for engine specifications.

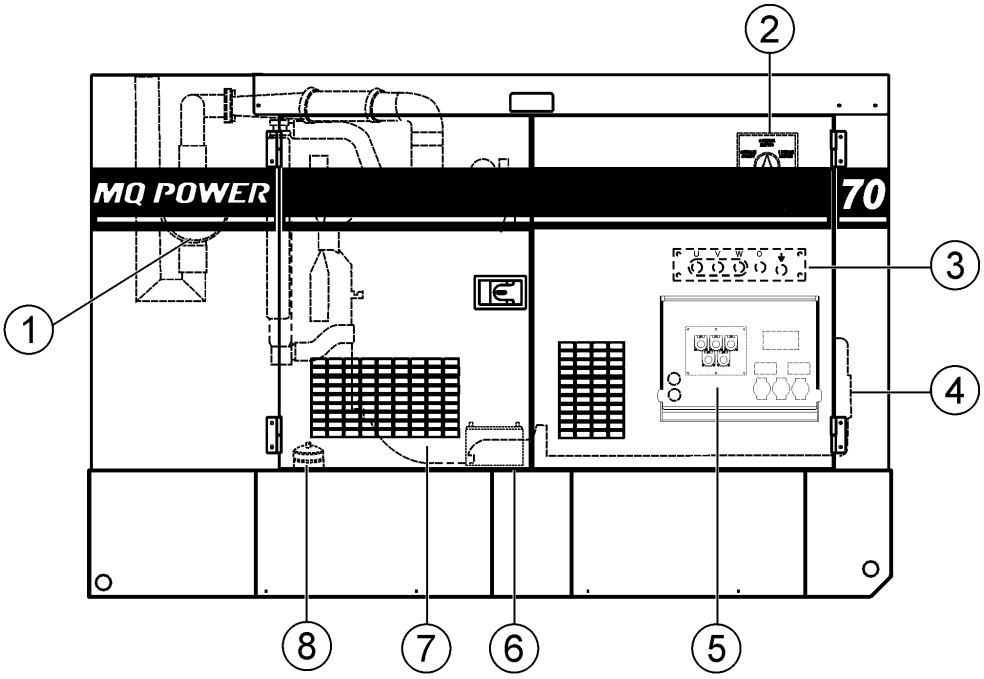
In keeping with MQ Power's policy of constantly improving its products, the specifications quoted herein are subject to change without prior notice.

ELECTRIC GOVERNOR SYSTEM

The electric governor system controls the RPMs of the engine. When the engine demand increases or decreases, the governor system regulates the frequency variation to ±.25%.

EXTENSION CABLES

When electric power is to be provided to various tools or loads at some distance from the generator, extension cords are normally used. Cables should be sized to allow for distance in length and amperage so that the voltage drop between the generator and point of use (load) is held to a minimum. Use the cable selection chart (Table 8) as a guide for selecting proper extension cable size.



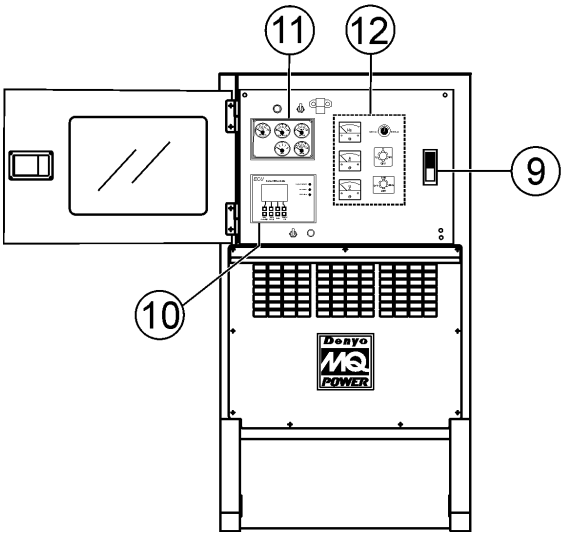


Figure 4. Generator Major Components

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

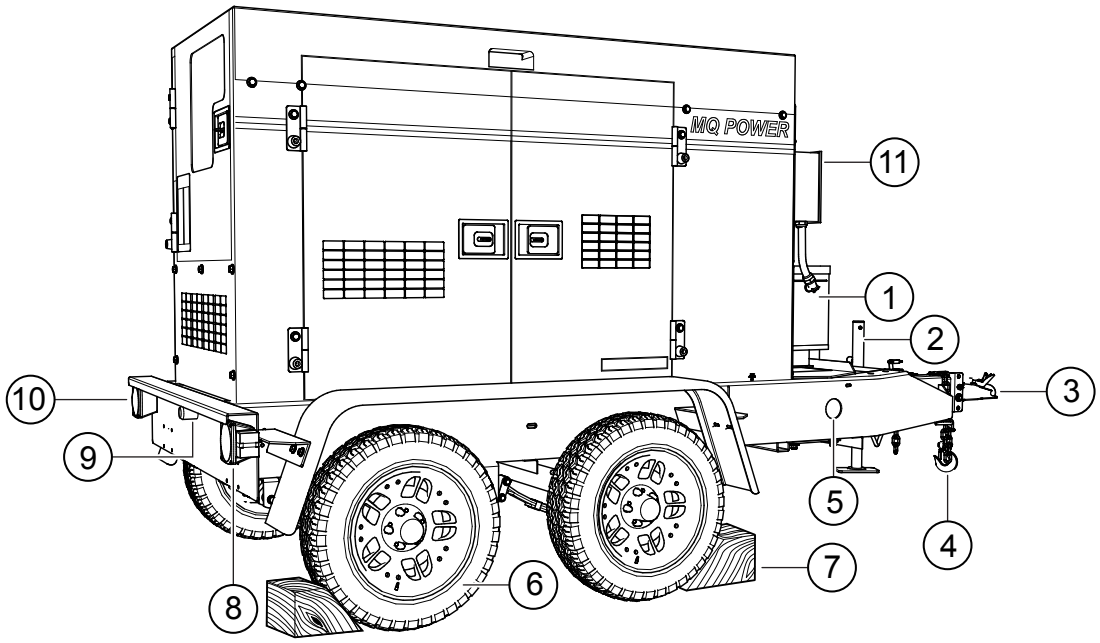


Figure 5. Trailer Major Components

Figure 5 shows the location of the trailer components and the 600 VAC option. The function of each component is described below:

1. **Auto-Transformer (Option)** — Voltage converter transformer. Converts the generator's 3Ø, 480 output voltage to 3Ø, 600 VAC.
2. **Tongue Jackstand** — Use this jackstand to support the trailer tongue when attaching the generator to a towing vehicle
3. **Ball Hitch Coupler** — Attach the trailer's 2-5/16 inch ball coupler or 3-inch pintle coupler to the towing vehicle. Use only the specified ball diameter as indicated on your coupler. Use of any other ball diameter will create an extremely dangerous condition which can result in separation of the coupler and ball or ball failure.
4. **Safety Chain** — Always attach safety chains to the towing vehicle. **NEVER** use the trailer with the safety chain unattached. Make sure safety chains are crossed when towing.
5. **Side Reflectors** — There are two amber reflectors located on the side of the trailer. These reflectors provide better visibility in dark conditions.
6. **Tires** — This trailer uses a ST205/75D15 LR-C size tire. Replace with only recommended tire size. **NEVER** operate the trailer with bad or worn tires.
7. **Chock Blocks** — Place blocks (not included as part of the generator package) under each trailer wheel to prevent rolling.
8. **Right Brake Light** — Before towing the generator, make sure that this light is operational and is working correctly. **NEVER** use the trailer if this light is inoperative.
9. **License Light** — This light illuminates the license plate. Whenever towing of the generator is required, make sure this light is operational.
10. **Left Brake Light** — Before towing the generator, make sure that this light is operational and is working correctly. **NEVER** use the trailer if this light is inoperative.
11. **Control Box Enclosure (Option)** — Contains 70 amp breaker for 600 VAC operation.

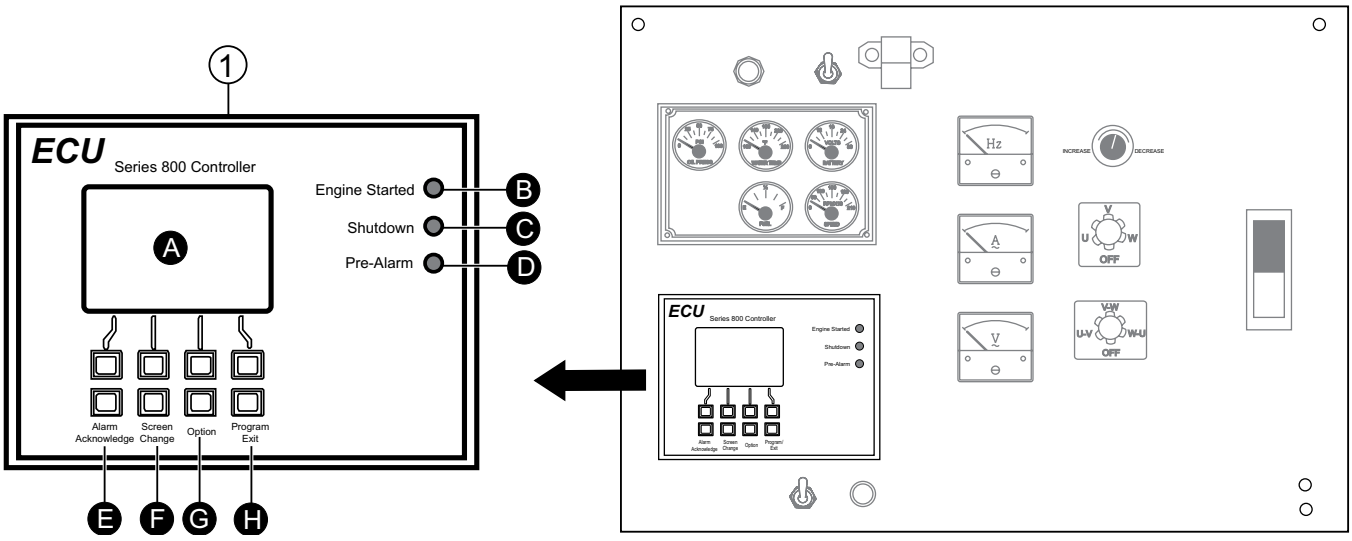


Figure 6. Engine Control Unit (ECU)

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

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

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

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

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

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

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

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

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

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

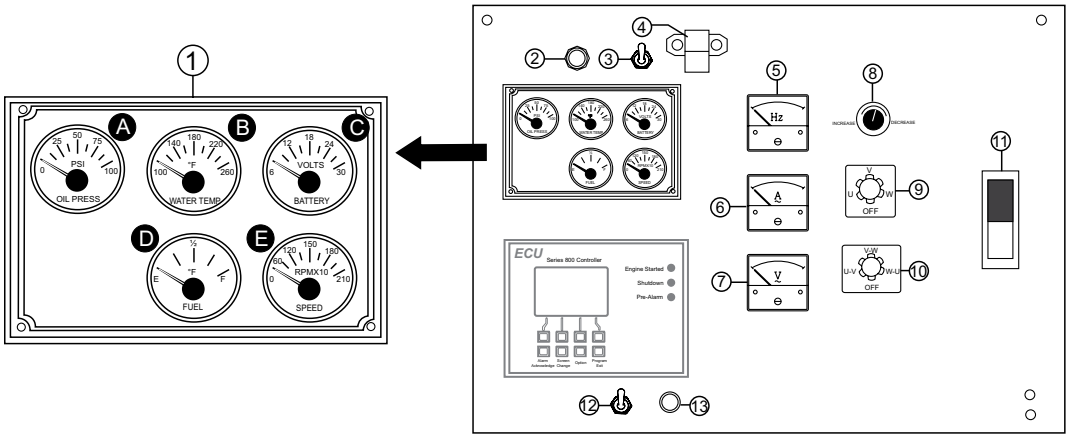


Figure 7. Engine/Generator Control Panel

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

1. **Gauge Unit Assembly** — This assembly houses the various engine monitoring gauges. These gauges indicate: oil pressure, water temperature, charging voltmeter, fuel and engine speed RPM (tachometer).
   - A. **Oil Pressure Gauge** — During normal operation this gauge be should read between 35 to 65 psi. (241~448 kPa). When starting the generator the oil pressure may read a little higher, but after the engine warms up the oil pressure should return to the correct pressure range.
   - B. **Water Temperature Gauge** — During normal operation this gauge be should read between 185° and 207°F (85°~97°C).
   - C. **Charging Voltmeter Gauge** — During normal operation this gauge indicate minimum 14 VDC
   - D. **Fuel Gauge** — Indicates amount of diesel fuel available.
   - E. **Tachometer** — Indicates engine speed in RPM's for 60 Hz operation. This meter should indicate 1800 RPM's when the rated load is applied.
2. **Fuel Leak Detected Alarm Lamp** — This lamp when ON indicates that fluids in the containment area have reach a high level.
3. **Panel Light Switch** — When activated will turn on control panel light.
4. **Panel Light** — For operation at night, panel light illuminates control panel for ease of reading meters and gauges. Make sure panel light switch is in the OFF position when light is not in use.
5. **Frequency Meter** — Indicates the output frequency in hertz (Hz). Normally 60 Hz.
6. **AC Ammeter** — Indicates the amount of current the load is drawing from the generator per leg selected by the ammeter phase-selector switch.
7. **AC Voltmeter** — Indicates the output voltage present at the **U,V, and W Output Terminal Lugs**.
8. **Voltage Regulator Control** — Allows ±15% manual adjustment of the generator's output voltage.
9. **Ammeter Change-Over Switch** — This switch allows the AC ammeter to indicate the current flowing to the load connected to any phase of the output terminals, or to be switched off. This switch does not effect the generator output in any fashion, it is for current reading only.
10. **Voltmeter Change-Over Switch** — This switch allows the AC voltmeter to indicate phase to phase voltage between any two phases of the output terminals or to be switched off.
11. **Main Circuit Breaker** — This three-pole, 200 amp main breaker is provided to protect the **U,V, and W Output Terminal Lugs** from overload.
12. **Auto/Start Switch** — This switch selects either manual or automatic operation. Center position is OFF (reset).
13. **Hour Check Button** — With the engine stopped, press and hold this button. The total running hours, fuel level, and battery voltage will be displayed.

OUTPUT TERMINAL PANEL

The Output Terminal Panel (Figure 8) shown below is located on the right-hand side (left from control panel) of the generator. Lift up on the cover to gain access to receptacles and terminal lugs.

NOTICE

Terminal legs “O” and “Ground” are considered bonded grounds

OUTPUT TERMINAL FAMILIARIZATION

The “Output Terminal Panel ” (Figure 8) is provided with the following:

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

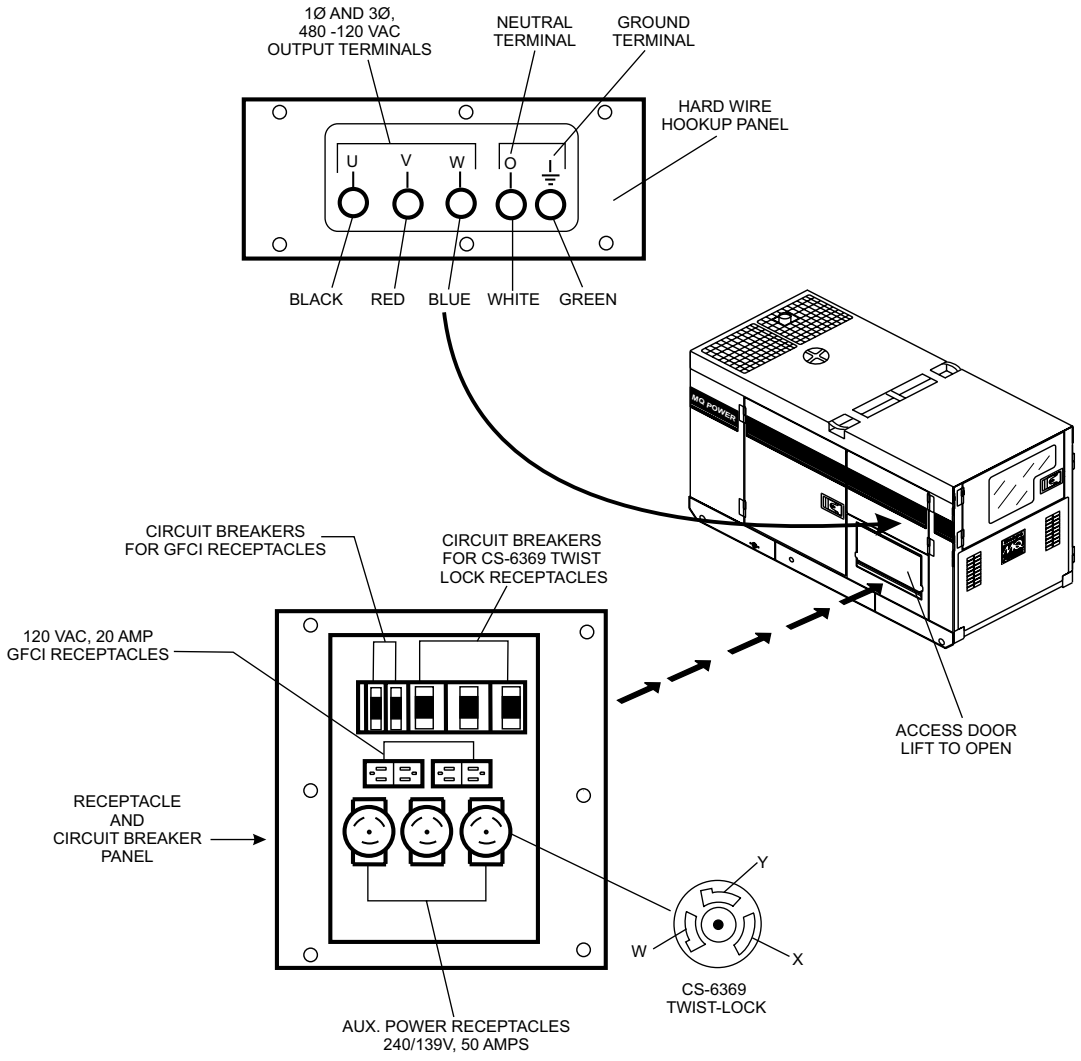


Figure 8. Output Terminal Panel

120 VAC GFCI Receptacles

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

Pressing the **reset** button resets the GFCI receptacle after being tripped. Pressing the **test button** (See Figure 9) in the center of the receptacle will check the GFCI function. Both receptacles should be tested at least once a month.

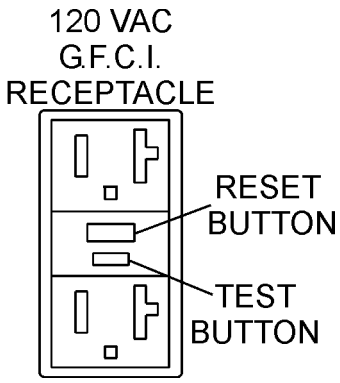


Figure 9. G.F.C.I. Receptacle

Twist Lock Dual Voltage 120/240 VAC Receptacles

There are three 240/139V, 50 amp auxiliary twist-lock (CS-6369) receptacles (Figure 10) provided on the output terminal panel. These receptacles can **only** be accessed when the voltage change-over board is configured for **single-phase 240/120** application

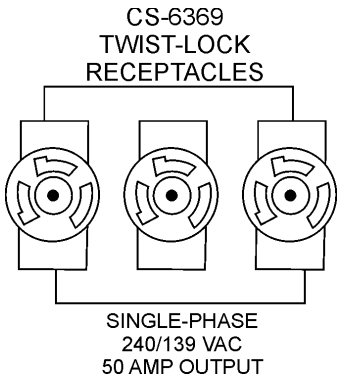


Figure 10. 240/139V Twist-Lock Auxiliary Receptacles

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

Turn the ***voltage regulator control knob*** (Figure 11) on the control panel to obtain the desired voltage. Turning the knob clockwise will **increase** the voltage, turning the knob counter-clockwise will **decrease** the voltage.

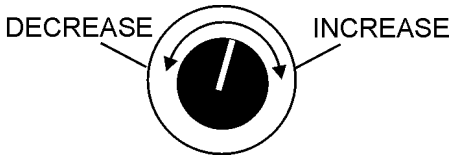


Figure 11. Voltage Regulator Control Knob

Removing the Plastic Face Plate (Hard Wire Hookup Panel)

The ***Output Terminal Lugs*** are protected by a plastic face plate cover (Figure 12). Un-screw the securing bolts and lift the plastic terminal cover to gain access to the terminal enclosure.

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

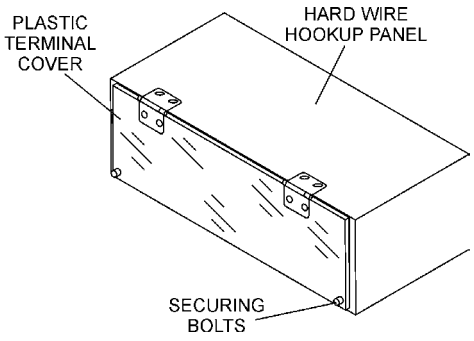


Figure 12. Plastic Face Plate (Output Terminal Lugs)

Connecting Loads

Loads can be connected to the generator by various methods, output terminal lugs, camlocks or the convenience receptacles (Figure 13). Make sure to read the operation manual before attempting to connect a load to the generator.

To protect the output terminals from overload, a 3-pole, 200A **main** circuit breaker is provided. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

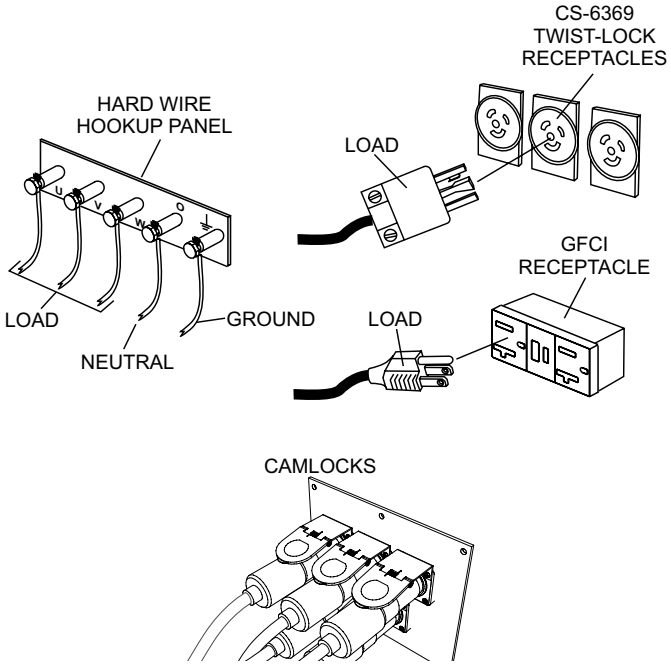


Figure 13. Connecting Loads

Over Current Relay

An **over current relay** (Figure 14) is connected to the main circuit breaker. In the event of an overload, both the circuit breaker and the over current relay may trip. If the circuit breaker can not be reset, the **reset button** on the over current relay must be pressed. The over current relay is located in the control box.

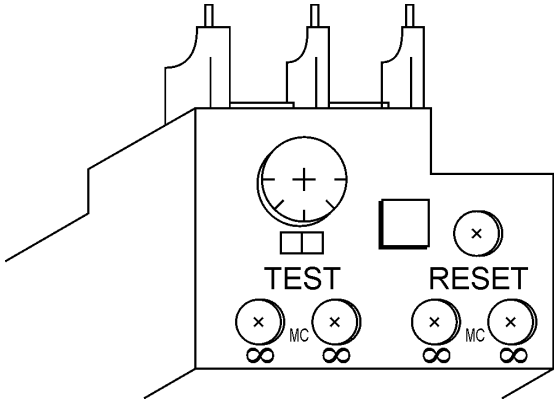


Figure 14. Over Current Relay

NOTICE

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

In the event of a short circuit or over current condition, it will automatically trip the 200 amp main breaker.

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

SINGLE PHASE LOAD

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

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

NOTICE

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

WATTS = VOLTAGE x AMPERAGE

The power factor of this generator is 0.8. See Table 7 below when connecting loads.

Table 7. 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 8. Cable Selection (60 Hz, Single Phase Operation)

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

THREE PHASE LOAD

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

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

NOTICE

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

NOTICE

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

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

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

When connecting ordinary power tools, a capacity of up to the generating set's rated output (kW) multiplied by 0.8 can be used.

DANGER

Before connecting this generator to any building's electrical system, a **licensed electrician** must install an **isolation (transfer) switch**. Serious damage to the building's electrical system may occur without this transfer 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 15). To obtain some of the voltages as listed in Table 9 (see below) will require a fine adjustment using the **voltage regulator** (VR) **control knob** located on the control panel.

Voltage Selector Switch

The voltage selector switch (Figure 15) is located above the output terminal panel's Hard Wire Hook-up Panel. It has been provided for ease of voltage selection..

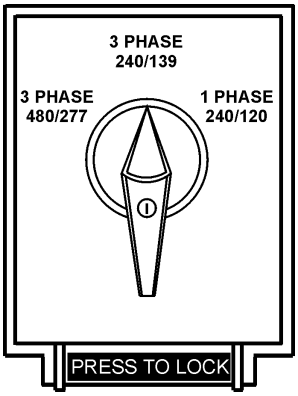


Figure 15. Voltage Selector Switch

CAUTION

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

Table 9. Voltages Available

UVWO Output Terminal Lugs	Voltage Selector Switch 3-Phase 240/139V Position			Voltage Selector Switch 3-Phase 480/270V 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

Maximum Amps

Table 10 shows the **maximum** amps the generator can provide. **DO NOT** exceed the maximum amps as listed.

Table 10. Generator Maximum Amps

Rated Voltage	Maximum Amps
1Ø 120 Volt	155.5 X 2 amps (4 wire) 168 amps X 2 (Zigzag)
1Ø 240 Volt	78.8 amps (4 wire) 168 amps (Zigzag)
3Ø 240 Volt	168 amps
3Ø 480 Volt	84 amps

GFCI Receptacle Load Capability

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

Figure 18 and Table 12 show what amount of current is available at the GFCI receptacles when the output terminals and twist lock receptacles are in use. Be careful that your load does not to exceed the available current capability at the receptacles.

Table 11. 1Ø GFCI Receptacle Load Capacity

KW in Use Twist Lock (C6369)	Available Load Current (Amps)
1Ø 240/120V	GFCI Duplex 5-20R 120V
40.4	0
39.2	5 amps/receptacle
38.0	10 amps/receptacle
38.6	15 amps/receptacle
35.6	20 amps/receptacle

Table 12. 3Ø Generator Maximum Amps

KVA in Use (UVWO Terminals)	Available Load Current (Amps)
3Ø 240/480V	GFCI Duplex 5-20R 120V
70	0 amps/receptacle
65.8	5 amps/receptacle
61.7	10 amps/receptacle
57.5	15 amps/receptacle
53.4	20 amps/receptacle

HOW TO READ THE AC AMMETER AND AC VOLTAGE GAUGES

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

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

Before taking a reading from either gauge, set the ***Voltage Selector Switch*** (Figure 16) to the position which produces the required voltage (For example, for 3Ø 240V, choose the center 3Ø 240/139V position on the voltage selector switch.

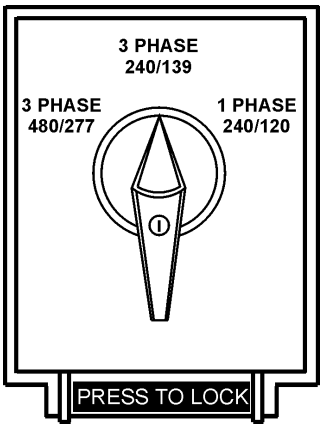


Figure 16. Voltage Selector Switch-240/3Ø Position

AC Voltmeter Gauge Reading

Place the ***AC Voltmeter Change-Over Switch*** (Figure 17) in the W-U position and observe the phase to phase voltage reading between the W and U terminals as indicated on the ***AC Voltmeter Gauge*** (Figure 18).

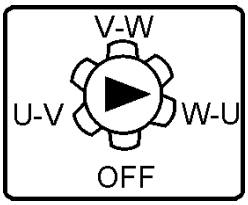


Figure 17. AC Voltmeter Change-Over Switch

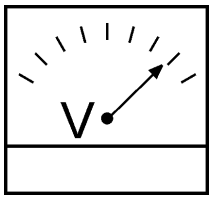


Figure 18. AC Voltmeter Gauge (Volt reading on W-U Lug)

AC Ammeter Gauge Reading

Place the ***AC Ammeter Change-Over Switch*** (Figure 19) in the U position and observe the current reading (load drain) on the U terminal as indicated on the ***AC Ammeter Gauge*** (Figure 20). This process can be repeated for terminals V and W.

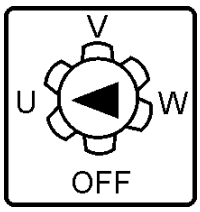


Figure 19. AC Ammeter Change-Over Switch

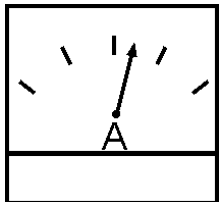


Figure 20. AC Ammeter (Amp reading on U Lug)

NOTICE

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

UVWO TERMINAL OUTPUT VOLTAGES

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

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

3Ø-240V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 240/139 position as shown in Figure 21.

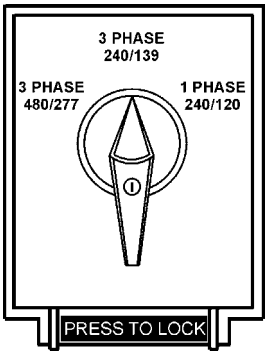


Figure 21. Voltage Selector Switch 3Ø-240/139V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 22.

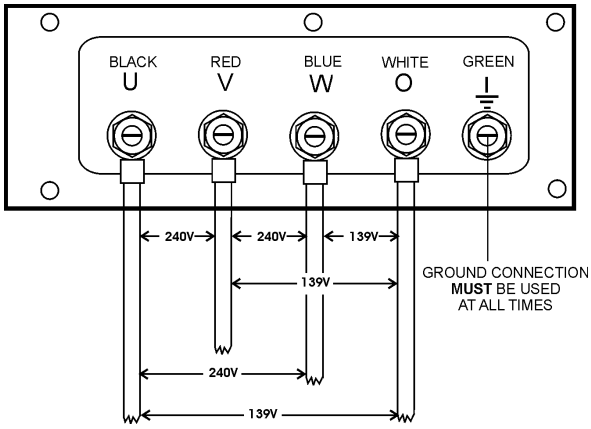


Figure 22. UVWO Terminal Lugs

3. Turn the voltage regulator knob (Figure 23) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use voltage regulator adjustment knob whenever fine tuning of the output voltage is required.

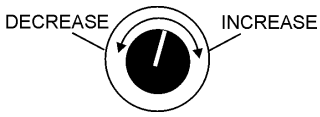


Figure 23. Voltage Regulator Knob

3Ø-208V/1Ø-120V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 240/139 position as shown in Figure 21.
2. Connect the load wires to the UVWO terminals as shown in Figure 24.

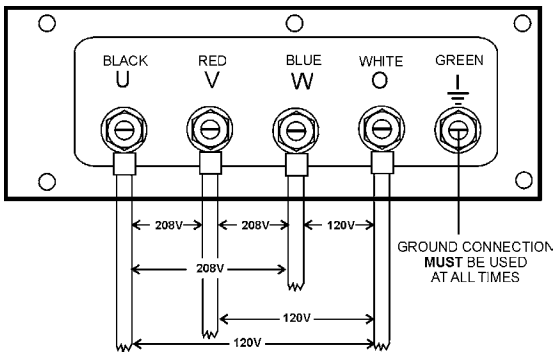


Figure 24. UVWO Terminal Lugs 3Ø-208/1Ø-120V Connections

NOTICE

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

3Ø-480/277V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 480/277 position as shown in Figure 25.

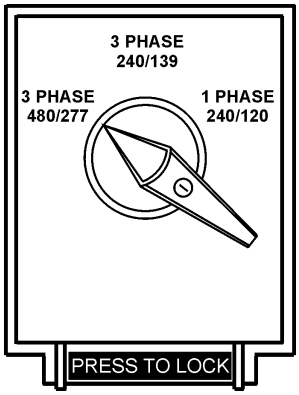


Figure 25. Voltage Selector Switch 3Ø-480/277V Position

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

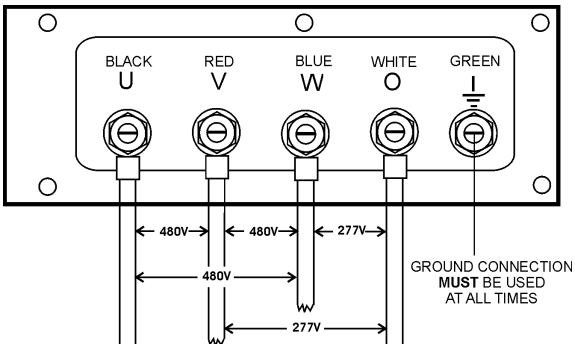


Figure 26. UVWO Terminal Lugs 3Ø-480V Connections

NOTICE

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

1Ø-240/120V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 1Ø 240/120 position as shown in Figure 27.

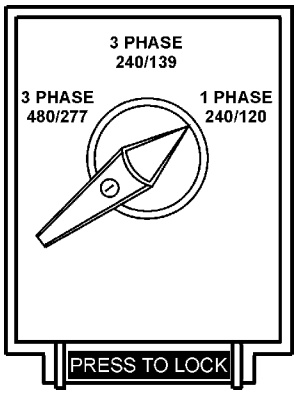


Figure 27. Voltage Selector Switch 1Ø-240/120V Position

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

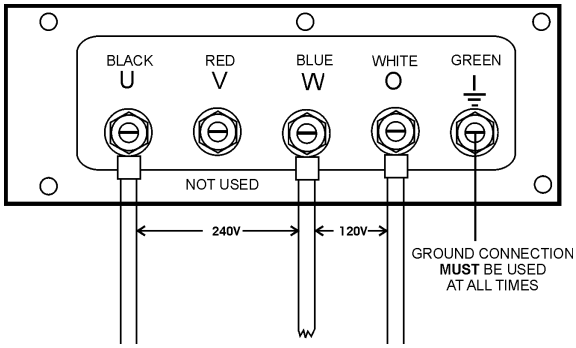


Figure 28. UVWO Terminal Lugs 1Ø-240/120V Connection

3. Turn the voltage regulator knob (Figure 23) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use voltage regulator adjustment knob whenever fine tuning of the output voltage is required.

3Ø-600V Auto-Transformer

3Ø, 600 VAC can be achieved via the auto-transformer module. This module provides the necessary electronics to convert the 3Ø, 480 VAC inut voltage to a 3Ø, 600 VAC output voltage.

The 3Ø, 600 VAC ouput voltage cannot be achieved unless the voltage selector switch (Figure 29) is placed in the 3Ø, 480/277 position.

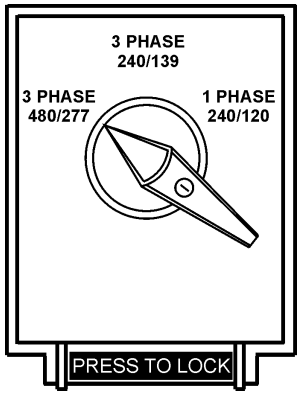


Figure 29. Voltage Selector Switch
3Ø-240/139V Position (600 VAC Auto-Transformer)

3Ø-600VAC Load Connections

DANGER

When connecting the load wires make sure the generator is **OFF**. The possibility of electrocution exists causing severe bodily harm even death!

1. Loosen the latches on the control box enclosure and open the door.
2. Drill a 1-1/2 inch hole at the bootom control box enclosure as shown in Figure 30.

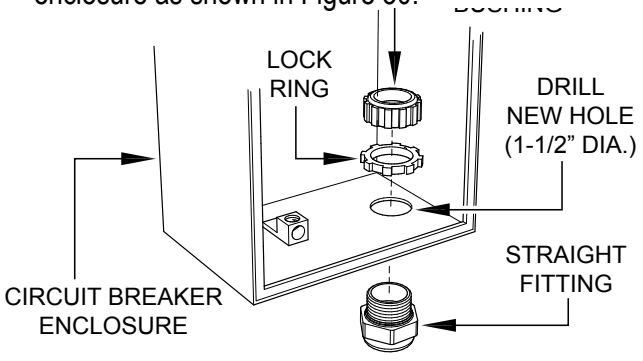


Figure 30. Control Box Enclosure (Drilling)

3. After drilling, make sure all shavings and debris have been removed from the enclosure.
4. Install customer supplied conduit, fittings and bushing through enclosure hole opening.
5. Next, route the customer supplied 5 wires through the straight conduit fitting.
6. Connect the 3 load wires (**RED**, **BLACK** and **BLUE**) to the load side (bottom) of the circuit breaker, **T1**, **T2** and **T3** respectively. Reference Figure 31.

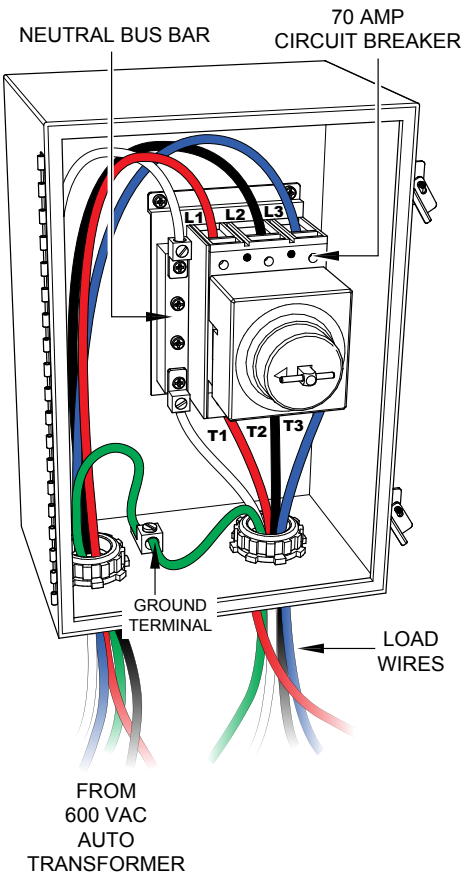


Figure 31. Control Box Enclosure
Load Connections

7. Connect the neutral wire (**WHITE)** to the neutral bus bar.
8. Connect the ground wire (**GREEN**) to the ground terminal.
9. Torque all wires to 45 lbf-in (5 N·m).
10. Once all wires have been securely tighten, close control box enclosure door and securely tighten the control box door latches.

CIRCUIT BREAKERS

To protect the generator from an overload, a 3-pole, 200 amp, main circuit breaker is provided to protect the **U,V, and W Output Terminals** from overload. In addition two single-pole, 20 amp **GFCI** circuit breakers are provided to protect the GFCI receptacles from overload. Three 50 amp **load** circuit breakers have also been provided to protect the auxiliary receptacles from overload. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

LUBRICATION OIL

Fill the engine crankcase with lubricating oil through the filler hole, but **DO NOT** overfill. Make sure the generator is level and verify that the oil level is maintained between the two notches (Figure 32) on the dipstick. See Table 13 for proper selection of engine oil.

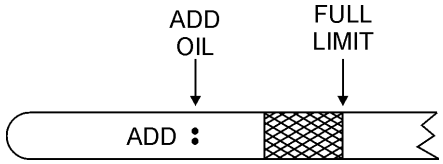
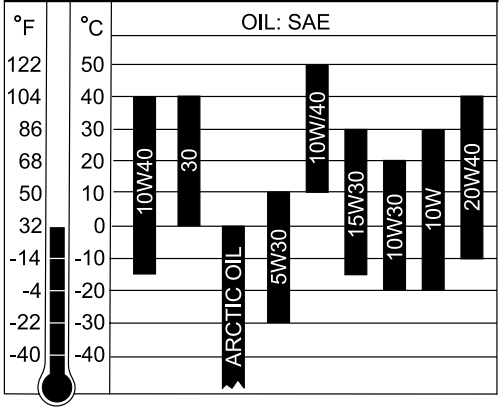


Figure 32. Engine Oil Dipstick

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

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

Table 13. Recommended Motor Oil



FUEL CHECK

DANGER

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

Refilling the Fuel System

CAUTION

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

This generator may have a fuel tank (Figure 33) 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 safety container. If the container does not have a spout, use a funnel. Wipe up any spilled fuel immediately.

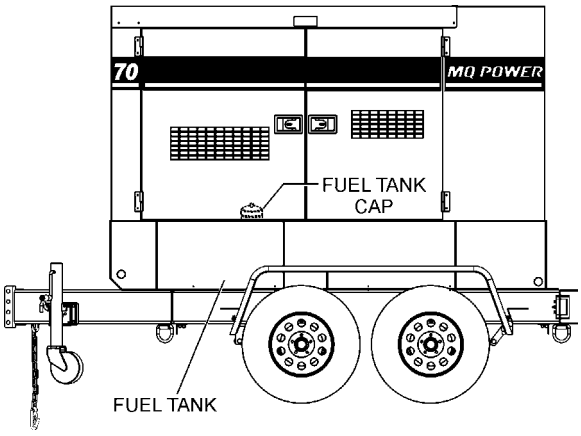


Figure 33. Trailer Mounted Fuel Tank

Refueling Procedure:

WARNING



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

1. **Level Tanks** — Make sure fuel cells are level with the ground. Failure to do so will cause fuel to spill from the tank before reaching full capacity (Figure 34).

CAUTION

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

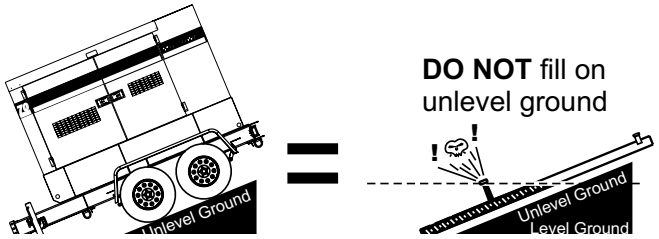


Figure 34. Only Fill on Level Ground

NOTICE

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

2. Open cabinet doors on the "right side" of the generator (from generator control panel position). Remove fuel cap and fill tank (Figure 35).

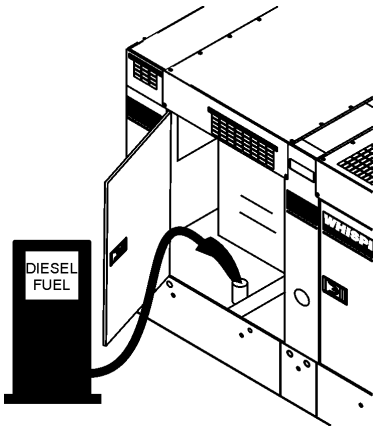


Figure 35. Fueling the Generator

3. **NEVER overfill fuel tank** — It is important to read the fuel gauge when filling trailer fuel tank. **DO NOT** wait for fuel to rise in filler neck (Figure 36).

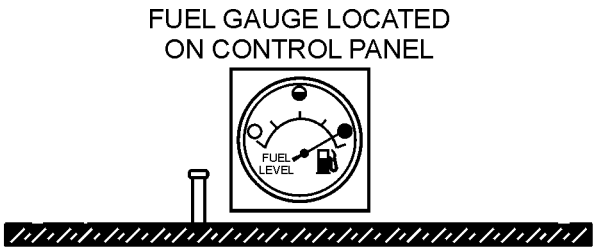


Figure 36. Full Fuel Tank

CAUTION

DO NOT OVERFILL fuel system. Leave room for fuel expansion. Fuel expands when heated (Figure 37).

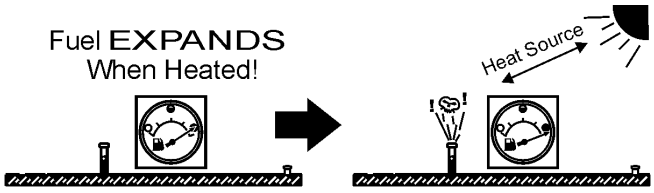


Figure 37. Fuel Expansion

COOLANT (ANTIFREEZE/SUMMER COOLANT/ WATER)

John Deere 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 **John Deere Engine Owner's Manual** for further details.

WARNING



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

Day-to-day addition of coolant is done from the recovery tank. When adding coolant to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. See Table 14 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 14. Coolant Capacity	
Engine and Radiator	5.92 gal (22.4 liters)
Reserve Tank	N/A

Operation in Freezing Weather

When operating in freezing weather, be certain the proper amount of antifreeze (Table 15) has been added.

Table 15. Anti-Freeze Operating Temperatures		
Vol % Anti-Freeze	Freezing Point	
	°C	°F
50	-37	-34

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.

NOTICE

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

AIR CLEANER

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

FAN BELT TENSION

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

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

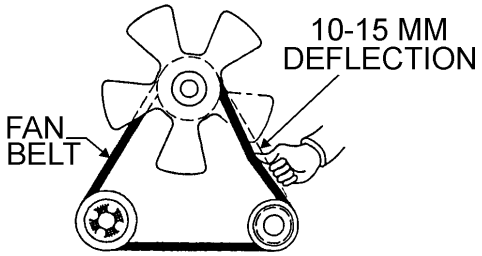


Figure 38. Fan Belt Tension

CAUTION

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

BATTERY

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

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

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

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

Battery Cable Installation

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

⚠ CAUTION

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

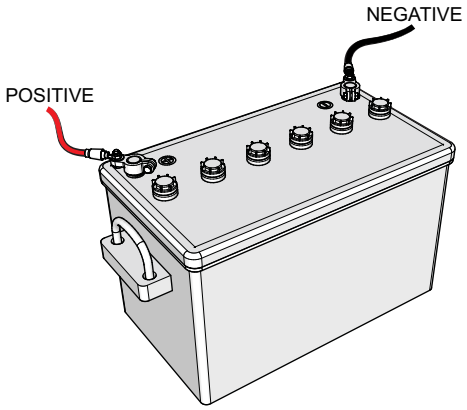


Figure 39. Battery Connections

When connecting battery do the following:

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

NOTICE

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

⚠ CAUTION

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

ALTERNATOR

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

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

WIRING

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

PIPING AND HOSE CONNECTION

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

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

BEFORE STARTING

⚠ CAUTION

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

⚠ WARNING

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

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

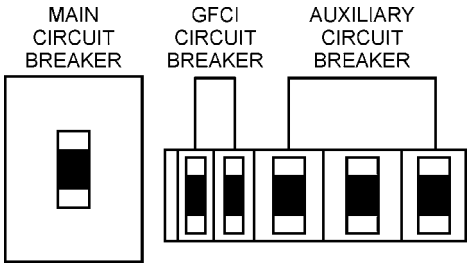


Figure 40. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Make sure the **voltage change-over board** has been configured for the desired output voltage.
3. Connect the load to the **receptacles** or the **output terminal lugs** as shown in Figure 13. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.
4. Tighten terminal nuts securely to prevent load wires from slipping out.
5. Close all engine enclosure doors (Figure 41).

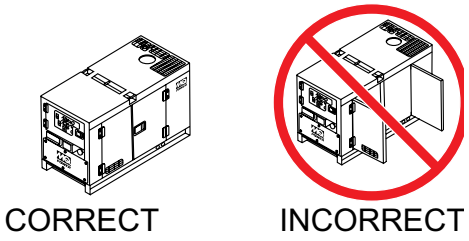


Figure 41. Engine Enclosure Doors

STARTING (MANUAL)

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

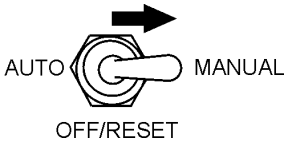


***Figure 42. Auto-Off/Reset Manual*;Switch (Manual Position)**

NOTICE

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

NOTICE

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

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

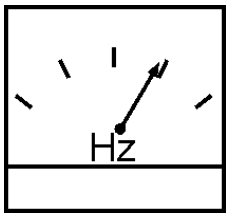


Figure 43. Frequency Meter

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

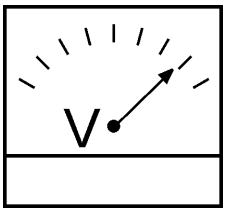


Figure 44. Voltmeter

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

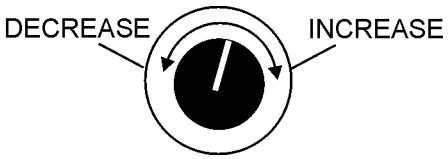


Figure 45. Voltage Adjust Control Knob

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

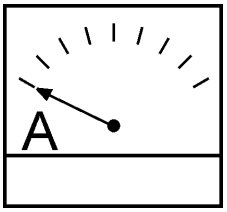


Figure 46. Ammeter (No Load)

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

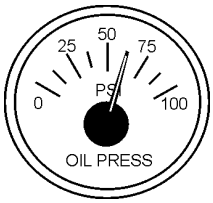


Figure 47. Oil Pressure Gauge

8. The **coolant temperature gauge** (Figure 48) will indicate the coolant temperature. Under normal operating conditions the coolant temperature should be between 180°~225°F (75°~95°C) (**Green Zone**).

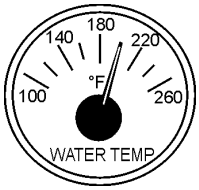


Figure 48. Coolant Temperature Gauge

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

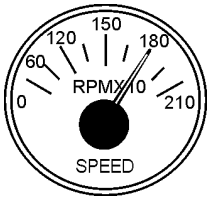


Figure 49. Engine Tachometer Gauge

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

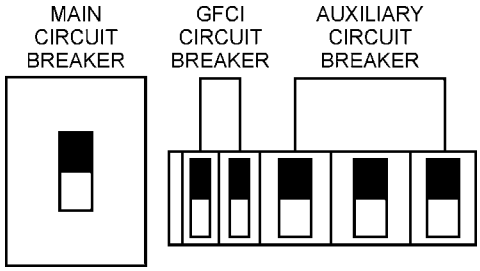


Figure 50. Main, Aux. and GFCI Circuit Breakers (ON)

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

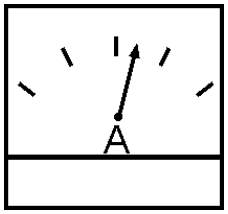


Figure 51. Ammeter (Load)

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

3Ø-600 VAC Operation

NOTICE

The 3Ø, 600 VAC output voltage can only be achieved when the voltage selector switch has been placed in the 3Ø-480/277V position.

Place the 70 amp circuit breaker switch (Figure 52) on the 600 VAC control box enclosure to the ON position.



Figure 52. Circuit Breaker ON (600 VAC)

STARTING AUTO MODE

DANGER



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

CAUTION

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

NOTICE

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

WARNING

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

CAUTION

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

NOTICE

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

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

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

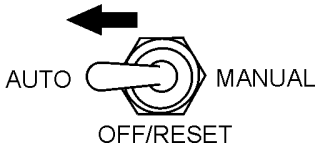


Figure 53. Auto Off/Reset Manual Switch (AUTO)

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

⚠ WARNING

NEVER stop the engine suddenly except in an emergency.

NORMAL SHUTDOWN PROCEDURE

To shutdown the generator, use the following procedure:

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

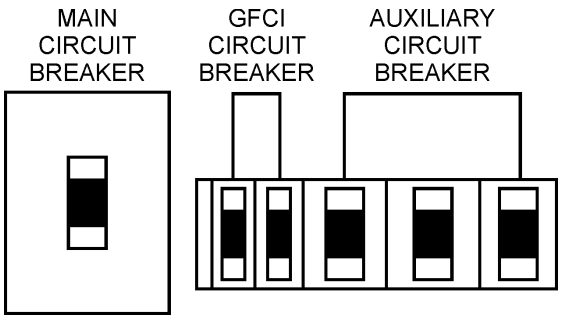


Figure 54. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Let the engine cool by running it at low speed for 3-5 minutes with no load applied.
3. Place the **Auto Off/Reset Manual Switch** (Figure 55) in the **OFF/RESET** position.



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

4. Verify that all status LEDs on the ECU control panel are **OFF** (not lit).
5. Remove all loads from the generator.
6. Place the 70 amp circuit breaker switch (Figure 56) on the 600 VAC control box enclosure to the OFF position.



Figure 56. Circuit Breaker OFF (600 VAC)

7. Inspect entire generator for any damage or loosening of components that may have occurred during operation.

EMERGENCY SHUTDOWN PROCEDURE

1. Place the **MPEC Control Switch** (in the **OFF/RESET** position.

AUTOMATIC SHUT-DOWN SYSTEM

This unit is equipped with safety devices to automatically stop the engine in the event of low oil pressure, approximately 14 psi (97 kPa), or high water temperature, approximately 230° F (110° C), overspeed approximately +15%. The alarm lamps on the ECU illuminate to signify the reason for the shutdown.

NOTICE

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

Table 16. Inspection/Maintenance		10 Hrs DAILY	250 Hrs	500 Hrs or Every 12 Months	3000 Hrs or Every 36 Months	OTHER
Engine	Check Engine Oil and Coolant Levels	X				
	Check Fuel Filter/Water Separator Bowl	X				
	Check Air Cleaner	X				
	Check Air Cleaner Element	X				
	Check for Leaks/Hoses/Clamps	X				
	Check for Loosening of Parts	X				
	Change Engine Oil and Oil Filter * [1]		X			
	Clean Unit, Inside and Outside		X			
	Replace Fuel Filter Elements			X		
	Check Engine Mounts			X		
	Service Battery			X		
	Check Air Intake Hoses			X		
	Check Fan Belt Condition			X		
	Check Automatic Belt Tensioner			X		
	Check Electrical Ground Connection			X		
	Clean Radiator, Check Cooling System			X		
	Coolant Solution Analysis, Add SCA's As Required			X		
	Pressure Test Cooling System			X		
	Check Engine Speed			X		
	Test Thermostats				X	
	Check and Adjust Engine Valve Clearance				X	
	Test Glow Plugs				X	
	Inspect Diesel Particulate Filter (DPF) * [2]				X	
	Flush and Refill Cooling System*[3]					2 yrs. or 2000 hrs.
	Clean Inside of Fuel Tank					1000 hrs.
	Check Crankcase Ventilation Filter*[4]					1500 hrs.
	Replace Air Cleaner Elements * [5]					As Required
Generator	Measure Insulation Resistance Over 3M ohms		X			
	Check Rotor Rear Support Bearing			X		

*[1] During initial operation of a new engine, change oil and filter between a minimum of 100 hrs. and a maximum of 250 hrs. Service interval depends on type of oil.

*[2] Expectation for minimal service interval will be at least 3000 hrs. based on engine power. However, actual service should take place when indicated by diagnostic gauge. Please contact nearest authorized Multiquip Service Center for DPF Cleaning.

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

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

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

GENERAL INSPECTION

Prior to each use, the generator should be cleaned and inspected for deficiencies. Check for loose, missing or damaged nuts, bolts or other fasteners. Also check for fuel, oil, and coolant leaks. Use Table 16 as a general maintenance guideline **Engine Side** (Refer to the Engine Instruction Manual).

AIR CLEANER

Every 250 hours: Remove air cleaner element (Figure 57) and clean the heavy duty paper element with light spray of compressed air. Replace the air cleaner as needed.

Air Cleaner with Dust Indicator

This indicator (Figure 57) is attached to the air cleaner. When the air cleaner element is clogged, air intake restriction becomes greater and the dust indicator signal shows **RED** meaning the element needs changing or service. After changing the air element, press the dust indicator button to reset the indicator.

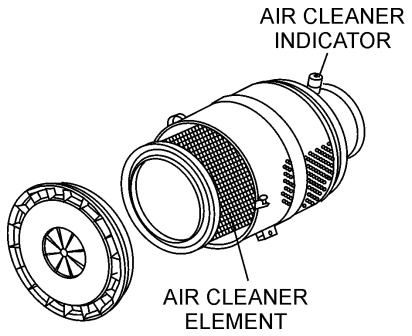


Figure 57. Air Cleaner/Indicator

NOTICE

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

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

FUEL ADDITION

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

Removing Water from the Fuel Tank

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

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

Cleaning Inside the Fuel Tank

Drain the fuel inside the fuel tank completely. Using a spray washer (Figure 58) wash out any deposits or debris that have accumulated inside the fuel tank.

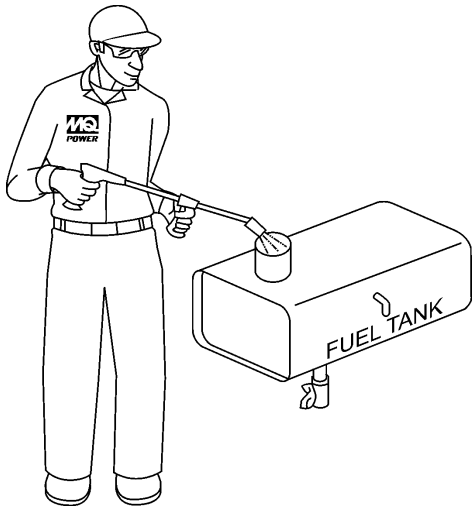


Figure 58. Fuel Tank Cleaning

FUEL TANK INSPECTION

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

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

Replacing Fuel Filter

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

AIR REMOVAL

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

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

CHECK OIL LEVEL

Check the crankcase oil level prior to each use, or when the fuel tank is filled. Insufficient oil may cause severe damage to the engine. Make sure the generator is level. The oil level must be between the two notches on the dipstick as shown in Figure 32.

Replacing Oil Filter

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

FLUSHING OUT RADIATOR AND REPLACING COOLANT

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

⚠ WARNING



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

RADIATOR CLEANING

The radiator (Figure 59) should be sprayed (cleaned) with a high pressure washer when excessive amounts of dirt and debris have accumulated on the cooling fins or tube. When using a high pressure washer, stand at least 5 feet (1.5 meters) away from the radiator to prevent damage to the fins and tube.

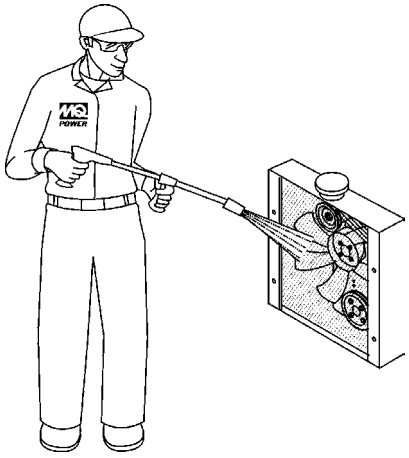


Figure 59. Radiator Cleaning

GENERATOR STORAGE

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

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

WATER HEATING ELEMENT AND INTERNAL BATTERY CHARGER 120 VAC INPUT RECEPTACLES (OPTIONAL)

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

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

These receptacles will **ONLY** function when commercial power has been supplied to them (Figure 60). To apply commercial power to these receptacles, a power cord of adequate size will be required (See Table 8).

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

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

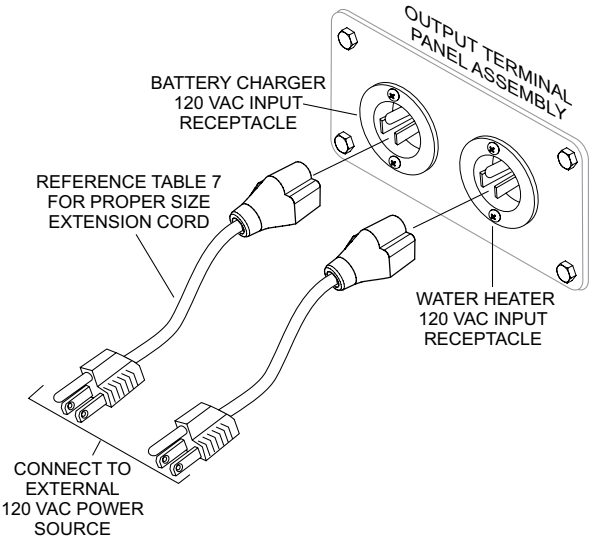


Figure 60. Battery Charger and Water Heater Power Connections

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

NOTICE

To ensure adequate starting capability, always have power applied to the generator's internal battery charger.

EMISSION CONTROL

The emission control system employed with the John Deere 4045HFG93 diesel engine consist of a Diesel Oxidation Catalyst (DOC) and a Diesel Particulate Filter (DPF). The oxidation catalyst and particulate filter are housed in one unit. See Figure 63.

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

Diesel Oxidation Catalyst (DOC)

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

Diesel Particulate Filter (DPF)

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

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

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

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

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

DPF PRE-ALARM

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

This maintenance action will be shown on the LCD display (DPF Warning Symbol) and the AMBER pre-alarm LED on the ECU control panel will be ON (lit). See Figure 61.

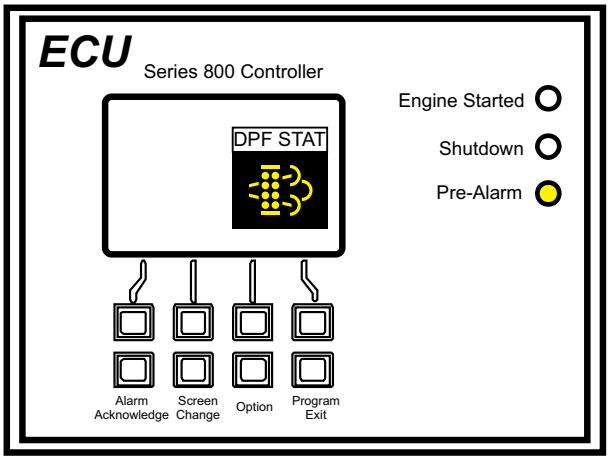


Figure 61. ECU DPF Pre-Alarm

The DPF pre-alarm status symbol displayed in Figure 61 indicates the soot level buildup has exceeded a pre-determined level and a "Forced Regeneration" action is required.

NOTICE

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

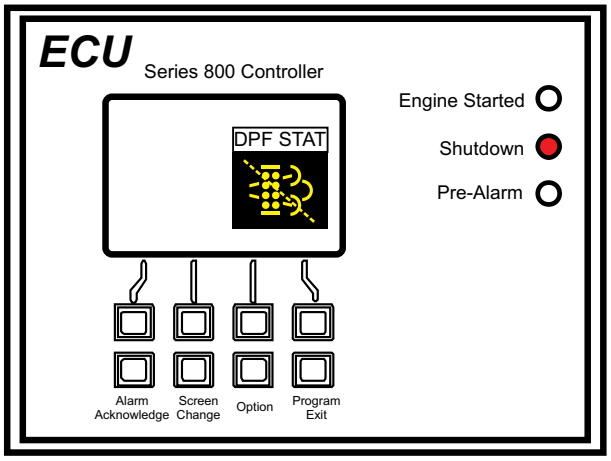


Figure 62. ECU DPF Engine Shutdown

NOTICE

If the **RED** engine shutdown LED is ever **ON** (Figure 62), John Deere recommends that the DPF be removed, cleaned or replaced. In addition the shutdown code must be cleared. To clear the code, the ECM must be reset by a licensed John Deere Engine Service Technician, using John Deere service software.

NOTICE

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

FORCED REGENERATION PROCEDURE

Follow the steps below to initiate a forced regeneration:

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

NOTICE

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



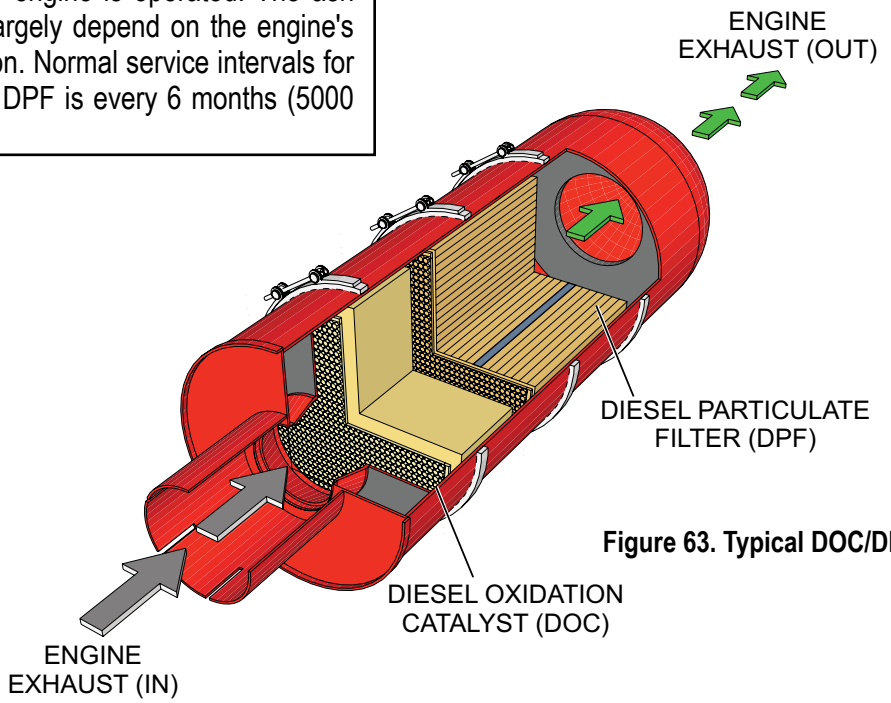


Figure 63. Typical DOC/DPF Unit

AUTO REGENERATION PROCEDURE

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

Reference Table 17 for the various soot level stages for the DPF system.

Table 17. Automatic DPF System

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

NOTICE

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

NOTICE

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

NOTICE

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

The following trailer maintenance guidelines are intended to assist the operator in preventive maintenance.

TRAILER BRAKES

Properly functioning brake shoes and drums are essential to ensure safety. The brakes should be inspected the first 200 miles of operation. This will allow the brake shoes and drums to seat properly. After the first 200 mile interval, inspect the brakes every 3,000 miles. If driving over rough terrain, inspect the brakes more frequently.

HYDRAULIC BRAKES

If your trailer has hydraulic brakes, they function the same way the surge brakes do on your tow vehicle. The hydraulic braking system must be inspected at least as often as the brakes on the tow vehicle, but no less than once per year. This inspection includes an assessment of the condition and proper operation of the wheel cylinders, brake shoes, brake drums and hubs.

MANUALLY ADJUSTING THE BRAKES

Most axles are fitted with a brake mechanism that will adjust the brakes during a hard stop. However, some braking systems are not automatically adjusted by hard stopping. These brakes require manual adjustment. The following steps apply to adjust most manually adjustable brakes.

1. Jack up the trailer and secure it on adequate capacity jackstands.
2. Be sure the wheel and brake drum rotate freely.
3. Remove the adjusting-hole cover from the adjusting slot on the bottom of the brake backing plate.
4. With a screwdriver or standard adjusting tool, rotate the starwheel of the adjuster assembly to expand the brake shoes. Adjust the brake shoes out until the pressure of the linings against the drum makes the wheel very difficult to turn. Note: Your trailer maybe equipped with drop spindle axles. See axle manual for your axle type. You will need a modified adjusting tool for adjusting the brakes in these axles. With drop spindle axles, a modified adjusting tool with about an 80 degree angle should be used.
5. Rotate the starwheel in the opposite direction until the wheel turns freely with a slight drag.
6. Replace the adjusting-hole cover.
7. Repeat the above procedure on all brakes.
8. Lower the trailer to the ground.

Check the fluid level in the master cylinder reservoir at least every three months. If you tow your trailer an average of 1,000 miles per month in a hot and dry environment, you must check the brake fluid level once a month. The brake fluid reservoir is located on the tongue of the trailer. Always fill with clean, uncontaminated DOT 4 brake fluid.

Figure 64 below displays the major hydraulic brake components that will require inspection and maintenance. Please inspect these components as required using steps 1 through 6 as referenced in the “Manually Adjusting The Brakes” section on this page. See Table 1 for Hydraulic Brake Troubleshooting.

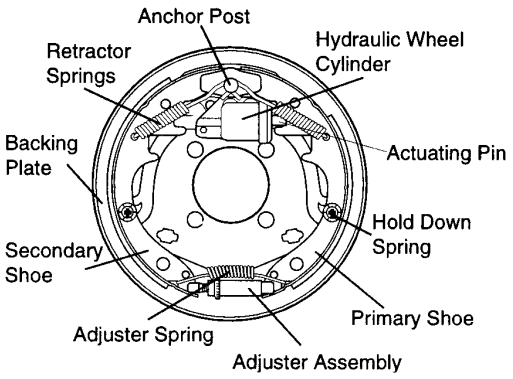


Figure 64. Hydraulic Brake Components

HYDRAULIC BRAKE ACTUATOR

The hydraulic brake actuator (Figure 65) is the mechanism that activates the trailer’s brake system. This actuator changes fluid power into mechanical power. Therefore, the fluid level must be checked frequently to assure that the brakes function properly.

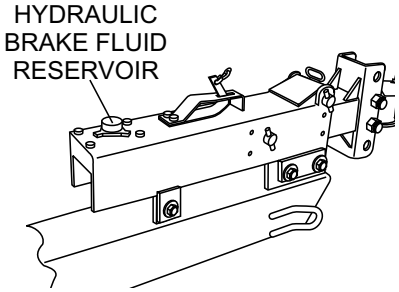


Figure 65. Hydraulic Brake Actuator

⚠ WARNING

Failure to maintain proper fluid level in the actuator may result in loss of braking action which could cause severe property damage, injury or death.

Periodically check the actuator mounting fasteners for damage or loosening. Inspect the actuator for worn or damaged parts. As you are towing your trailer, be aware of any changes in braking quality. This could be an early warning of brake or actuator malfunction and requires immediate attention. Consult a certified brake specialist to make necessary adjustment or repairs.

Table 18. Hydraulic Brake Troubleshooting

Symptom	Possible Cause	Solution
No Brakes	Brake line broken or kinked?	Repair or replace.
Weak Brakes or Brakes Pull to One Side	Brake lining glazed?	Reburnish or replace.
	Trailer overloaded?	Correct weight.
	Brake drums scored or grooved?	Machine or replace.
	Tire pressure correct?	Inflate all tires equally.
	Tires unmatched on the same axle?	Match tires.
Locking Brakes	Brake components loose, bent or broken?	Replace components.
	Brake drums out-of-round?	Replace.
Noisy Brakes	System lubricated?	Lubricate.
	Brake components correct?	Replace and correct.
Dragging Brakes	Brake lining thickness incorrect or not adjusted correctly?	Install new shoes and linings.
	Enough brake fluid or correct fluid?	Replace rubber parts fill with dot 4 fluid.

ADJUSTABLE CHANNEL

Your trailer may be equipped with an adjustable channel (Figure 66) that allows the coupler to be raised or lowered to a desired height. Periodically check the channel bolts for damage or loosening.

NOTICE

When replacing channel mounting hardware (nuts, bolts and washers), **NEVER** substitute substandard hardware. Pay close attention to ***bolt length*** and ***grade***. **ALWAYS** use manufacturer's recommended parts when replacing channel mounting hardware.

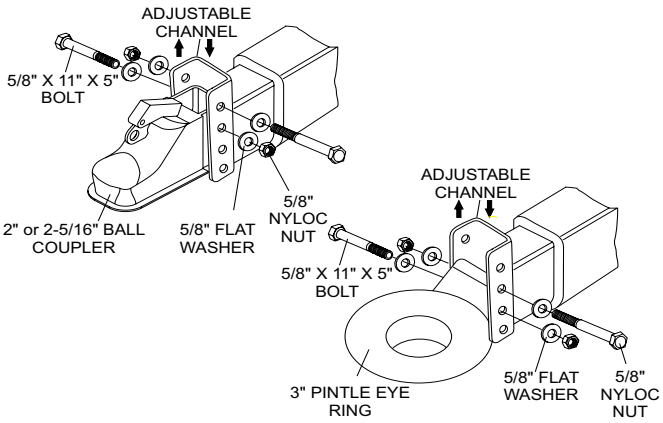


Figure 66. Adjustable Channel

Wheel Bearings

Wheel bearings (Figure 67) must be inspected and lubricated once a year or 12,000 miles to insure safe operation of your trailer.

If trailer wheel bearings are immersed in water, they must be replaced.

⚠ DANGER

If trailer wheels are under water for a long period of time, wheel bearings may fail. If this is the case, service wheel bearings immediately.

The possibility exists of the wheels falling off causing equipment damage and severe bodily harm even death!

If the trailer has not been used for an extended amount of time, have the bearings inspected and packed more frequently, at least every six months and prior to use.

Follow the steps below to disassemble the wheel hub and service the wheel bearings. See Figure 67.

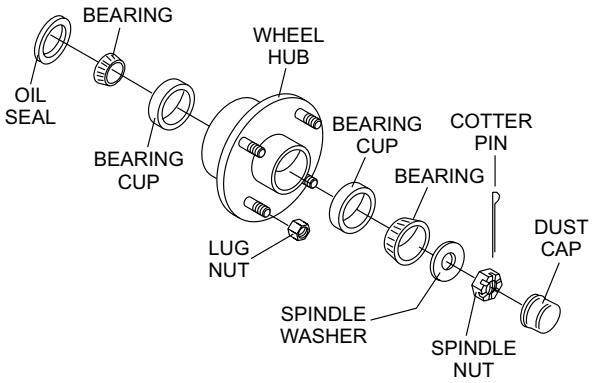


Figure 67. Wheel Hub Components

- After removing the dust cap, cotter pin, spindle nut and spindle washer, remove the hub to inspect the bearings for wear and damage.
- Replace bearings that have flat spots on rollers, broken roller cages, rust or pitting. Always replace bearings and cups in sets. The inner and outer bearings are to be replaced at the same time.
- Replace seals that have nicks, tears or wear.
- Lubricate the bearings with a high quality EP-2 automotive wheel bearing grease.

WHEEL HUB ADJUSTMENT

Every time the wheel hub is removed and the bearings are reassembled, follow the steps below to check the wheel bearings for free running and adjust.

- Turn the hub slowly, by hand, while tightening the spindle nut until you can no longer turn the hub by hand.
- Loosen the spindle nut just until you are able to turn it (the spindle nut) by hand. Do not turn the hub while the spindle nut is loose.
- Install a new cotter pin through the spindle nut and axle.
- Check the adjustments. Both the hub and the spindle nut should be able to move freely (the spindle nut motion will be limited by the cotter pin).

DANGER

NEVER crawl under the trailer unless it is on firm and level ground and resting on properly placed and secured jackstands.

The possibility exists of the trailer falling thus causing equipment damage and severe bodily harm even death!

DANGER

When performing trailer inspection and maintenance activities, you must jack up the trailer using jacks and jackstands.

When jacking and using jackstands, place them so as to clear wiring, brake lines, and suspension parts (i.e., springs, torsion bars). Place jacks and jackstands inside of the perimeter strip on the supporting structure to which the axles are attached.

DANGER

Improper weld repair will lead to early failure of the trailer structure and can cause serious injury or death.

DO NOT repair cracked or broken welds unless you have a certified welder perform the repair. If not, have the welds repaired by your dealer.

WARNING

If the trailer is involved in an accident, have it inspected immediately by qualified personnel. In addition, the trailer should be inspected annually for signs of wear or deformations.

LEAF SUSPENSION

The leaf suspension springs and associated components (Figure 68) should be visually inspected every 6,000 miles for signs of excessive wear, elongation of bolt holes, and loosening of fasteners. Replace all damaged parts (suspension) immediately.

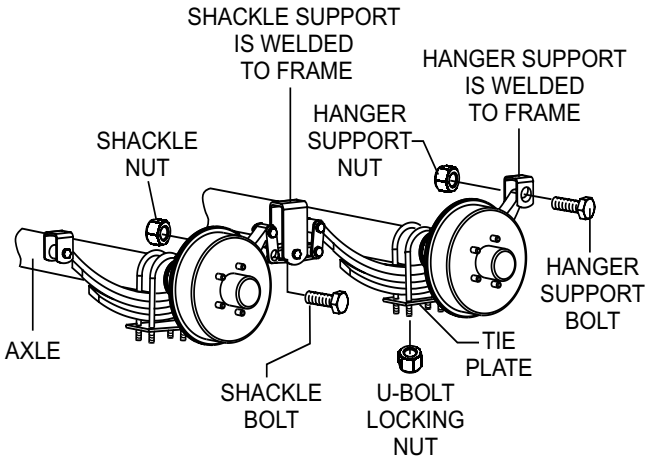


Figure 68. Leaf Suspension Components

DANGER

Worn or broken suspension parts can cause loss of control, damage to equipment and severe bodily injury, even death!

Check suspension regularly.

The following guidelines are intended to assist the operator in the operation and handling of a trailer.

Safety precautions should be followed at all times when operating a trailer. Failure to read, understand and follow the safety guidelines could result in injury to yourself and others. Loss of control of the trailer or tow vehicle can result in death or serious injury.

COMMON CAUSES FOR LOSS OF TRAILER

- Driving too fast for the conditions (maximum speed when towing a trailer is 55 mph).
- Overloading the trailer or loading the trailer unevenly.
- Trailer improperly coupled to the hitch.
- No braking on trailer.
- Not maintaining proper tire pressure.
- Not keeping lug nuts tight.
- Not properly maintaining the trailer structure.
- Ensure machine is towed level to tow vehicle.

TRAILER TOWING GUIDELINES

- Recheck the load tiedowns to make sure the load will not shift during towing.
- Before towing, check coupling, safety chain, safety brake, tires, wheels and lights.
- Check the lug nuts or bolts for tightness.
- Check coupler tightness after towing 50 miles.
- Use your mirrors to verify that you have room to change lanes or pull into traffic.
- Use your turn signals well in advance. Allow plenty of stopping space for your trailer and tow vehicle.
- Allow plenty of stopping space for your trailer and tow vehicle.
- **DO NOT** drive so fast that the trailer begins to sway due to speed.
- Allow plenty of room for passing. A rule of thumb is that the passing distance with a trailer is 4 times the passing distance without the trailer.
- Shift your automatic transmission into a lower gear for city driving.
- **ALWAYS** use lower gears for climbing and descending grades.
- **DO NOT** ride the brakes while descending grades, they may get so hot that they stop working. Then you will potentially have a runaway tow vehicle and trailer.
- To conserve fuel, don't use full throttle to climb a hill. Instead, build speed on the approach.
- Slow down for bumps in the road. Take your foot off the brake when crossing the bump.
- **DO NOT** brake while in a curve unless absolutely necessary. Instead, slow down before you enter the curve and power through the curve. This way, the towing vehicle remains in charge.
- **DO NOT** apply the brakes to correct extreme trailer swaying. Continued pulling of the trailer, and even slight acceleration, will provide a stabilizing force.
- Anticipate the trailer "swaying." Swaying is the trailer reaction to the air pressure wave caused by passing trucks and buses. Continued pulling of the trailer provides a stabilizing force to correct swaying. DO NOT apply the brakes to correct trailer swaying.
- Use lower gear when driving down steep or long grades. Use the engine and transmission as a brake. Do not ride the brakes, as they can overheat and become ineffective.
- Be aware of your trailer height, especially when approaching roofed areas and around trees.
- Make regular stops, about once each hour. Confirm that:
  - Coupler is secure to the hitch and is locked.
  - Electrical connectors are secure.
  - There is appropriate slack in the safety chains.
  - There is appropriate slack in the breakaway switch pullpin cable.
  - Tires are not visibly low on pressure.

DRIVING CONDITIONS

When towing a trailer, you will have decreased acceleration, increased stopping distance, and increased turning radius (which means you must make wider turns to keep from hitting curbs, vehicles, and anything else that is on the inside corner). In addition, you will need a longer distance to pass, due to slower acceleration and increased length.

- Be alert for slippery conditions. You are more likely to be affected by slippery road surfaces when driving a tow vehicle with a trailer, than driving a tow vehicle without a trailer.
- Check rearview mirrors frequently to observe the trailer and traffic.
- **NEVER** drive faster than what is safe.

WARNING

Driving too fast for severe road conditions can result in loss of control and cause death or serious injury.

Decrease your speed as road, weather, and lighting conditions deteriorate.

Always check for local trailer tow speed limits in your area.

WARNING

Do not transport people on the trailer. The transport of people puts their lives at risk and may be illegal.

COUPLING TO THE TOW VEHICLE

Follow all of the safety precautions and instructions in this manual to ensure safety of persons, equipment, and satisfactory life of the trailer. Always use an adequate tow vehicle and hitch. If the vehicle or hitch is not properly selected and matched to the Gross Vehicle Weight Rating (GVWR) of your trailer, you can cause an accident that could lead to death or serious injury.

If you already have a tow vehicle, know your vehicle tow rating and make certain the trailer's rated capacity is less than or equal to the tow vehicle's rated towing capacity. If you already have (or plan to buy) a trailer, make certain that the tow rating of the tow vehicle is equal to or greater than that of the trailer.

The trailer VIN tag contains the critical safety information for the use of your trailer. Again, be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

WARNING

Proper selection and condition of the coupler and hitch are essential to safely towing your trailer. A loss of coupling may result in death or serious injury.

- Be sure the hitch load rating is equal to or greater than the load rating of the coupler.
- Be sure the hitch size matches the coupler size.
- Observe the hitch for wear, corrosion and cracks before coupling. Replace worn, corroded or cracked hitch components before coupling the trailer to the tow vehicle.
- Be sure the hitch components are tight before coupling the trailer to the tow vehicle.

WARNING

An improperly coupled trailer can result in death or serious injury.

DO NOT move the trailer until:

- The coupler is secured and locked to hitch.
- The safety chains are secured to the tow vehicle.
- The trailer jack(s) are fully retracted.

DO NOT tow the trailer on the road until:

- Tires and wheels are checked.
- The trailer brakes are checked.
- The breakaway switch is connected to the tow vehicle.
- The load is secured to the trailer.
- The trailer lights are connected and checked.

WARNING

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

INOPERABLE BRAKES, LIGHTS OR MIRRORS

Be sure that the brakes and all of the lights on your trailer are functioning properly before towing your trailer. Check the trailer taillights by turning on your tow vehicle headlights. Check the trailer brake lights by having someone step on the tow vehicle brake pedal while you look at trailer lights. Do the same thing to check the turn signal lights. See Trailer Wiring Diagram section in this manual.

Standard mirrors usually do not provide adequate visibility for viewing traffic to the sides and rear of a towed trailer. You must provide mirrors that allow you to safely observe approaching traffic.

⚠ WARNING

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and can lead to collision.

Before each tow, check that the tail lights, brake lights and turn signals work.

TRAILER TOWING TIPS

Driving a vehicle with a trailer in tow is vastly different from driving the same vehicle without a trailer in tow. Acceleration, maneuverability and braking are all diminished with a trailer in tow.

It takes longer to get up to speed, you need more room to turn and pass, and more distance to stop when towing a trailer. You will need to spend time adjusting to the different feel and maneuverability of the tow vehicle with a loaded trailer.

Because of the significant differences in all aspects of maneuverability when towing a trailer, the hazards and risks of injury are also much greater than when driving without a trailer. You are responsible for keeping your vehicle and trailer in control, and for all the damage that is caused if you lose control of your vehicle and trailer.

As you did when learning to drive an automobile, find an open area with little or no traffic for your first practice trailering. Of course, before you start towing the trailer, you must follow all of the instructions for inspection, testing, loading and coupling. Also, before you start towing, adjust the mirrors so you can see the trailer as well as the area to the rear of it.

Drive slowly at first, 5 mph or so, and turn the wheel to get the feel of how the tow vehicle and trailer combination responds. Next, make some right and left hand turns. Watch in your side mirrors to see how the trailer follows the tow vehicle. Turning with a trailer attached requires more room.

Stop the rig a few times from speeds no greater than 10 mph. If your trailer is equipped with brakes, try using different combinations of trailer brake and tow vehicle brake. Note the effect that the trailer brakes have when they are the only brakes used. When properly adjusted, the trailer brakes will come on just before the tow vehicle brakes.

It will take practice to learn how to back up a tow vehicle with a trailer attached. Take it slow. Before backing up, get out of the tow vehicle and look behind the trailer to make sure that there are no obstacles.

Some drivers place their hands at the bottom of the steering wheel, and while the tow vehicle is in reverse, “think” of the hands as being on the top of the wheel. When the hands move to the right (counterclockwise, as you would do to turn the tow vehicle to the left when moving forward), the rear of the trailer moves to the right. Conversely, rotating the steering wheel clockwise with your hands at the bottom of the wheel will move the rear of the trailer to the left while backing up.

If you are towing a bumper hitch rig, be careful not to allow the trailer to turn too much because it will hit the rear of the tow vehicle. To straighten the rig, either pull forward or turn the steering wheel in the opposite direction.

TRAILER VIN TAG

Figure A below is a sample of the Vehicle Identification Number (VIN) Tag which is typically located on the left front of the trailer. See Figure B for location.

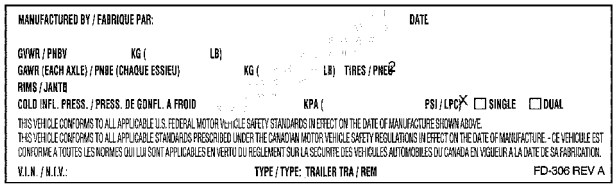


Figure A. Vehicle VIN Tag

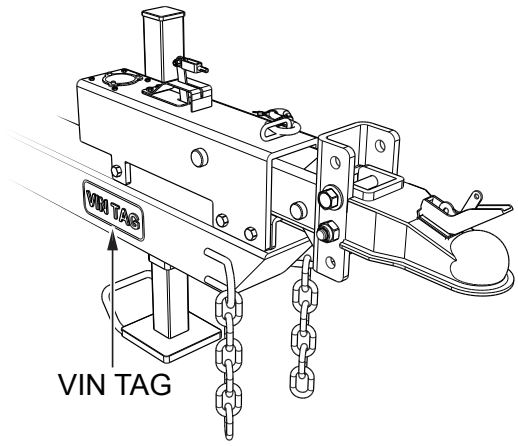


Figure B. Typical VIN Tag Location

The trailer VIN Tag contains the following critical safety information for the use of your trailer.

GAWR: The maximum gross weight that an axle can support. It is the lowest of axle, wheel, or tire rating.

Usually, the tire or wheel rating is lower than the axle rating, and determines GAWR.

GVWR: The maximum allowable gross weight of the trailer and its contents. The gross weight of the trailer includes the weight of the trailer and all of the items within it. GVWR is sometimes referred to as GTWR (Gross Trailer Weight Rating), or MGTW (Maximum Gross Trailer Weight). GVWR, GTWR and MGTW are all the same rating.

The sum total of the GAWR for all trailer axles may be less than the GVWR for the trailer, because some of the trailer load is to be carried by the tow vehicle, rather than by the trailer axle(s). The total weight of the cargo and trailer must not exceed the GVWR, and the load on an axle must not exceed its GAWR.

PSIC: The tire pressure (psi) measured when cold.

VIN: The Vehicle Identification Number.

EMPTY WEIGHT: Some information that comes with the trailer (such as the Manufacturer's Statement of Origin) is not a reliable source for "empty" or "net" weight. The shipping documents list average or standard weights and your trailer may be equipped with options.

To determine the "empty" or "net" weight of your trailer, weigh it on an axle scale. To find the weight of the trailer using an axle scale, you must know the axle weights of your tow vehicle without the trailer coupled. Some of the trailer weight will be transferred from the trailer to the tow vehicle axles, and an axle scale weighs all axles, including the tow vehicle axles.

TOW VEHICLE

The towing hitch attached to your tow vehicle must have a capacity equal to or greater than the load rating of the trailer you intend to tow. The hitch capacity must also be matched to the tow vehicle capacity. Your vehicle dealer can provide and install the proper hitch on your tow vehicle.

SUSPENSION SYSTEM

Sway bars, shock absorbers, heavy duty springs, heavy duty tires and other suspension components may be required to sufficiently tow the trailer and pump.

BRAKE CONTROLLER

For trailers equipped with electric brakes, the electric brake controller is part of the tow vehicle and is essential in the operation of the electric brakes on the trailer. The brake controller is not the same as the safety breakaway brake system that may be equipped on the trailer.

SIDE VIEW MIRRORS

The size of the trailer that is being towed and your state law regulations determine the size of the mirrors. However, some states prohibit extended mirrors on a tow vehicle, except while a trailer is actually being towed. In this situation, detachable extended mirrors are necessary. Check with your dealer or the appropriate state agency for mirror requirements.

HEAVY DUTY FLASHER

A Heavy Duty Flasher is an electrical component that may be required when your trailer turn signal lights are attached to the tow vehicle flasher circuit.

ELECTRICAL CONNECTOR

An Electrical Connector connects the light and brake systems on the trailer to the light and brake controls on the towing vehicle.

EMERGENCY FLARES AND TRIANGLE REFLECTORS

It is wise to carry these warning devices even if you are not towing a trailer. It is particularly important to have these when towing a trailer because the hazard flashers of your towing vehicle will not operate for as long a period of time when the battery is running both the trailer lights and tow vehicle lights.

SAFETY CHAINS

If the coupler connection comes loose, the safety chains can keep the trailer attached to the tow vehicle. With properly rigged safety chains, it is possible to keep the tongue of the trailer from digging into the road pavement, even if the coupler-to-hitch connection comes apart.

TRAILER LIGHTING AND BRAKING CONNECTOR

A device that connects electrical power from the tow vehicle to the trailer. Electricity is used to turn on brake lights, running lights, and turn signals as required. In addition, if your trailer has a separate braking system, the electrical connector will also supply power to the brakes from the tow vehicle.

BREAKAWAY SYSTEM

If the trailer coupler connection comes loose, the breakaway system can actuate emergency hydraulic brakes depending on the type of actuator on the trailer. The breakaway cable must be rigged to the tow vehicle with appropriate slack that will activate the system if the coupler connection comes loose.

JACKSTAND

A device on the trailer that is used to raise and lower the coupler. The jack is sometimes called the “landing gear” or the “tongue jack”.

COUPLER TYPES

Two types of coupler used wit the trailer are discussed below.

- Ball Hitch Coupler
- Pintel Eye Coupler

BALL HITCH COUPLER

A ball hitch coupler (Figure C) connects to a ball that is located on or under the rear bumper of tow vehicle. This system of coupling a trailer to a tow vehicle is sometimes referred to as “bumper pull.”

A ball hitch trailer may be fitted with a tongue jack that can raise and lower the coupler. The tongue jack is mounted to the A-frame (front or tongue) part of the trailer. By rotating the jack handle clockwise, the jack will extend and raise the tongue of the trailer.

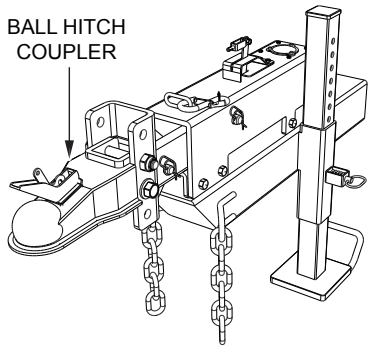


Figure C. Ball Hitch Coupler

Before each tow, coat the ball with a thin layer of automotive bearing grease to reduce wear and ensure proper operation. Check the locking device that secures the coupler to the ball for proper operation.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the ball or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

The coupler handle lever must be able to rotate freely and automatically snap into the latched position. Oil the pivot points, sliding surfaces, and spring ends with SAE 30W motor oil. Keep the ball socket and latch mechanism clean. Dirt or contamination can prevent proper operation of the latching mechanism.

The load rating of the coupler and the necessary ball size are listed on the trailer tongue. You must provide a hitch and ball for your tow vehicle where the load rating of the hitch and ball is equal to or greater than that of your trailer.

Also, the ball size must be the same as the coupler size. If the hitch ball is too small, too large, is underrated, is loose

or is worn, the trailer can come loose from the tow vehicle and may cause death or serious injury.

THE TOW VEHICLE, HITCH AND BALL MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER **Gross Vehicle Weight Rating (GVWR)**. IT IS ESSENTIAL THAT THE HITCH BALL BE OF THE SAME SIZE AS THE COUPLER.

The ball size and load rating (capacity) are marked on the ball. Hitch capacity is marked on the hitch.

WARNING

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the LOAD RATING of the hitch ball is equal or greater than the load rating of the coupler.

Be sure the SIZE of the hitch ball matches the size of the ball coupler.

WARNING

A worn, cracked or corroded hitch ball can fail while towing and may result in death or serious injury.

Before coupling trailer, inspect the hitch ball for wear, corrosion and cracks.

Replace worn or damaged hitch ball.

WARNING

A loose hitchball nut can result in uncoupling, leading to death or serious injury.

Be sure the hitch ball is tight to the hitch before coupling the trailer.

- Rock the ball to make sure it is tightened to the hitch, and visually check that the hitch ball nut is solid against the lock washer and hitch frame.
- Wipe the inside and outside of the coupler. Clean and visually inspect it for cracks and deformations. Feel the inside of the coupler for worn spots and pits.
- Be sure the coupler is secured tightly to the tongue of the trailer. All coupler fasteners must be visibly solid against the trailer frame.
- The bottom surface of the coupler must be above the top of the hitch ball. Use the tongue jackstand to support the trailer tongue. Wood or concrete blocks may also be used.

Coupling the Trailer to the Tow Vehicle (Ball Coupler)

- Lubricate the hitch ball and the inside of the coupler with a thin layer of automotive bearing grease.
- Slowly back up the tow vehicle so that the hitch ball is near or aligned under the coupler.
- Using the jackstand at the front of trailer (tongue), turn the jackstand crank handle to raise the trailer. If the ball coupler does not line up with the hitch ball, adjust the position of the tow vehicle.
- Open the coupler locking mechanism. Ball couplers have a locking mechanism with an internal moving piece and an outside handle. In the open position, the coupler is able to drop fully onto the hitch ball.
- Lower the trailer (Figure D) until the coupler fully engages the hitch ball.

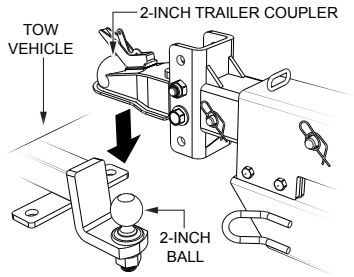


Figure D. Ball Hitch Coupling Mechanism

- Engage the coupler locking mechanism. In the engaged position, the locking mechanism securely holds the coupler to the hitch ball.
- Insert a pin or lock through the hole in the locking mechanism.
- Be sure the coupler is all the way on the hitch ball and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jackstand, verify that you can raise the rear of the tow vehicle by 1 inch after the coupler is locked to the hitch.
- Lower the trailer so that its entire tongue weight is held by the hitch.
- Raise the jackstand to a height where it will not interfere with the road.

NOTICE

Overloading can damage the tongue jack. **DO NOT** use the tongue jack to raise the tow vehicle more than one inch.

If the coupler cannot be secured to the hitch ball, do not tow the trailer. Call your dealer for assistance. Lower the trailer so that its entire tongue weight is held by the hitch and continue retracting the jack to its fully retracted position.

Attaching Safety Chain

Visually inspect the safety chains and hooks for wear or damage. Replace worn or damaged safety chains and hooks before towing.

Attach the safety chains so that they:

- Cross underneath the coupler. See Figure E.

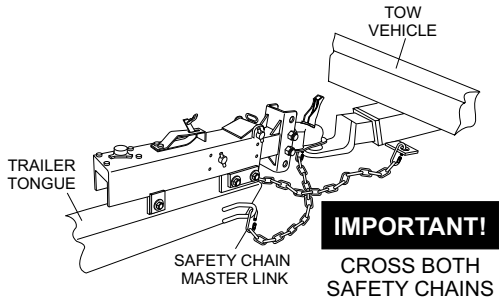


Figure E. Attaching Safety Chain (Ball Hitch)

- Loop around a frame member of the tow vehicle or holes provided in the hitch system (**DO NOT** attach them to an interchangeable part of the hitch assembly).
- Have enough slack to permit tight turns, but not be close to the road surface, so if the trailer uncouples, the safety chains can hold the tongue up above the road

WARNING

Improper rigging of the safety chains can result in loss of control of the trailer and tow vehicle, leading to death or serious injury, if the trailer uncouples from the tow vehicle.

- Fasten chains to frame of tow vehicle. **DO NOT** fasten chains to any part of the hitch unless the hitch has holes or loops specifically for that purpose.
- Cross chains underneath hitch and coupler with enough slack to permit turning and to hold tongue up, if the trailer comes loose.

Breakaway Brake System

If the coupler or hitch fails, a properly connected and working breakaway brake system (Figure F) will apply the hydraulic brakes on the trailer. The safety chains will keep the tow vehicle attached and as the brakes are applied at the trailer's axles, the trailer/tow vehicle combination will come to a controlled stop.

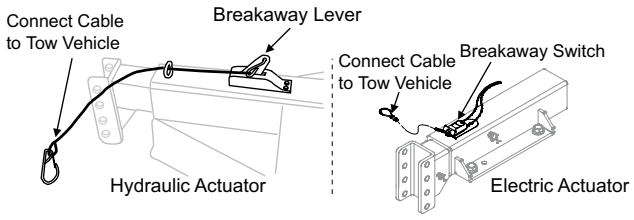


Figure F. Breakaway Brake System

Breakaway Cable Surge Brake System

The breakaway brake system includes a brake cable connected to the tow vehicle on one end and to the emergency brake lever located on the hydraulic actuator on the other end.

WARNING

- An ineffective breakaway brake system can result in a runaway trailer, leading to death or serious injury, if the coupler or ball hitch fails.
- Connect the breakaway cable to the tow vehicle and **NOT** to the hitch, ball or support.
- Before towing the trailer, test the function of the breakaway brake system. If the breakaway brake system is not working, **DO NOT** tow the trailer. Have it serviced or repaired.

NOTICE

DO NOT tow the trailer with the breakaway brake system ON because the brakes will overheat which can result in permanent brake failure.

NOTICE

Replace the breakaway brake battery (if equipped) at intervals specified by manufacturer.

Connecting Trailer Lights

Connect the trailer lights to the tow vehicle's electrical system using the electric connectors at the front of the trailer (tongue). Refer to the wiring diagram shown in the trailer wiring diagram section of this manual. Before towing the trailer check for the following:

- Running lights (turn on tow vehicle headlights).
- Brake Lights (step on tow vehicle brake pedal).
- Backup Lights (place tow vehicle gear shift in reverse).
- Turn Signals (activate tow vehicle directional signal lever).

⚠ WARNING

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and electric brakes, and can lead to collision.

Before each tow:

- Check that the taillights, brake lights and turn signals work.
- Check that the electric brakes work by operating the brake controller inside the tow vehicle.

Uncoupling the Ball Hitch

Follow these steps to uncouple ball hitch from tow vehicle:

- Block trailer tires to prevent the trailer from rolling, before jacking the trailer up.
- Disconnect the electrical connector.
- Disconnect the breakaway brake switch cable. Promptly replace the pullpin in the switchbox.
- Before extending jackstand, make certain the ground surface below the jackstand foot will support the tongue load.
- Rotate the jackstand handle (or crank) clockwise. This will slowly extend the jack and transfer the weight of the trailer tongue to the jack.

PINTLE HITCH COUPLER

A pintle eye coupler (Figure G) connects to a pintle-hook hitch that is located on or under the rear bumper of the tow vehicle. This system of coupling a trailer to a tow vehicle is sometimes referred to as a "lunette eye, tow ring or G.I. hitch."

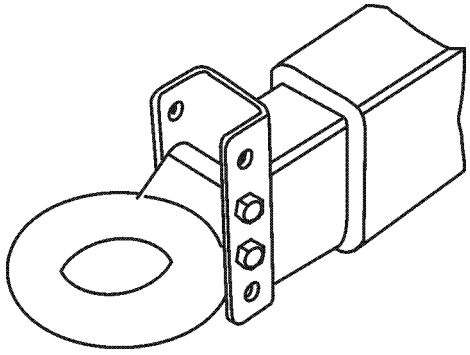


Figure G. Pintle Hitch Coupler

A pintle hitch trailer may be fitted with a tongue jackstand that can raise and lower the coupler. The tongue jack is mounted to the A-frame (front or tongue) part of the trailer. By rotating the jack handle clockwise, the jack will extend and raise the tongue of the trailer.

The load rating of the coupler and the necessary pintle hitch size are listed on the trailer tongue. You must provide a pintle hitch and pintle coupler for your tow vehicle, where the load rating of the pintle hitch and pintle coupler is equal to or greater than that of your trailer.

Also, the pintle hitch size must be the same as the pintle coupler size. If the hitch is too small, too large, underrated, loose or worn, the trailer can come loose from the tow vehicle, and may cause death or serious injury.

Pintle Coupler and Pintle Hook

Before each tow, check the locking device that secures the coupler to the pintle hook assembly.

The pintle hook lever must be able to operate freely and automatically snap into place into the latched position. Lightly oil the pivot points and sliding surfaces with SAE30W motor oil to prevent rust and help ensure proper operation of the latching mechanism.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the pintle hook or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of

the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

THE TOW VEHICLE, PINTLE HITCH AND PINTLE COUPLER MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER **Gross Vehicle Weight Rating (GVWR)**.

IT IS ESSENTIAL THAT THE PINTLE HITCH BE OF THE SAME SIZE AS THE PINTLE COUPLER.

The coupler size and load rating (capacity) are marked on the coupler. Hitch capacity is marked on the hitch.

⚠ WARNING

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the LOAD RATING of the pintle hitch hook is equal or greater than the load rating of the pintle eye coupler.

Be sure the SIZE of the pintle hitch hook matches the size of the pintle eye coupler.

⚠ WARNING

A worn, cracked or corroded pintle hitch hook can fail while towing, and may result in death or serious injury.

Before coupling trailer, inspect the pintle hitch hook for wear, corrosion and cracks.

Replace worn or damaged pintle hitch hook.

- Rock the pintle eye coupler to make sure it is secured tightly to the hitch.
- Wipe the inside and outside of the pintle coupler. Clean and inspect it visually for cracks and deformations. Feel the inside of the coupler for worn spots and pits.
- Be sure the coupler is secured tightly to the tongue of the trailer. All coupler fasteners must be visibly solid against the trailer frame.
- Raise the bottom surface of the coupler to be above the top of the pintle hitch hook. Use the tongue jackstand to support the trailer tongue. Wood or concrete blocks may also be used.

⚠ WARNING

A defective pintle hitch not properly fastened can result in uncoupling, leading to death or serious injury.

Be sure the pintle hook is securly tighten to the tow vehicle before coupling the trailer.

Coupling Trailer to Tow Vehicle (Pintle Coupler)

- Slowly back up the tow vehicle so that the pintle hitch hook is near or aligned under the pintle eye ring coupler.
- Using the jackstand at the front of trailer (tongue), turn the jackstand crank handle to raise the trailer. If the pintle eye coupler does not line up with the pintle hitch hook, adjust the position of the tow vehicle.
- OPEN the pintle hook locking mechanism (Figure H). Place the hook inside the eye coupler. CLOSE the pintle hook mechanism.

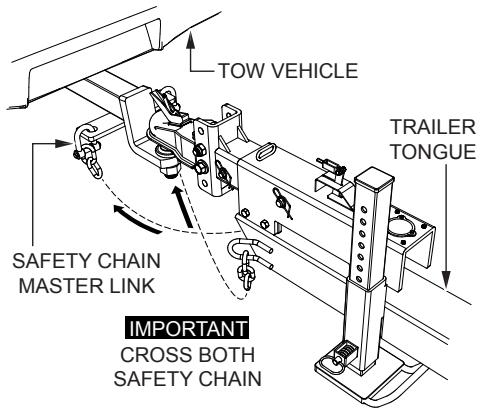


Figure H. Attaching Safety Chain (Pintle Hitch)

- Insert a pin or lock through the hole in the locking mechanism.
- Be sure the pintle hook is inserted completely through the eye ring and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jack, test to see that you can raise the rear of the tow vehicle by 1-inch after the coupler is locked to the hitch.
- Lower the trailer so that its entire tongue weight is held by the hitch.
- Raise the jackstand to a height where it will not interfere with the road.

TIRE SAFETY

Unsafe Tires, Lug Nuts or Wheels

Trailer tires and wheels are more likely to fail than car tires and wheels because they carry a heavier load. Therefore, it is essential to inspect the trailer tires before each tow.

If a tire has a bald spot, bulge, cuts, is showing any cords, or is cracked, replace the tire before towing. If a tire has uneven tread wear, take the trailer to a dealer service center for diagnosis.

Uneven tread wear can be caused by tire imbalance, axle misalignment or incorrect inflation.

Tires with too little tread will not provide adequate tracking on wet roadways and can result in loss of control, leading to death or serious injury.

Improper tire pressure causes an unstable trailer and can result in a tire blowout and loss of control. Therefore, before each tow you must also check the tire pressure. Tire pressure must be checked when tires are cold.

Allow 3 hours cool-down after driving as much as 1 mile at 40 mph before checking tire pressure. Trailer tires will be inflated to higher pressures than passenger vehicle tires.

Since trailer wheels and lug nuts (or bolts) are subjected to greater side loads than automobile wheels, they are more prone to loosen. Before each tow, check to make sure they are tight.

The proper tightness (torque) for lug nuts is listed in the lug nut tightening section of this manual. Use a torque wrench to tighten the lug nuts. If you do not have a torque wrench, use a lug wrench (from your tow vehicle) and tighten the nuts as much as you can. Then have a service garage or trailer dealer tighten the lug nuts to the proper torque.

⚠ WARNING

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

Lug nuts are also prone to loosen after first being assembled. When driving a new trailer (or after wheels have been remounted), check to make sure they are tight after the first 10, 25 and 50 miles of driving and before each tow thereafter.

Failure to perform this check can result in a wheel parting from the trailer and a crash, leading to death or serious injury.

⚠ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

⚠ WARNING

Improper lug nut torque can cause a wheel parting from the trailer, leading to death or serious injury.

Be sure lug nuts are tight before each tow.

⚠ WARNING

Improper tire pressure can result in a blowout and loss of control, which can lead to death or serious injury.

Be sure tires are inflated to pressure indicated on side wall before towing trailer.

Determining Load Limit of Trailer

Determining the load limits of a trailer includes more than understanding the load limits of the tires alone. On all trailers there is a Federal certification/VIN label that is located on the forward half of the left (road) side of the unit. This certification/VIN label will indicate the trailer's Gross Vehicle Weight Rating (GVWR). This is the most weight the fully loaded trailer can weigh. It will also provide the Gross Axle Weight Rating (GAWR). This is the most a the axle can weigh.

There is a vehicle placard (Figure I) located in the same location as the certification label described above. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity.

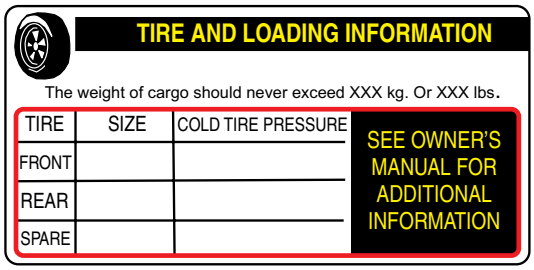


Figure I. Trailer Tire Placard

If additional work items (hoses, tools, clamps etc.) are going to be added to the trailer, be sure they are distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire.

Excessive loads and/or underinflation cause tire overloading and, as a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load, so proper inflation is critical. The proper air pressure may be found on the certification/VIN label and/or on the Tire and Loading Information placard. This value should never exceed the maximum cold inflation pressure stamped on the tire.

Perform the following steps to determine the load limit of your trailer.

Step 1.

Locate the statement, "The weight of cargo should never exceed XXX kg or XXX lbs.," on your vehicle's Tire and Loading Information placard (Figure I). This value equals the available amount of equipment load capacity.

Step 2.

Determine the weight of the equipment being loaded on the tow vehicle. That weight may not safely exceed the available equipment load capacity. The trailer's Tire Information Placard is attached adjacent to or near the trailer's VIN (Certification) label at the left front of the trailer (See Figure I).

Determining Load Limit of Tow Vehicle

Step 1.

Locate the statement, "The combined weight of occupants and cargo should never exceed XXX lbs.," on your vehicle's placard.

Step 2.

Determine the combined weight of the driver and passengers who will be riding in your vehicle.

Step 3.

Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.

Step 4.

The resulting figure equals the available amount of cargo and luggage capacity. For example, if the "XXX" amount equals 1400 lbs. and there will be five 150 lb. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 lbs. (1400-750 (5 x 150) = 650 lbs.).

Step 5.

Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage capacity calculated in Step 4.

If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult the tow vehicle's manual to determine how this weight transfer reduces the available cargo and luggage capacity of your vehicle.

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards and inspecting tires for cuts, slashes and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling.
- Help protect you and others from avoidable breakdowns and accidents.
- Improve fuel economy.
- Increase the tire life.

Use the information contained in this section to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

TIRE FUNDAMENTALS

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires (Figure J). This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

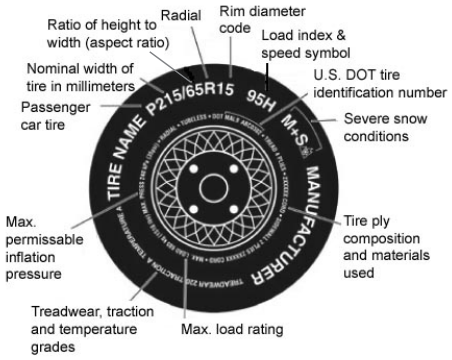


Figure J. Standard Tire Sidewall Information

P: The "P" indicates the tire is for passenger vehicles.

Next number: This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

Next number: This two-digit number, known as the aspect ratio, gives the tire's ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.

P: The "R" stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.

Next number: This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you will have to purchase new tires to match the new wheel diameter.

Next number: This two- or three-digit number is the tire's load index. It is a measurement of how much weight each tire can support. You may find this information in your owner's manual. If not, contact a local tire dealer. *Note*: You may not find this information on all tires because it is not required by law.

M+S: The "M+S" or "M/S" indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.

Speed Rating: The speed rating denotes the speed at which a tire is designed to be driven for extended periods of time. The ratings range from 99 miles per hour (mph) to 186 mph. These ratings are listed in Table A. Note: You may not find this information on all tires because it is not required by law.

Table A. Speed Rating

Letter Rating	Speed Rating
Q	99 mph
R	106 mph
S	112 mph
T	118 mph
U	124 mph
H	130 mph
V	149 mph
W	168* mph
Y	186* mph

U.S. DOT Tire Identification Number: This begins with the letters "DOT" and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer's discretion. This information is used to contact consumers if a tire defect requires a recall.

Tire Ply Composition and Materials Used: The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

Maximum Load Rating: This number indicates the maximum load in kilograms and pounds that can be carried by the tire.

Maximum Permissible Inflation Pressure: This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

Uniform Tire Quality Grading Standards (UTQGS)

Treadwear Number: This number indicates the tire's wear rate. The higher the treadwear number is, the longer it should take for the tread to wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

Traction Letter: This letter indicates a tire's ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with a lower grade. Traction is graded from highest to lowest as "AA","A", "B", and "C".

Temperature Letter: This letter indicates a tire's resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, underinflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire's resistance to heat is graded as "A", "B", or "C".

Refer to Figure K for additional tire information for light trucks.

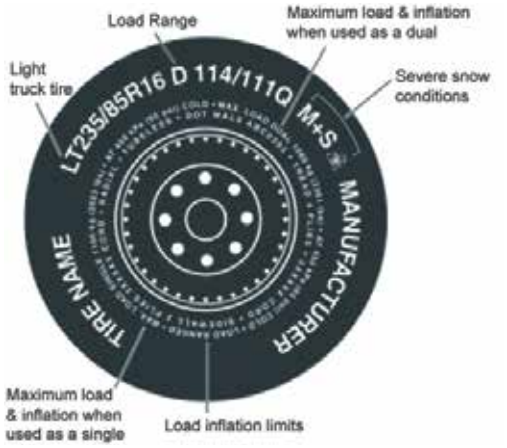


Figure K. UTQGS Tire Information

Tires for light trucks have other markings besides those found on the sidewalls of passenger tires.

LT: The "LT" indicates the tire is for light trucks or trailers.

ST: An "ST" is an indication the tire is for trailer use only.

Max. Load Dual kg (lbs) at kPa (psi) Cold: This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle).

Max. Load Single kg (lbs) at kPa (psi) Cold: This information indicates the maximum load and tire pressure when the tire is used as a single.

Load Range: This information identifies the tire's load-carrying capabilities and its inflation limits.

Tire Safety Tips

- Slow down if you have to go over a pothole or other object in the road.
- **DO NOT** run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.
- Check tire inflation pressure weekly during use to insure the maximum tire life and tread wear.
- **DO NOT** bleed air from tires when they are hot.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Make sure your tire valves have valve caps.
- **ALWAYS** check tire pressure on tow vehicle and trailer before towing. Check tire pressure at least once a month.
- **DO NOT** overload tow vehicle. Check the tire information and loading placard for safe allowable tire loading conditions.

Tire Repair

The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

Replacing Worn or Damaged Tires

Replace the tire before towing the trailer if the tire treads have less than 1/16 inch depth or the telltale bands are visible. Check inflation pressure weekly during use to insure the maximum tire life and tread wear. A bubble, cut or bulge in a side wall can result in a tire blowout. Inspect both side walls of each tire for any bubble, cut or bulge; and replace a damaged tire before towing the trailer.

Table B below will help pinpoint the causes and solutions of tire wear problems.

Table B. Tire Wear Troubleshooting

Wear Pattern	Cause	Solution
Center Wear	Over inflation.	Adjust pressure to particular load per tire manufacturer.
Edge Wear	Under inflation.	Adjust pressure to particular load per tire manufacturer.
Side Wear	Loss of camber or overloading.	Make sure load does not exceed axle rating. Align wheels.
Toe Wear	Incorrect toe-in.	Align wheels.
Cupping	Out-of-balance.	Check bearing adjustment and balance tires.
Flat Spots	Wheel lockup and tire skidding.	Avoid sudden stops when possible and adjust brakes.

⚠ WARNING



ALWAYS wear safety glasses when removing or installing force fitted parts. **DO NOT** attempt to repair or modify a wheel. DO NOT install an inner-tube to correct a leak through through the rim. If the rim is cracked, the air pressure in the inner tube may cause pieces of the rim to explode (break off) with great force and cause serious eye or bodily injury.

Wheel Rims

If the trailer has been struck, or impacted, on or near the wheels, or if the trailer has struck a curb, inspect the rims for damage (i.e. being out of round); and replace any damaged wheel. Inspect the wheels for damage every year, even if no obvious impact has occurred.

Wheels, Bearings and Lug Nuts

A loose, worn or damaged wheel bearing is the most common cause of brakes that grab.

To check wheel bearings, jack trailer and check wheels for side-to-side looseness. If the wheels are loose, or spin with a wobble, the bearings must be serviced or replaced. Check inflation pressure weekly during use to insure the maximum tire life and tread wear. Most trailer axles are built with sealed bearings that are not serviceable. Sealed bearings must be replaced as complete units.

NOTICE

NEVER use an pneumatic air gun to tighten wheel lug nuts.

Over-tightening lug nuts will result in breaking the studs or permanently deforming the mounting stud holes in the wheels.

⚠ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury. Check all wheel lug nuts periodically.

Lug Nut Torque Requirements

It is extremely important to apply and maintain proper wheel mounting torque on the trailer. Be sure to use only the fasteners matched to the cone angle of the wheel. Proper procedure for attachment of the wheels is as follows:

1. Start all wheel lug nuts by hand.
2. Torque all lug nuts in sequence. See Figure L. DO NOT torque the wheel lug nuts all the way down. Tighten each lug nut in 3 separate passes as defined by Table C.
3. Check to see if the lug nuts are tight after the first 10, 25 and 50 miles of driving and before each tow thereafter.

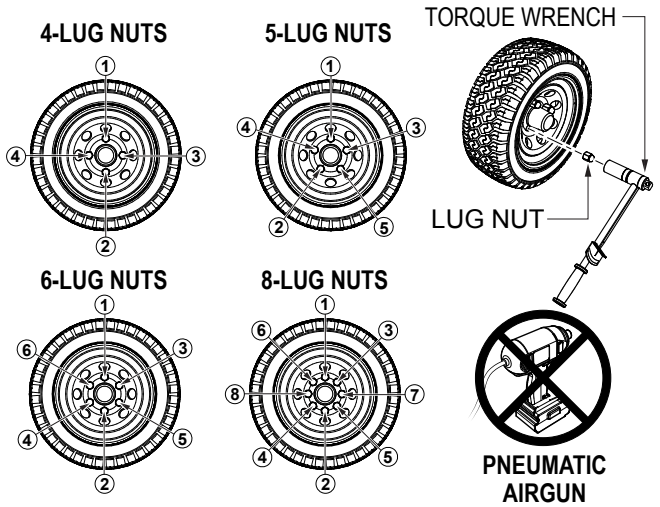


Figure L. Wheel Lug Nuts Tightening Sequence

Table C. Tire Torque Requirements			
Wheel Size	First Pass FT-LBS	Second Pass FT-LBS	Third Pass FT-LBS
12"	20-25	35-40	50-65
13"	20-25	35-40	50-65
14"	20-25	50-60	90-120
15"	20-25	50-60	90-120
16"	20-25	50-60	90-120

Lights and Signals

Before each tow, check the trailer taillights, stoplights, turn signals and any clearance lights for proper operation.

Replace any broken or burned-out lamps as necessary. Check the wire harness for cuts, fraying or other damage. If it needs replacing, contact your dealer.

WARNING

Improper operating taillights, stoplights and turn signals can cause collisions.

Check all lights before each tow.

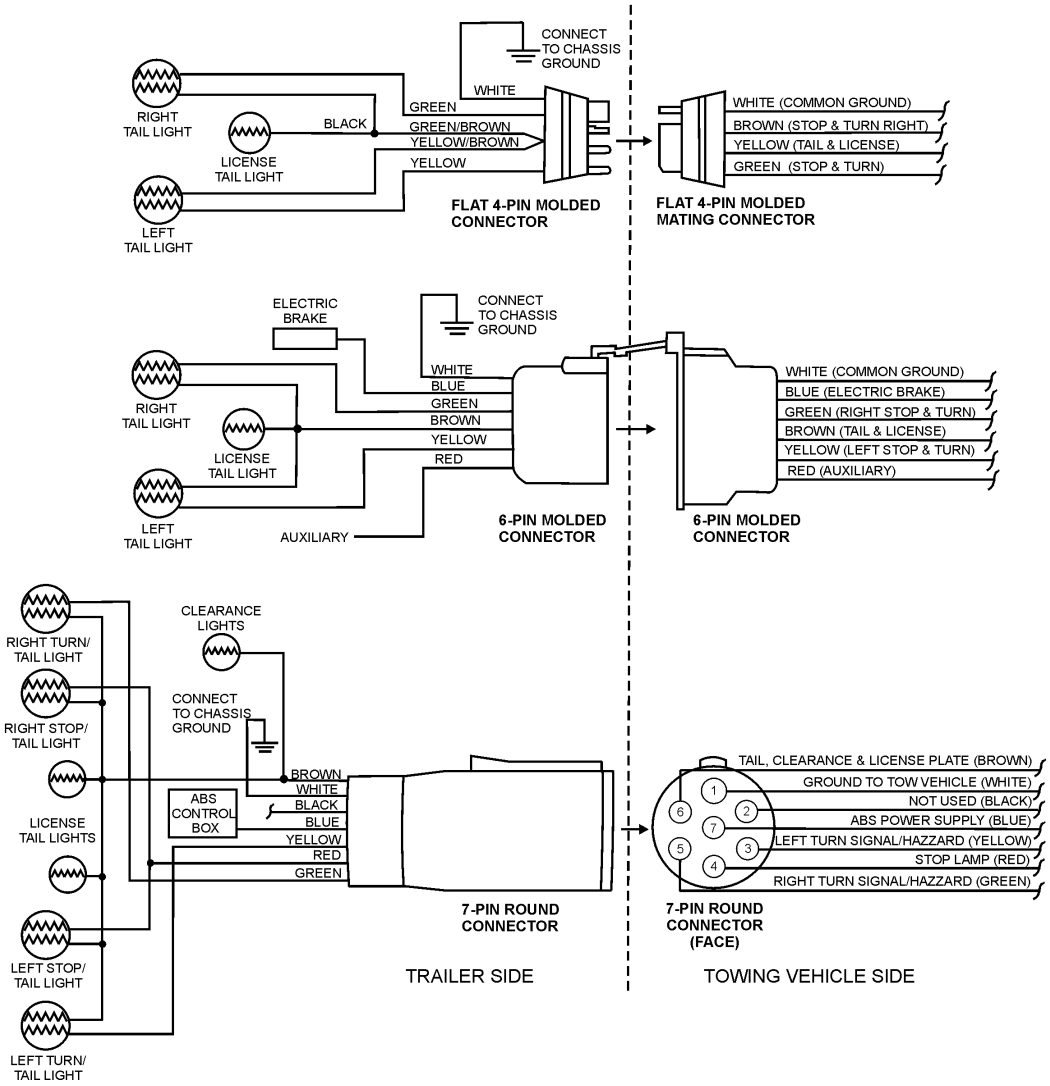


Figure M. Trailer to Tow Vehicle Wiring Diagram

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

1. With the engine stopped (**OFF**). Push and hold the ***Hour Check Button*** (Figure 69) located on the control panel.

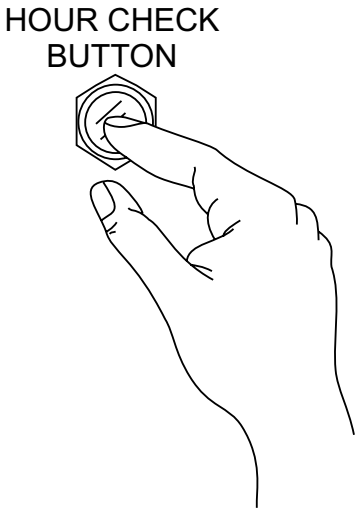


Figure 69. Hour Check Button

2. While keeping the ***Hour Check Button*** pressed, place the ***Auto Off/Reset Manual Switch*** (Figure 70) in the **MANUAL** position.

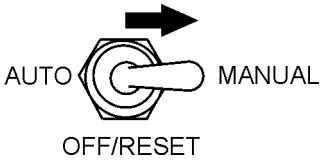


Figure 70. Auto-Off/Reset Switch (Manual Position)

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

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

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

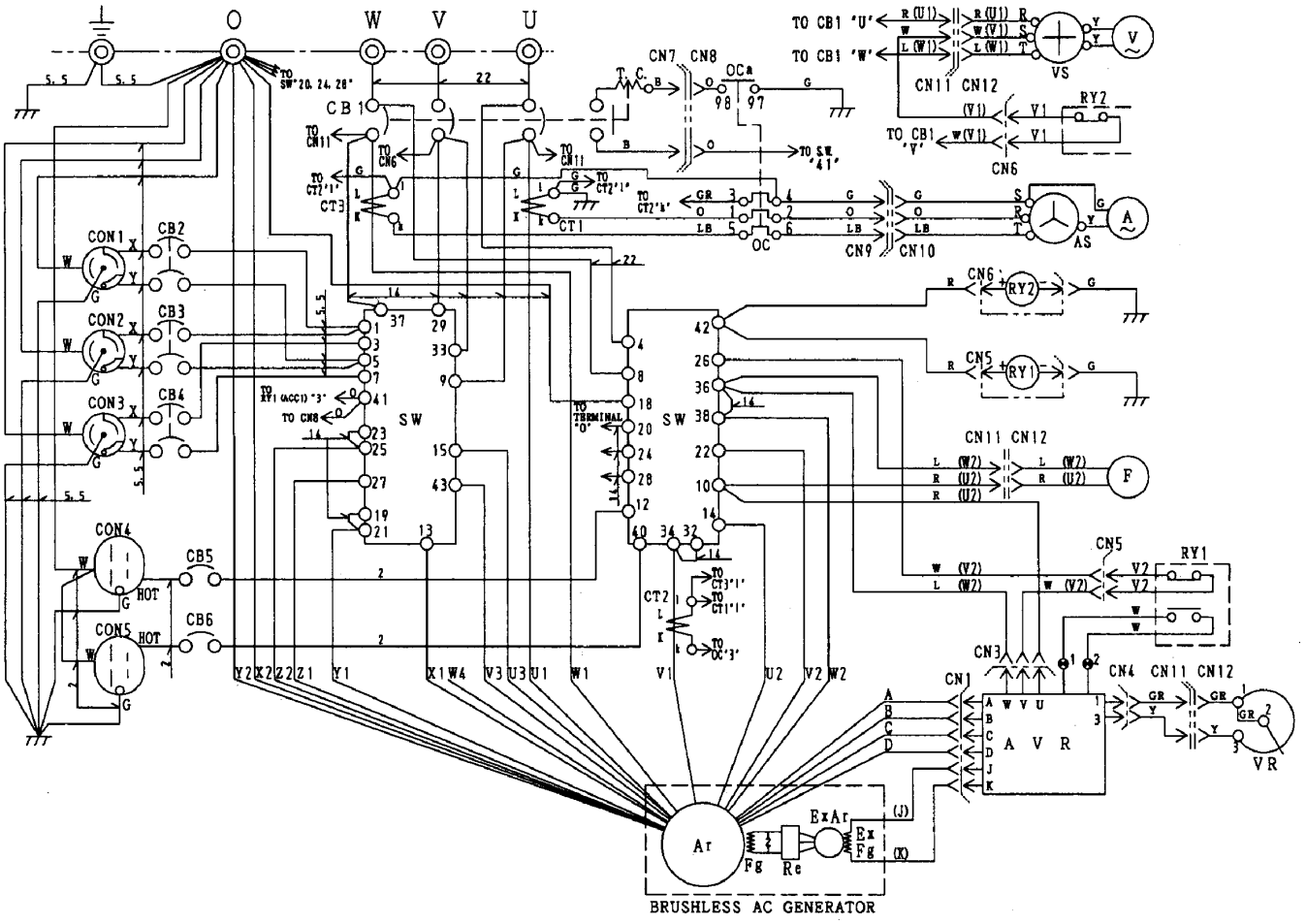
Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 19 shown below for diagnosis of the Generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 19. Generator Troubleshooting

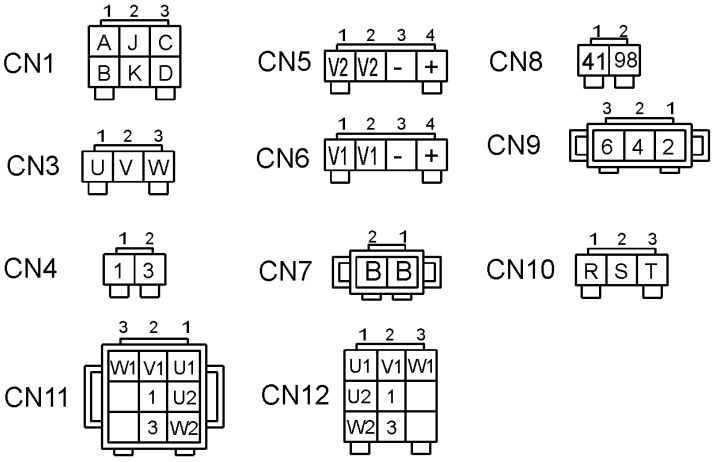
Symptom	Possible Problem	Solution
No Voltage Output	AC Voltmeter defective?	Check output voltage using a voltmeter.
	Is wiring connection loose?	Check wiring and repair.
	Is AVR defective?	Replace if necessary.
	Defective Rotating Rectifier?	Check and replace.
	Defective Exciter Field?	Check for approximately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

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

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



(WIRING VIEW)



COLOR CODE			
SYM.	WIRE COLOR	SYM.	WIRE COLOR
B	BLACK	R	RED
L	BLUE	W	WHITE
BR	BROWN	Y	YELLOW
G	GREEN	LB	LIGHT BLUE
GR	GRAY	LG	LIGHT GREEN
V	VIOLET	O	ORANGE
P	PINK		

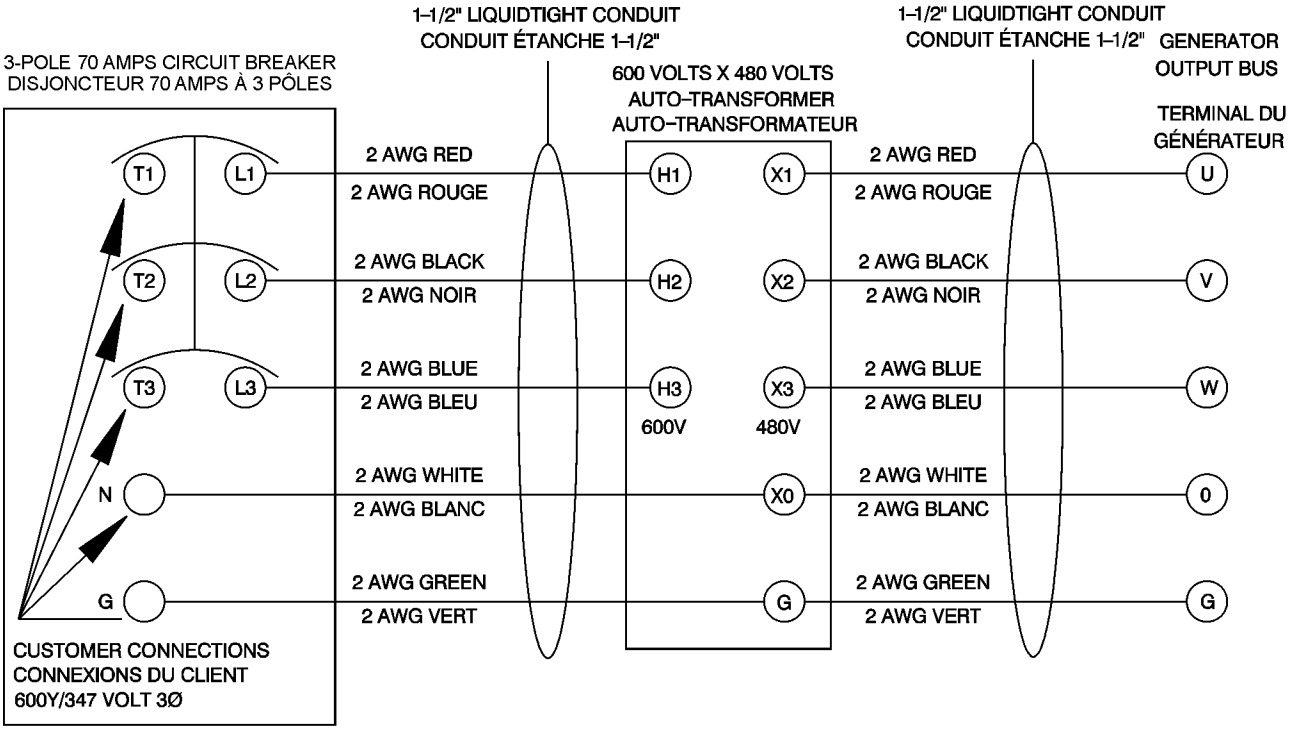
Notice:

1. No designation lead size : 1.25

SYMBOL	DESIGNATION
Ar	MAIN GENERATOR ARMATURE WINDING
Fg	MAIN GENERATOR FIELD WINDING
ExAr	EXCITER ARMATURE WINDING
ExFg	EXCITER FIELD WINDING
Re	RECTIFIER
AVR	AUTOMATIC VOLTAGE REGULATOR
VR	VOLTAGE REGULATOR (RHEOSTAT)
CT 1,2,3	CURRENT TRANSFORMER
AS	CHANGE-OVER SWITCH,AMMETER
A	AC.AMMETER
VS	CHANGE-OVER SWITCH,VOLTMETER
V	AC. VOLTMETER
F	FREQUENCY METER
CB1	CIRCUIT BREAKER 3P 200A
CB2,3,4	CIRCUIT BREAKER 2P 50A
CB5,6	CIRCUIT BREAKER 1P 20A
CON1,2,3	RECEPTACLE 250V 50A
CON4,5	RECEPTACLE 125V 20A
OC	OVER CURRENT RELAY
SW	SELECTOR SWITCH
RY1,2	RELAY UNIT
Re1	RECTIFIER

Figure 71. Generator Wiring Diagram

600 VAC AUTO TRANSFORMER WIRING DIAGRAM



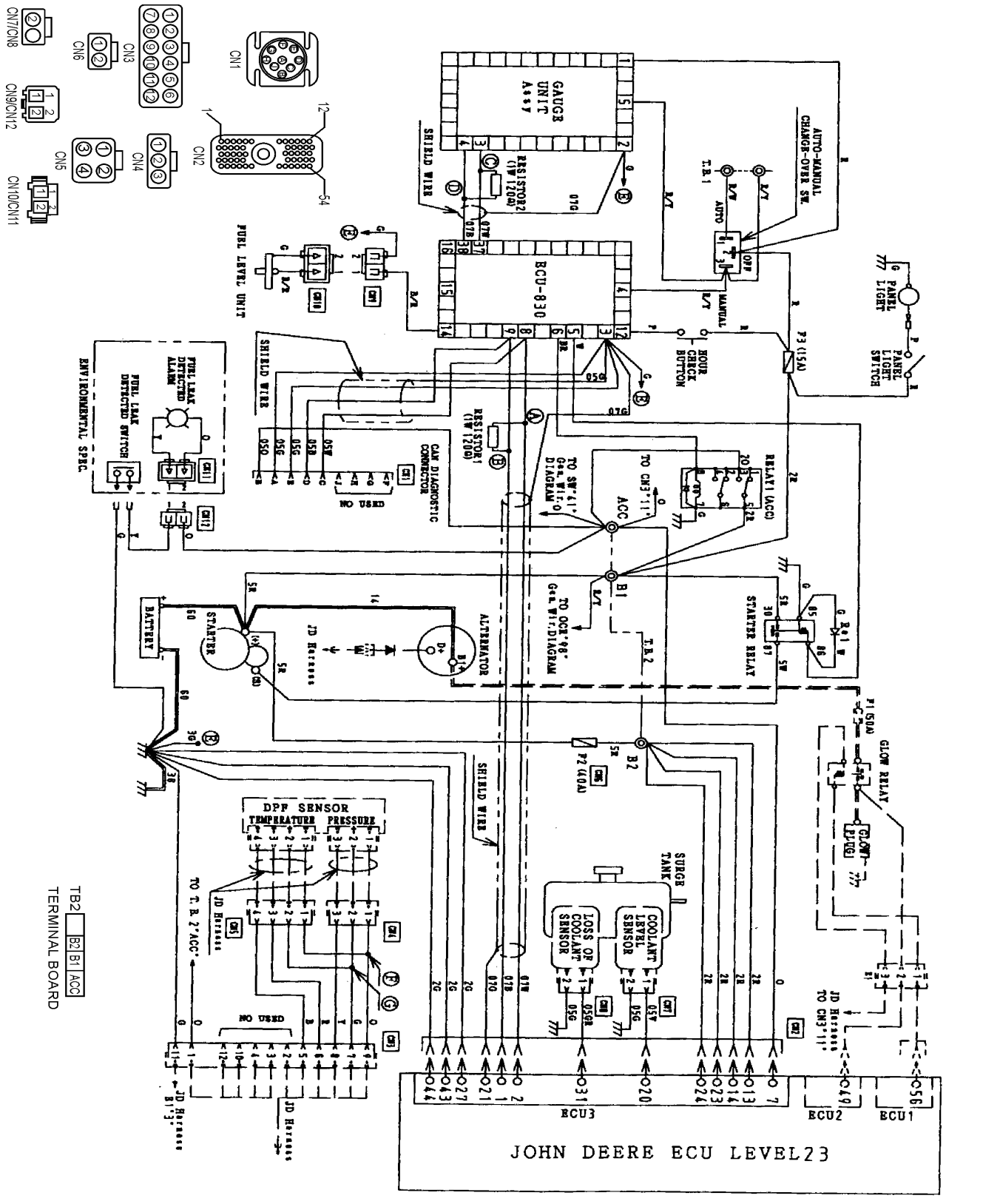
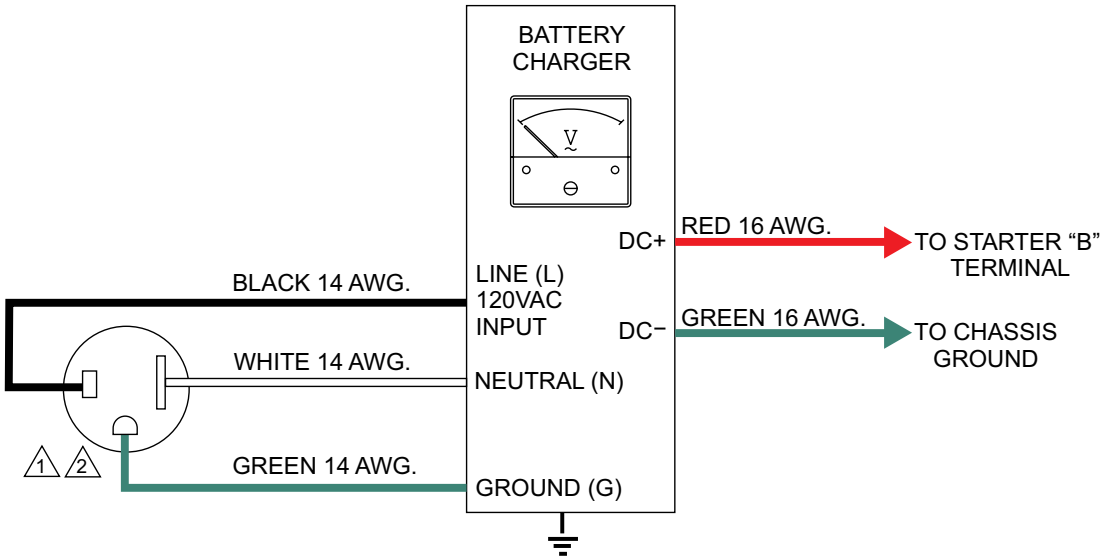


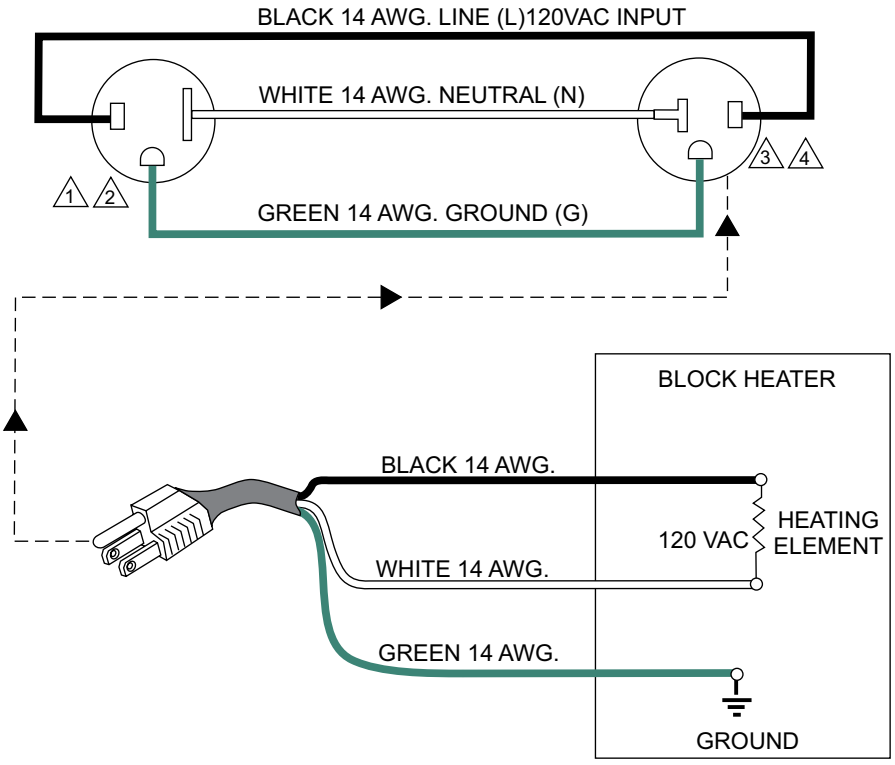
Figure 72. Engine Wiring Diagram



NOTES:

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

Figure 73. Battery Charger Wiring Diagram



NOTES:

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

Figure 74. Water Heater Element Wiring Diagram

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

© COPYRIGHT 2026, MULTIQUIP INC.

Multiquip Inc., the MQ logo and the MQ Power logo are registered trademarks of Multiquip Inc. and may not be used, reproduced, or altered without written permission. All other trademarks are the property of their respective owners and used with permission.

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.

DISCLAIMER: Product features, descriptions, and specifications are based on published information at the time of publication and are subject to change at any time without notice. Multiquip Inc. and its affiliates reserve the right to change specifications, features, design, and descriptions of products at any time without notice.

Manufactured for
MQ Power Inc.
by
DENYO MANUFACTURING CORP.