Tier 3/4I Towable Generators
(Trailer and Skid Mounted)

(Diesel Liquid Cooled)

TS25, 35, 45, 60, 80, 130, 175, 225, 250, 350, 400 and 500

Installation & Operating Manual
WARNING:
CALIFORNIA PROPOSITION 65 WARNING:
Engine exhaust from this product contains chemicals known to the state of California to cause cancer, birth defects and other reproductive harm.

WARNING:
CALIFORNIA PROPOSITION 65 WARNING:
Battery posts, terminals and related accessories are known to the state of California to cause cancer, birth defects and other reproductive harm.
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Section 1
Product Safety Information

Safety Notice

Be sure that you are completely familiar with the safe operation of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury. Always disconnect all electrical loads before starting the generator.

Installation and repair procedures require specialized skills with electrical generating equipment and liquid cooled engine systems. Any person that installs or repairs this generator must have these specialized skills to ensure that this generating unit is safe to operate. Seek expert advise for repairs or any questions you may have about the safe installation and operation.

The precaution statements are general guidelines for the safe use and operation of this generator. It is not practical to list all unsafe conditions. Therefore, if you use a procedure that is not recommended in this manual you must determine if it is safe for the operator and all personnel in the proximity to the generator and connected loads. If there is any question of the safety of a procedure please seek expert advise before starting or stopping the generator.

This equipment contains high voltages. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

This equipment may be connected to other machines that have rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

System documentation must be available to anyone that operates this equipment at all times.

− Keep non-qualified personnel at a safe distance from this equipment.
− Only qualified personnel familiar with the safe installation, operation and maintenance of this device should attempt start-up or operating procedures.
− Always stop engine before making or removing any connections.
− Always stop engine and allow it to cool before refueling.

Responsibility

When your generator is delivered, it becomes the responsibility of the owner/operator of the generator set to prevent unsafe conditions and operation of the equipment. Some responsibilities include (but are not limited to) the following:

1. It is the responsibility of the owner/operator of this generator to ensure that this equipment is correctly and safely installed.
2. It is the responsibility of the owner/operator of this generator to ensure that this equipment, when installed fully complies with all federal, state and local codes.
3. It is the responsibility of the owner/operator of this generator to ensure that any person operating this equipment has been properly trained.
4. It is the responsibility of the owner/operator of this generator to ensure that any person operating this equipment has access to all manuals and information required for the safe use and operation of this equipment.
5. It is the responsibility of the owner/operator of this generator to ensure that it is properly maintained and safety inspected at regular scheduled intervals.
6. It is the responsibility of the owner/operator of this generator to ensure that any person who has not been trained on the safe use of this equipment does not have access to this equipment.

Read This Manual Thoroughly

If you do not understand any concept, any procedure, any safety warning statement, any safety caution statement or any portion of this manual, seek expert advise. Make sure you understand the information in this manual so that you can safely enjoy the full use of this generator.

Symbols

This symbol is shown throughout the manual to indicate a connection to ground reference point.

⚠️ Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

⚠️ Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.
Precaution Statements Used In This Manual

There are three classifications of precautionary statements used in this manual. The most critical is a **WARNING** statement, then the **Caution** statement and the least critical is the **Note** statement. The usage of each statement is as follows:

**WARNING**: Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

**Caution**: Indicates a potentially hazardous situation which, if not avoided, could result in damage to property.

**Note**: Additional information that is not critical to the installation or operation.

**IMPORTANT SAFETY INSTRUCTIONS**

**SAVE THESE INSTRUCTIONS** – This manual contains important instructions for the generator that should be followed during installation, operation and maintenance of the generator.

For ease of reading, the Warning statements are divided into four categories: Operation, Burn, Installation, and Maintenance.

**Operation Statements**

**WARNING**: If the trailer is not properly secured to the tow vehicles tow hitch, the trailer may separate from the tow vehicle and cause severe injury or property damage. Always ensure that the tow hitch and trailer tongue are properly connected, in good working condition and that safety chains are properly connected from the trailer to the tow vehicle.

**WARNING**: Never allow a person to ride in or on a trailer that is being towed. All states prohibit passengers in towed vehicles. A person can fall off and be struck by another vehicle or run over by the towed trailer. Failure to observe this warning can result in death.

**WARNING**: Before using a tow vehicle, verify that the vehicle is designed for the load. Using a vehicle that is too small is very dangerous. Be certain that it can handle the M.G.V.W. (Maximum Gross Vehicle Weight) and the tongue weight for safe towing and braking.

**WARNING**: For a new trailer, the wheel lug nuts should be tightened to the proper torque specification before use, after 50 miles of operation and every 100 miles of operation thereafter. Failure to check the lug nuts for proper tightness can result in an accident due to a wheel falling from the trailer.

**WARNING**: Never operate a trailer or tow vehicle that has a loose, missing or broken lug nut. The trailer is designed for safe operation with all lug nuts installed and all at the proper torque rating. Operating the trailer with one or more broken or missing lug nuts greatly increases the load on the remaining nuts and can cause failure of the remaining nuts that can result in an accident due to a wheel falling from the trailer.

**WARNING**: Never operate this generator in a manner other than as described in this manual. Operation in any manner not described in this manual should be considered unsafe and should not be attempted. Never start the engine unless you have first verified that the installation and operation of the generator are as described in this manual.

**WARNING**: Be sure that you are completely familiar with the safe operation of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury.

**WARNING**: Exhaust fumes/gases are extremely dangerous and can cause severe illness or death. Never breath exhaust fumes produced by a running engine. Only run the engine outdoors where ventilation is plentiful. Exhaust gases contain carbon monoxide, a colorless, odorless and extremely dangerous gas that can cause unconsciousness or death. Symptoms of carbon monoxide poisoning include: dizziness, nausea, headaches, sleepiness, vomiting or incoherence. If you or anyone else experiences these symptoms, get out into fresh air immediately. Stop the engine and do not restart the engine until it has been inspected and if necessary repaired or reinstalled in a well ventilated area.

**WARNING**: When operating this generator remain alert at all times. Never operate machinery when physically or mentally fatigued, or while under the influence of alcohol, drugs or medication.

Continued on next page.
WARNING: Gasoline and diesel fuel are flammable and can cause fire, explosions, injury or death. For storage or refueling handle fuel with care and only in clean, approved, properly marked safety fuel containers.

WARNING: Do not overfill the fuel tank. Only fill the tank to within \( \frac{1}{2} \) of the top of the tank to allow space for fuel expansion. Overfilling of tank may cause fuel to spill out onto engine and cause fire or explosion.

WARNING: Clean up fuel spills by wiping completely dry before starting engine. Gasoline and diesel fuel are flammable and can cause fire, explosions, injury or death.

WARNING: Make sure the fuel cap is completely and securely closed after refueling to prevent spillage. Gasoline and diesel fuel are flammable and can cause fire, explosions, injury or death.

WARNING: Over crank indication can mean a loss of crank disconnect signal during the previous run period. Attempting to restart the engine with no crank disconnect signal can destroy the starter motor, which can cause serious personal injury.

WARNING: Hot exhaust gasses must never be directed toward anything that may catch fire or explode.

WARNING: Never operate the generator set indoors or in a poorly ventilated area such as a tunnel or cave. Exhaust fumes are extremely dangerous to all personnel that are in or in contact with that area.

WARNING: Keep generator at least three feet away from buildings and other structures.

WARNING: Keep generator away from flammable or hazardous materials (trash, rags, lubricants, explosives, paints etc.) and grass or leaf build up.

WARNING: Some parts of this generator rotate during operation. Rotating parts can present extreme danger if clothing or body extremities are caught by the rotating part and can cause serious or fatal injury. Never touch a part of the generator until the engine has been stopped and all rotating parts are completely stopped. Also, disconnect the battery terminals to prevent accidental engine rotation during servicing.

WARNING: Never move a generator set that is running. Loads should be connected and position secure before starting the engine. Hazards are caused by moving a generator set that is running.

WARNING: Never connect or disconnect loads during operation. Always connect load circuits before starting the engine and use external branch disconnects etc. to switch loads On/Off.

WARNING: High voltage is present whenever engine is running. Electrical shock can cause serious or fatal injury. Never operate electrical equipment while standing in water, on wet ground or with wet hands, feet or shoes or while barefoot.

WARNING: High voltage is present whenever the engine is running. Electrical shock can cause serious or fatal injury. Always stop engine before connecting or disconnecting power cords or external devices.

WARNING: Be sure that you understand how to stop the engine quickly in case of an emergency situation. Become familiar with the controls and safety systems provided with this generator set.

WARNING: Always wear safety glasses with side shields and hearing protection when working near the generator.

WARNING: Improper operation may cause violent motion of connected equipment. Be certain that unexpected movement will not cause injury to personnel or damage to equipment.

WARNING: Never permit anyone to operate the generator without proper instructions. Be sure to keep a copy of this manual with the generator so that all users can be properly informed of its safe operation.

WARNING: Never allow children or pets to be in the area where the generator is running. The generator and the equipment being powered by the generator may cause injury or death.

WARNING: Never operate the generator unless all guards, covers, shields and other safety items are properly installed.

WARNING: Do not put hands, feet, tools clothing or other objects near rotating parts such as drive shaft, pulley, belt etc. Rotating parts cause extremely dangerous situations because they can catch loose clothing or extremities and cause serious or fatal injury.

WARNING: Never operate the engine when the air cleaner is removed. An engine backfire can cause serious burns.

Continued on next page.
**Warning Statements**

**Operation Statements** Continued

**WARNING:** Never “jump start” a generator to start the engine. If the battery charge is insufficient to start the engine, charge or replace the battery and try to restart. Jump starting a battery can cause the battery to explode and cause severe injury or death to anyone in the area.

**WARNING:** Do not smoke near generator during operation or when close to fuel source. Gasoline and diesel fuel are flammable and can cause fire, explosions, injury or death.

**WARNING:** Keep a fire extinguisher near the generator while generator is in use. An extinguisher rated “ABC” by the National Fire Protection Association is appropriate.

**Burn Statements**

**WARNING:** Parts of this generator are extremely hot during and after operation. To prevent severe burns, do not touch any part of the generator until you have first determined if the part is hot. Wear protective clothing and after use allow sufficient time for parts to cool before touching any part of the generator.

**WARNING:** Do not touch the hot exhaust parts. In addition to a severe burn, the sudden involuntary jerk of the hand or body part caused by contact with high voltage or a hot surface can result in injury to yourself or others.

**WARNING:** Engine coolant is under pressure and is near the boiling point of water when engine is hot. Do not open the coolant system until the engine has completely cooled. Hot coolant can cause severe burns and other injuries. When engine is cool, coolant level can be checked.

**Installation Statements**

**WARNING:** Disconnect the battery’s ground terminal before working in the vicinity of the battery or battery wires. Contact with the battery can result in electrical shock when a tool accidentally touches the positive battery terminal or wire. The risk of such shock is reduced when the ground lead is removed during installation and maintenance.

**WARNING:** Installation and repair procedures requires specialized skills with electrical generating equipment and small engine systems. Any person that installs or performs repairs must have these specialized skills to ensure that the generator set is safe to operate. Seek expert advise for installation or repairs.

**WARNING:** Be sure all wiring complies with the National Electrical Code (NEC) and all regional and local codes or CE Compliance. Improper wiring may cause a hazardous condition and exposure to electrical hazards can cause serious injury or death.

**WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that grounds are connected. Electrical shock can cause serious or fatal injury. NEC requires that the frame and exposed conductive surfaces (metal parts) be connected to an approved earth ground. Local codes may also require proper grounding of generator systems.

**Warning:** Do not connect the generator output neutral to the frame or local ground. The generator output is isolated from ground. NEC and local codes require that the generator output remain isolated from local ground reference.

**WARNING:** Place protective covers over all rotating parts such as drive shaft, pulley, belt etc. Rotating parts cause extremely dangerous situations because they can catch loose clothing or extremities and cause serious or fatal injury.

**WARNING:** Unauthorized modification of a generator set may make the unit unsafe for operation or may impair the operation of the unit. Never start a generator set that has been modified or tampered with. Be sure that all covers and guards are properly installed and that the unit is safe before starting the engine. If you are unsure, seek expert advise before starting the engine.

**WARNING:** When moving the generator, use reasonable caution. Be careful where you place fingers and toes to prevent injury “Pinch Points”. Never try to lift a generator without a hoist or lift means because they are heavy and bodily injury may result.

**Warning:** Never connect this generator to the electrical system of any building unless a licensed electrician has installed an approved transfer switch. The national electrical code (NEC) requires that connection of a generator to any electrical circuit normally powered by means of an electric utility must be connected by means of approved transfer switch equipment to isolate the electrical circuit from the utility distribution system when the generator is operating. Failure to isolate the electrical circuits by such means may result in injury or death to utility power workers due to backfeed of electrical energy onto the utility lines.

Continued on next page.
Installation Statements  Continued

WARNING: Circuit overload protection must be provided in accordance with the National Electrical Code and local regulations.

WARNING: Check Ground Fault Circuit Interrupt (GFCI) receptacles monthly by using the “Test” and “Reset” buttons.

WARNING: Have electrical circuits and wiring installed and checked by licensed electrician or qualified technician. Electrical shock can cause serious or fatal injury.

WARNING: Never stand under or close to an object that is being hoisted or lift into position. Accidents happen and if the object falls or tips over you or someone else could be crushed by the weight of the object causing severe injury or death to yourself or others. Always remain a safe distance from the object and always wear protective head gear (hard hat).

Maintenance Statements

WARNING: Installation and servicing of batteries is to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

WARNING: Before servicing the generator set, be sure to disconnect the battery terminals to prevent accidental engine rotation or starting.

WARNING: Before cleaning, inspecting, repairing or performing any maintenance to the generator set, always be sure the engine has stopped and that all rotating parts have also stopped. After stopping, certain components are still extremely hot so be careful not to get burned.

WARNING: Before servicing the generator set, be sure to disconnect the glow plugs or spark plug wires and the battery terminals to prevent accidental engine rotation or starting.

WARNING: Engine coolant is under pressure and is near the boiling point of water when engine is hot. Do not open the coolant system until the engine has completely cooled. Hot coolant can cause severe burns and other injuries. When engine is cool, coolant level can be checked.

WARNING: Inspect all wiring frequently and replace any damaged, broken or frayed wiring or wires with damaged insulation immediately. Electrical shock can cause serious or fatal injury.

WARNING: Disconnect all electrical wires and load devices from generator power outlets before servicing the generator. Electrical shock can cause serious or fatal injury. Always treat electrical circuits as if they are energized.

WARNING: A battery presents a risk of fire and explosion because they generate hydrogen gas. Hydrogen gas is extremely explosive. Never jump start a battery, smoke in the area around the battery or cause any spark to occur in the area around the battery.

WARNING: Do not mutilate the battery or dispose of a battery in a fire. The battery is capable of exploding. If the battery explodes, electrolyte solution will be released in all directions. Battery electrolyte solution is caustic and can cause severe burns and blindness. If electrolyte contacts skin or eyes, immediately flush the area with water and seek medical attention quickly.

WARNING: The battery electrolyte is a dilute sulfuric acid that is harmful to the skin and eyes. It is electrically conductive and corrosive. If electrolyte contacts the skin, flush the area immediately with water and wash it off using soap and water. If electrolyte contacts the eyes, immediately flush the eye thoroughly with water and seek medical attention quickly.

WARNING: A battery presents a risk of electrical shock hazard and high short circuit current. Electrical shock can cause serious or fatal injury. Never wear jewelry, watch or any metal objects when in the area around the battery.

WARNING: Check fuel tank, fuel line, and connections monthly for fuel leaks. Diesel is flammable and can cause fire, explosions, injury or death. If a leak is found, replace only with approved pipe or components.

Continued on next page.
Caution Statements

Caution: Avoid installing the generator set beside heat generating equipment, or directly below water or steam pipes or in the vicinity of corrosive substances or vapors, metal particles and dust. Heat can cause engine problems to develop and unwanted substances can cause rust or generator failure over time.

Caution: Do not apply high voltage to windings (do not start the generator) in a moisture-saturated condition. Moisture can cause insulation breakdown, making it necessary to repair the generator and consequent expense and loss of time.

Caution: Use only original equipment or authorized replacement parts. Using the correct parts will assure continued safe operation as designed.

Caution: Do not support the generator from the top of the frame or enclosure.

Caution: Do not tamper with or change the engine speed. Engine speed is factory set to produce the correct voltage and output frequency.

Caution: Never operate the engine without a muffler. The engine is designed to have the correct exhaust components installed and operating without these components can present a fire hazard, cause excessive exhaust gases and cause damage to engine. Inspect muffler periodically and replace if necessary.

Caution: The Programmable Output Contacts selection must agree with the external control wiring prior to energizing the controller. Failure to do so may cause severe equipment damage.

Caution: If a dead battery is suspected, remove the controller fuse, charge battery (or replace), and then attempt starting. Damage to engine control may result from jump starting.

Caution: This generator must have a battery installed for operation. The battery is used during starting and during operation. If engine operation is attempted while the battery is removed, damage to the engine's electrical components may result.

Caution: Large “Engine Compartment Doors” on each side of enclosure must remain closed during operation. If doors remain open, engine will overheat due to insufficient air flow around engine.
Thank you for purchasing your Baldor Generator Set. This manual contains information you need to safely and efficiently install and operate your generator set. During the preparation of this manual every effort was made to ensure the accuracy of its contents. This manual describes only very basic engine information. A separate owner’s manual for the engine is supplied with this unit for your use. Please refer to the engine manual for information relative to engine operation, maintenance, recommendations and additional safety warnings.

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Baldor Generators have earned the reputation of being high quality and dependable. We take pride in this fact and continue to keep our quality standards high on our list of priorities. We are also constantly researching new technological ideas to determine if they could be used to make our generator sets even better.

Baldor makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties of fitness for any particular purpose. The information in this document is subject to change without notice. Baldor assumes no responsibility for any errors that may appear in this document.

**Limited Warranty**

www.baldor.com/support/warranty_generators.asp
Receiving & Inspection  When you receive your generator, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your system.
2. Verify that the part number of the system you received is the same as the part number listed on your purchase order.
3. If the system is to be stored for several weeks before use, be sure that it is stored in a location that conforms to published storage temperature and humidity specifications.

**WARNING:** Never stand under or close to an object that is being hoisted or lift into position. Accidents happen and if the object falls or tips over you or someone else could be crushed by the weight of the object causing severe injury or death to yourself or others. Always remain a safe distance from the object and always wear protective head gear (hard hat).

Lifting the Generator  When lift or hoist equipment is used to lift the generator and move it to position, be careful not to contact overhead wires or other obstacles. Be sure the lift or hoist equipment has appropriate capacity and tires for the terrain to avoid becoming stuck or tipping over. If the shipping pallet is intact, use a fork lift to move the generator. If the shipping pallet has been removed, use the “Lift Point” hole at the top of the generator, Figure 3-1.

The lift point is designed only for the weight of the generator and factory trailer. Do not lift by these points if the generator is mounted to a trailer that has been modified from the factory specifications for stock units. Please consult Baldor for custom designs.

![Generator Lifting Diagram](image)

**Figure 3-1 Generator Lifting**

![Mounting Dimensions Table](image)

<table>
<thead>
<tr>
<th>Generator</th>
<th>No. of Axles</th>
<th>A</th>
<th>A1</th>
<th>A2</th>
<th>B</th>
<th>B1</th>
<th>C</th>
<th>C1</th>
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<td>67</td>
<td>47.5</td>
<td>5.5</td>
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<td>74</td>
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<td>55</td>
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<td>7.1</td>
<td>251</td>
<td>195</td>
<td>98</td>
<td>66</td>
</tr>
</tbody>
</table>

Physical Location  The mounting location of the system is important. It should be installed in an area that is protected from direct harmful gases or liquids, dust, metallic particles, shock and vibration. It should be installed in an outdoor location so the exhaust fumes are vented to the atmosphere.

**When the Generator is installed outdoors**
The factory installed enclosure is designed to keep out undesirable weather elements while providing cooling and ventilation.
Several other factors should be carefully evaluated when selecting a location for installation:

1. For effective cooling and maintenance, the system should be mounted on a flat, smooth, noncombustible level surface. A concrete pad is ideal and provides a secure installation.

2. Installation should prevent water levels from reaching the generator. Drainage must be adequate to keep concrete pad free from standing water.

3. Installation should prevent obstructions by buildup of leaves, grass, sand, snow, etc. If these items pose a problem, consider building a small fence or other break to protect the unit from accumulation of debris.

4. Installation should place the generator as close as possible to the transfer switch.

5. At least forty-eight (48) inches clearance must be provided on all sides for air flow.

6. Access must be provided to allow the enclosure covers to be opened or removed for service and maintenance.

7. For TS25–TS175, TS250, TS400 maximum ambient temperature is 122°F (50°C).
   For TS225, TS350, TS500 maximum ambient temperature is 113°F (45°C).

**Figure 3-2 Generator Mounting (Skid)**

<table>
<thead>
<tr>
<th>Generator</th>
<th>A</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>B</th>
<th>B1</th>
<th>MTG Hole Dia. in (mm)</th>
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<td>23.81</td>
<td></td>
<td>38</td>
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<td></td>
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<td>0.66 (16.76)</td>
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<td>84</td>
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<td>28.56</td>
<td></td>
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<td>0.66 (16.76)</td>
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<td>13.25</td>
<td>28.56</td>
<td></td>
<td>38</td>
<td>36</td>
<td>0.66 (16.76)</td>
</tr>
<tr>
<td>TS130</td>
<td>118</td>
<td>21.69</td>
<td>26.56</td>
<td>24.13</td>
<td>24.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS175</td>
<td>130</td>
<td>19.94</td>
<td>30.06</td>
<td>19.88</td>
<td>48</td>
<td>44.74</td>
<td>0.69 (17.52)</td>
</tr>
<tr>
<td>TS225</td>
<td>159</td>
<td>18.00</td>
<td>40.00</td>
<td>21.00</td>
<td>54</td>
<td>52</td>
<td>0.75 (19.05)</td>
</tr>
<tr>
<td>TS250</td>
<td>159</td>
<td>18.00</td>
<td>40.00</td>
<td>21.00</td>
<td>54</td>
<td>52</td>
<td>0.75 (19.05)</td>
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<tr>
<td>TS350</td>
<td>168</td>
<td>18.00</td>
<td>44.00</td>
<td></td>
<td>54</td>
<td>52</td>
<td>0.81 (20.74)</td>
</tr>
<tr>
<td>TS400</td>
<td>195</td>
<td>12.00</td>
<td>48.00</td>
<td>72.00</td>
<td>66</td>
<td>63</td>
<td>0.75 (19.05)</td>
</tr>
<tr>
<td>TS500</td>
<td>192</td>
<td>12.00</td>
<td>48.00</td>
<td>72.00</td>
<td>66</td>
<td>63</td>
<td>0.63 (16.00)</td>
</tr>
</tbody>
</table>
Secure the Generator  (Skid Mount only)

Six mounting bolts (eight for TS130/175/225/350/500, twelve for TS400) in the base frame secure the generator to the shipping pallet. Remove these bolts, lift the generator and remove the shipping pallet. Secure the generator to the concrete pad using anchor hardware (not provided) in the base frame mounting holes (holes are 0.66” diameter). See Figure 3-2 and Table 3-2. Anchor bolts must be long enough to extend through the generator mounting frame.

Hot Exhaust Gasses

**WARNING:** Exhaust fumes/gases are extremely dangerous and can cause severe illness or death. Never breath exhaust fumes produced by a running engine. Only run the engine outdoors where ventilation is plentiful. Exhaust gases contain carbon monoxide, a colorless, odorless and extremely dangerous gas that can cause unconsciousness or death. Symptoms of carbon monoxide poisoning include: dizziness, nausea, headaches, sleepiness, vomiting or incoherence. If you or anyone else experiences these symptoms, get out into fresh air immediately. Stop the engine and do not restart the engine until it has been inspected and if necessary repaired or reinstalled in a well ventilated area.

**WARNING:** Hot exhaust gases must never be directed toward anything that may catch fire or explode.

Exhaust must always be directed away from living areas or buildings that are occupied by people or animals. Never allow exhaust gases to be directed towards any openings or air entry routes (doors, windows, vents, etc...) of an occupied building.

The direction of the discharged hot air and hot exhaust gases is important as they have the potential to create brown spots on the lawn or shrubs. In extreme cases this extremely hot air could cause dried grass, shrubs, trees or other debris to ignite.

It is also recommended that an exhaust rain cap be used whenever it is possible that rain could get into the system. This will help to prevent corrosion and damage to the exhaust system and engine.

Installation

The generator is completely assembled, tested and adjusted at the factory before it is shipped. The procedures presented in this manual are suggestions and it is the responsibility of the Owner/Operator to arrange for these procedures to be performed by licensed contractors according to all applicable codes including local codes for your Municipality/City/County and State. External connections required at the time of installation are:

1. Electrical Connections – power wiring (optional transfer switch) and control wiring.
2. Ground Connection.

After installation, the post installation checks must be performed prior to starting the engine. After these checks have been performed and the system operation is verified to be good, refer to Section 5 Maintenance for periodic checks that must be performed at scheduled intervals to ensure continued operation with minimal problems.

**WARNING:** Disconnect the battery’s ground terminal before working in the vicinity of the battery or battery wires. Contact with the battery can result in electrical shock when a tool accidentally touches the positive battery terminal or wire. The risk of such shock is reduced when the ground lead is removed during installation and maintenance.

Fuel Connections

External fuel connections are not required. A self contained fuel tank is located within the base of the generator set.

Electrical Connections

Class 1 wiring methods must be used for field wiring connections to terminals of a class 2 circuit. It is the responsibility of the owner/operator to arrange for these procedures to be performed by a licensed electrical contractor and ensure conformance to all applicable codes including local codes peculiar to your municipality/city/county and state. Wire size and insulation type should be as required by NEC (National Electrical Code) and local codes.

**Warning:** Never connect this generator to the electrical system of any building unless a licensed electrician has installed an approved transfer switch. The national electrical code (NEC) requires that connection of a generator to any electrical circuit normally powered by means of an electric utility must be connected by means of approved transfer switch equipment to isolate the electrical circuit from the utility distribution system when the generator is operating. Failure to isolate the electrical circuits by such means may result in injury or death to utility power workers due to backfeed of electrical energy onto the utility lines.
Warning: Incorrect installation of this generator set could result in property damage, injury or death. Connection of the generator to its fuel source must be done by a qualified professional technician or contractor.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that grounds are connected. Electrical shock can cause serious or fatal injury. NEC requires that the frame and exposed conductive surfaces (metal parts) be connected to an approved earth ground. Local codes may also require proper grounding of generator systems.

Intended Use The intended purpose of this generator set is to provide electrical power when the main utility power supply is interrupted. Therefore, it is important that all the wiring that connects the generator set with your house, transfer switch, distribution box, battery charger, etc. be properly installed.

Protection Circuit protection is provided within the generator. The power output connections are rated and sized according to the KW of the generator. Proper lead wire from these points to the automatic transfer switch (or load switching device) is mandatory. See transfer switch information for corresponding generator input terminals. Use only copper wires.

### Table 3-3 Standby Power Ratings

<table>
<thead>
<tr>
<th>Generator Catalog No.</th>
<th>1 Phase</th>
<th>3 Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kVA kW Volts</td>
<td>kVA kW Volts</td>
</tr>
<tr>
<td>TS25</td>
<td>18 18 240/120</td>
<td>25/25/25</td>
</tr>
<tr>
<td>TS35</td>
<td>25 25 104/2x104</td>
<td>30/30/30</td>
</tr>
<tr>
<td>TS45</td>
<td>27 27 112/2x112</td>
<td>37/37/37</td>
</tr>
<tr>
<td>TS60</td>
<td>43 43 179/2x179</td>
<td>48/49/49</td>
</tr>
<tr>
<td>TS80</td>
<td>45 45 167/2x187</td>
<td>59/64/64</td>
</tr>
<tr>
<td>TS130</td>
<td>78 78 325/2x325</td>
<td>100/101/101</td>
</tr>
<tr>
<td>TS175</td>
<td>100 100 416/2x416</td>
<td>135/150/150</td>
</tr>
<tr>
<td>TS225</td>
<td>150 150 625/2x625</td>
<td>180/180/180</td>
</tr>
<tr>
<td>TS250</td>
<td>175 175 729/2x729</td>
<td>200/200/200</td>
</tr>
<tr>
<td>TS350</td>
<td>206 206 858/2x858</td>
<td>280/280/280</td>
</tr>
<tr>
<td>TS400</td>
<td>250 250 1041/2x1041</td>
<td>320/320/320</td>
</tr>
<tr>
<td>TS500</td>
<td>250 250 1041/2x1041</td>
<td>400/400/400</td>
</tr>
</tbody>
</table>

* Example 2x75 means 2 lines (Line to Neutral) of 120V @ 75 amp each.

### Table 3-4 Prime Power Ratings

<table>
<thead>
<tr>
<th>Generator Catalog No.</th>
<th>1 Phase</th>
<th>3 Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kVA kW Volts</td>
<td>kVA kW Volts</td>
</tr>
<tr>
<td>TS25</td>
<td>18 18 240/120</td>
<td>23/23/23</td>
</tr>
<tr>
<td>TS35</td>
<td>22 22 92/2x92</td>
<td>27/27/27</td>
</tr>
<tr>
<td>TS45</td>
<td>25 25 104/2x104</td>
<td>35/35/35</td>
</tr>
<tr>
<td>TS60</td>
<td>40 40 167/2x167</td>
<td>45/45/45</td>
</tr>
<tr>
<td>TS80</td>
<td>41 41 171/2x171</td>
<td>54/58/58</td>
</tr>
<tr>
<td>TS130</td>
<td>76 76 317/2x317</td>
<td>90/92/92</td>
</tr>
<tr>
<td>TS175</td>
<td>90 90 375/2x375</td>
<td>110/125/125</td>
</tr>
<tr>
<td>TS225</td>
<td>135 135 562/2x562</td>
<td>160/160/160</td>
</tr>
<tr>
<td>TS250</td>
<td>160 160 667/2x667</td>
<td>180/180/180</td>
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<tr>
<td>TS350</td>
<td>187 187 779/2x779</td>
<td>255/255/255</td>
</tr>
<tr>
<td>TS400</td>
<td>240 240 1000/2x1000</td>
<td>292/292/292</td>
</tr>
<tr>
<td>TS500</td>
<td>240 240 1000/2x1000</td>
<td>365/365/365</td>
</tr>
</tbody>
</table>

* Example 2x75 means 2 lines (Line to Neutral) of 75 amp each.
Single Phase Connections

Single phase connections are made at load receptacles located by the operator panel, see Figure 3-3. Simply open the rear panel access door and make the connections. When the panel door is closed, the connections are weather tight.

**Figure 3-3 Receptacle Panel (Single Phase)**

Circuit Breakers (Single or Double pole)

Circuit Breakers provides protection on some units. To reset a breaker, place it in the OFF then the ON position.

Single pole breaker for 120VAC outlets

Double pole breaker for 240VAC outlets

Single phase power is always available.

GFI Outlet 120V, 20A

CS6365N 240V, 50A

**Figure 3-4 Remote Start Connections**

Tier 3 Systems

Remote Start Connections on front panel
Three Phase Connections
Three phase connections are made at L1, L2, L3 and N connections shown in Figure 3-5. An interlock trips the breaker if the door is opened during operation.

![Three Phase Connections Diagram]

For power to be applied to these terminals, the Output Voltage Selector Switch must be in the 120/208V, 120/240V or 277/480V positions.

Customer Connections
L1, L2, L3 and N

Earth Ground Connection
(to Driven Earth Ground Rod)

Transfer Switch Considerations
The following are general considerations for the safe use of a transfer switch:
1. The transfer switch should be located inside the building near the main breaker box or the disconnect box.
2. The transfer switch must be kept away from any location that might allow water to get on it.
3. If the transfer switch is mounted outside, it must be protected from the environment and its elements.
4. Do not mount the transfer switch on the generator set.
5. Do not mount the transfer switch where flammable liquids or vapors are present.

Remote Start Contacts
This two-wire connection will start and stop the generator, when properly connected to a remote start contact, shown in Figure 3-4. These contacts are connected to the “Engine Start Contacts” of the automatic transfer switch. A two pole normally open, closed to operate switch may also be used to start the generator.

Shore Power
Use extension cord with appropriately sized conductors to connect the optional “Shore Power” receptacle to 120VAC (240VAC for TS350–TS500) single phase utility power. This powers battery chargers, block heaters etc. when the generator is not in operation. A single phase 20 amp breaker is provided for circuit protection.

AC Input
These connections are for units with float type battery charger or engine block heater. A constant supply of 120 volts AC (or as specified) is needed at these terminals to power these devices when the generator is not operating.

Note: Power is not required when the unit is in operation. Internal battery charging and radiant heat during operation eliminate the need for these devices.

Battery Charger Considerations
1. Mount the battery charger inside the generator enclosure as close to the battery as is reasonably possible.
2. Do not mount the battery charger where flammable liquids or vapors are present. When the battery is charging it produces explosive gasses.

General Wiring Considerations
1. When routing the interface wiring, do not route it up against anything that could cut or chafe the wiring. do not route the wire up against any hot or potentially hot object.
2. Make sure that all the electrical components (generator set, transfer switch, battery charger, etc.) share a common ground.
3. Check with your local building inspector to determine what you must do to comply with the local regulations for grounding of this type of permanent installation.
Frame Ground Connection

**WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that grounds are connected. Electrical shock can cause serious or fatal injury. NEC requires that the frame and exposed conductive surfaces (metal parts) be connected to an approved earth ground. Local codes may also require proper grounding of generator systems.

It is important for safety reasons that the Generator set, transfer switch and battery charger share a common Ground and neutral.

The NEC requires that the frame and exposed metal surfaces be at local ground reference potential to avoid electrical shock hazard. A local ground reference may require a driven earth ground conductor at the generator installation site. Make the ground connection as shown in Figure 3-5. Use the appropriate size wire as required by NEC and local codes.

1. Open the enclosure electrical access panel door.
2. Connect the ground wire to the “earth ground connection” terminal shown in Figure 3-5. This is the local ground reference to ground the generator enclosure and frame.

Battery Connections

The generator is shipped with battery not connected.

**Caution:** This generator must have a battery installed for operation. The battery is used during starting and during operation. If engine operation is attempted while the battery is removed, damage to the engine’s electrical components may result.

**WARNING:** Installation and servicing of batteries is to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

**WARNING:** Do not dispose of battery or batteries in a fire. The battery is capable of exploding. If the battery explodes, electrolyte solution will be released in all directions. Battery electrolyte solution is caustic and can cause severe burns and blindness. If electrolyte contacts skin or eyes, immediately flush the area with water and seek medical attention quickly.

**WARNING:** Do not mutilate the battery. The battery contains electrolyte solution which is caustic and can cause severe burns and blindness. If electrolyte contacts skin or eyes, immediately flush the area with water and seek medical attention quickly.

**WARNING:** A battery presents a risk of electrical shock hazard and high short circuit current. The following precautions are to be followed when working on batteries:

1. Remove watches, rings, necklaces and all other metal objects.
2. Use tools with insulated handles.
3. Wear safety goggles, rubber gloves and boots.

**WARNING:** The battery electrolyte is a dilute sulfuric acid that is harmful to the skin and eyes. It is electrically conductive and corrosive. The following precautions are to be followed when working on batteries:

1. Wear full eye protection (safety glasses or goggles) and protective clothing.
2. Where electrolyte contacts the skin, flush the area immediately with water and wash it off using soap and water.
3. Where electrolyte contacts the eyes, immediately flush the eye thoroughly with water and seek medical attention quickly.
4. Spilled electrolyte is to be washed down with an acid neutralizing agent. A common practice is to use a solution of one pound (500 grams) bicarbonate of soda to one gallon (four liters) of water. The bicarbonate solution is to be added until evidence of reaction (foaming) has ceased. The resulting liquid is to be flushed with water and the area dried.
WARNING: A battery presents a risk of fire because they generate hydrogen gas. Hydrogen gas is extremely explosive. Never jump start a battery, smoke in the area around the battery or cause any spark to occur in the area around the battery. The following precautions are to be followed when working on batteries:

1. Do not smoke when near batteries.
2. Do not cause flame or spark in battery area.
3. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.

WARNING: Disconnect the battery’s ground terminal before working in the vicinity of the battery or battery wires. Contact with the battery can result in electrical shock when a tool accidentally touches the positive battery terminal or wire. The risk of such shock is reduced when the ground lead is removed during installation and maintenance.

Procedure: The correct type battery must be installed in the battery compartment provided, see Table 3-5. Installation and servicing of batteries is to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

1. Open access doors and locate battery tray.
2. Remove battery cables from the battery, the (−) negative first then the (+) positive.
3. Remove the Battery Hold Down Bar and Rods.
4. Remove the old battery and place the correct new battery (see Table 3-5) on the tray.
5. Install the Battery Hold Down Bar and Rods as shown in Figure 3-6.
   a. Place the bent end of the Battery Hold Down Rod through the hole in the Battery Tray.
   b. Place the threaded end of the Battery Hold Down Rod through the hole in the Battery Hold Down Bar and secure with flat washer, lock washer and nut.
   c. Repeat steps a and b for the other Battery Hold Down Rod.

 Figure 3-6 Battery Installation

6. Connect the positive lead to the positive (+) battery terminal.
7. Connect the negative lead to the negative (−) battery terminal.
8. Do not lay tools or metal parts on top of batteries.
9. Connect charging source to the battery terminals.
10. Disconnect the battery’s ground terminal before working in the vicinity of the battery or battery wires. Contact with the battery can result in electrical shock when a tool accidentally touches the positive battery terminal or wire. The risk of such shock is reduced when the ground lead is removed during installation and maintenance.
**Recommended Engine Oil and Battery Type**

When replacing batteries, use only the recommended battery for your generator, see Table 3-5.

**Table 3-5 Oil & Battery Recommendations**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>SUMMER OIL</th>
<th>WINTER OIL</th>
<th>OIL CAPACITY</th>
<th>RECOMMENDED BATTERY</th>
<th>(AMPS) COLD CRANKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS25</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>5.0 QTS</td>
<td>BCI Group 24</td>
<td>675</td>
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<td>TS35</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>8.5 QTS</td>
<td>BCI Group 24</td>
<td>675</td>
</tr>
<tr>
<td>TS45</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>7.6 QTS</td>
<td>BCI Group 31</td>
<td>925</td>
</tr>
<tr>
<td>TS60</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>7.6 QTS</td>
<td>BCI Group 31</td>
<td>925</td>
</tr>
<tr>
<td>TS80</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>14.7 QTS</td>
<td>BCI Group 31</td>
<td>925</td>
</tr>
<tr>
<td>TS130</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>16.5 QTS</td>
<td>BCI Group 31</td>
<td>925</td>
</tr>
<tr>
<td>TS175</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>34.0 QTS</td>
<td>BCI Group 31</td>
<td>925</td>
</tr>
<tr>
<td>TS225</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>34.0 QTS</td>
<td>BCI Group 31</td>
<td>925</td>
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<tr>
<td>TS250</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>34.0 QTS</td>
<td>BCI Group 31</td>
<td>925</td>
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<td>TS350</td>
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<td>5W/30</td>
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<tr>
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<td>5W/30</td>
<td>49.0 QTS</td>
<td>BCI Group 31</td>
<td>(2) 925</td>
</tr>
<tr>
<td>TS500</td>
<td>SAE 20W/50</td>
<td>5W/30</td>
<td>69.0 QTS</td>
<td>BCI Group 31</td>
<td>(2) 925</td>
</tr>
</tbody>
</table>

**Post Installation Checks**

When the initial installation is complete, these checks must be performed before starting the engine. These checks are not required before each start, only after the initial installation.

1. Generators that have been in transit or storage for long periods may be subjected to extreme temperature and moisture changes. This can cause excessive condensation, and the generator windings should be thoroughly dried before bringing the generator up to full nameplate voltage. If this precaution is not taken, serious damage to the generator can result.

Caution: Do not apply high voltage to windings (do not start the generator) in a moisture-saturated condition. Moisture can cause insulation breakdown, making it necessary to return the generator to the factory for repair, and consequent expense and loss of time.

Note: These precautions are especially necessary in locations such as seaboard installations and other high humidity areas. Some installations will be in atmospheres that are much more corrosive than others. Prevention of a failure is better than being forced to make a repair.

2. Verify that the transfer switch is in Utility Power mode. No power must be present at the generator or transfer switch connections. Verify with a voltmeter.
3. Verify that the engine starting battery is disconnected so accidental starting is not possible.
4. Verify generator is securely mounted and anchored to cement pad (skid mount only).
5. Verify that proper clearance exists on all sides and top of enclosure.
6. Verify no debris (buildup of leaves, grass, sand, snow, etc.) is present.
7. Assure generator is a safe distance from any flammable or combustible material.
8. Verify that the three phase generator power (L1, L2, L3 and N) are properly connected to the transfer switch.
9. Verify that the generator and transfer switch load are voltage compatible.
10. Verify that no load is connected to the circuit breaker and/or transfer switch.
11. Inspect the engine and generator and verify that there are no loose wires or components. Tighten if necessary.
12. Verify that the ground conductor is of correct wire size and properly connected.
13. Verify engine oil level is full. Refer to engine manual if necessary.
14. Verify engine coolant level is full. Refer to engine manual if necessary.
15. Verify exhaust system to assure it is in properly connected and pointing away from occupied living space, air entry routes (doors, windows, vents etc.) and combustible materials.
Post Installation Checks  Continued
16. Place the voltage output selector switch in the appropriate position.
17. Verify all loads are disconnected.
18. Verify the Master Control is in the “Stop” position.
   Connect the engine starting battery to the starter. Verify it is installed correctly.
19. Verify the fuel source is available.
20. Remove all tools, rags, etc. from inside the generator enclosure. Close all enclosure doors and be sure no hands are inside the generator enclosure when it starts.
21. Start the generator.
22. The engine should begin to crank and start when the fuel moves to the engine. If the engine fails to start, refer to Section 5 Troubleshooting.
23. With the engine running, several checks must be made:
   a. Verify there are no fuel leaks. If a fuel leak is detected, stop the engine (set the Master Control in the “Stop” position) immediately and repair the leak before proceeding.
   b. Verify there are no coolant or oil leaks. If a leak is detected, stop the engine (set the Master Control in the “Stop” position) immediately and repair the leak before proceeding.
   c. Verify that operation is smooth. If squeals, vibrations or other abnormal sources of noise exist, stop the engine (set the Master Control in the “Stop” position) immediately and repair before proceeding.
   d. Verify the correct voltage exists at the receptacles.

**WARNING:** Engine coolant is under pressure and is near the boiling point of water when engine is hot. Do not open the coolant system until the engine has completely cooled. Hot coolant can cause severe burns and other injuries. When engine is cool, coolant level can be checked.

24. After the operation checks are made, stop the engine (set the Master Control in the “Stop” position) and wait 2 hours for the engine to cool. When the engine is cool, check engine oil and coolant levels as instructed in the engine operation manual.
25. Close all enclosure covers. The post installation checks are now complete.
Towing the Generator

**WARNING:** Never allow a person to ride in or on a trailer that is being towed. All states prohibit passengers in towed vehicles. A person can fall off and be struck by another vehicle or run over by the towed trailer. Failure to observe this warning can result in death.

**WARNING:** Before using a tow vehicle, verify that the vehicle is designed for the load. Using a vehicle that is too small is very dangerous. Be certain that it can handle the M.G.V.W. (Maximum Gross Vehicle Weight) and the tongue weight for safe towing and braking.

**WARNING:** For a new trailer, the wheel lug nuts should be tightened to the proper torque specification before use, after 50 miles of operation, after 100 miles of operation and periodically thereafter. Failure to check the lug nuts for proper tightness can result in an accident due to a wheel falling from the trailer.

**WARNING:** Never operate a trailer or tow vehicle that has a loose, missing or broken lug nut. The trailer is designed for safe operation with all lug nuts installed and all at the proper torque rating. Operating the trailer with one or more broken or missing lug nuts greatly increases the load on the remaining nuts and can cause failure of the remaining nuts that can result in an accident due to a wheel falling from the trailer.

- Make sure the tow vehicle is able to tow the load. Vehicle brake capacity is extremely critical and the tow vehicle must be able to handle the additional weight of the trailer mounted generator. Radiator and transmission cooling must also be considered.
- Be sure hitch capacity is equal to or greater than the load when mounted on the vehicle.
- Be sure the size and rating of the hitch ball is equal to or greater than the load.
- Make sure the safety chain(s) rating is equal to or greater than twice the maximum gross vehicle weight rating of your trailer.
- It is illegal to transport passengers in any trailer.
- Reduce weight in car trunk and rear seat areas by the amount of tongue weight of your trailer.
- Any alterations or changes made to the trailer void any express or implied warranties on the trailer or towing equipment.

Selecting the Proper Towing Equipment

When selecting the proper towing equipment, the two most important factors that must be considered are the M.G.V.W. (Maximum Gross Vehicle Weight) and the Tongue Weight (trailer tongue weight at the hitch). The M.G.V.W. is the total weight of the trailer plus the payload in the trailer. The tongue weight is the downward pressure exerted at the coupler. The easiest way to measure the gross vehicle weight is to place the loaded trailer on a vehicle scale making sure that the scales are supporting the entire weight of the loaded trailer.

The easiest method to measure tongue weight is to place the jack stand (trailer tongue) on a scale making sure the trailer is level. The trailer tongue should be level and in its normal towing position. Tongue weight should be 10% of trailer weight and not more than 10% of M.G.V.W.

**Tow Vehicle**

Make sure the vehicle you are using to tow the trailer is capable of towing the weight. Check the vehicle Owner’s Manual for towing capability of the towing vehicle or contact the vehicle manufacturer for this information. Make sure the tow vehicle is able to tow the load. Vehicle brake capacity is extremely critical and the tow vehicle must be able to handle the additional weight of the trailer mounted generator. Radiator and transmission cooling must also be considered. Seek expert advice to select the proper tow vehicle. Trailers with a gross vehicle weight rating that exceeds 10,000 lbs require special consideration.

<table>
<thead>
<tr>
<th>Tow Vehicle</th>
<th>Hitch Class</th>
<th>Maximum Tow Capacity</th>
<th>Maximum Tongue Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Vehicle</td>
<td>Sub Class I</td>
<td>1000 Lbs.</td>
<td>100 Lbs.</td>
</tr>
<tr>
<td>Compact Vehicle</td>
<td>Class I</td>
<td>2000 Lbs.</td>
<td>200 Lbs.</td>
</tr>
<tr>
<td>Mid &amp; Full Size Vehicle</td>
<td>Class II</td>
<td>3500 Lbs.</td>
<td>300 Lbs.</td>
</tr>
<tr>
<td>3/4 Ton or larger Truck</td>
<td>Class III</td>
<td>5000 Lbs.</td>
<td>500 Lbs.</td>
</tr>
<tr>
<td>1 Ton or larger Truck</td>
<td>Class IV</td>
<td>10000 Lbs.</td>
<td>1000 Lbs.</td>
</tr>
<tr>
<td>Class 3-8 Vehicle</td>
<td>Custom Engineered</td>
<td>Custom Engineered</td>
<td>Custom Engineered</td>
</tr>
</tbody>
</table>
Selecting the Proper Towing Equipment  Continued

**Electrical Trailer Wiring**

All trailers must have taillights, brake lights and turn signals connected to the towing vehicle’s electrical system. It is also recommended that a heavy duty turn signal flasher and emergency flasher (if separate) be installed since the trailer lights place an extra load on car flasher units.

**Towing Heavy Trailer Loads**

1. **Trailer brakes.** In all cases refer to your vehicle’s owner manual and the trailer operating manual to be certain you have an adequate braking system to handle the vehicle/trailer combination. Also, State and local requirements, road and weather conditions and grade of road, etc. should be considered for trailer braking.

2. **Additional equipment.** The following items may be helpful for towing heavy loads. Consult your vehicle’s owner manual or dealership for recommended towing accessories.
   a. Overload Springs
   b. Overload or air shocks
   c. Transmission Oil Cooler
   d. Engine Oil Cooler
   e. Coolant recovery System
   f. Heavy Duty Fan
   g. Side View Mirrors
   h. Sway Control

**Safe Driving Tips**

1. **Loading Trailer.** The trailer should be loaded so that the downward tongue weight is approximately 10% of the gross vehicle weight. The trailer tongue should be level with the tow vehicle coupling during towing. Adjust load, hitch and coupling as necessary to ensure trailer tongue remains level during towing.

2. **Following and stopping distance.** The stopping distance is increased when towing a trailer. A rule of thumb for the minimum distance that should be maintained between you and the preceding car on dry pavement is one car and trailer length (2 car lengths) for every 10 MPH you are traveling. The distance should be increased accordingly depending on road and weather conditions. Avoid sudden stops if possible.

3. **Passing.** Accelerating and passing should be done slowly to allow extra distance for passing. Signal well in advance when passing and returning to the proper lane. Allow for the extra length of the trailer before changing lanes. Never change lanes abruptly as this may cause the trailer to sway and push the tow vehicle into a “jack knife” condition.

4. **Turning.** Allow for the extra length of the trailer. Drive slightly beyond normal turning point to avoid running over curbs and soft shoulders. Turning radius increases when towing.

5. **Uphill and Downhill Grades.** Reduce speed and use a lower transmission gear for steep or long up or down hill grades. Maintain safe distance from other vehicles.

6. **Parking.**
   - Avoid parking on uphill or downhill grades
   - Place transmission in “PARK”
   - Apply parking brake.
   - Use wheel chocks.
   - In a parking lot, avoid parking close to other vehicles. Turning radius is greater and it may be impossible to get out of a parking space after a few other vehicles have parked around your vehicle.

7. **Trailer Sway.** If trailer sway occurs, reduce speed. Apply trailer brakes rather than car brakes to control sway. See step 1 and ensure trailer tongue remains level during towing. If sway persists, seek expert advise.

8. **Trailer Backing.** Backing a trailer can be frustrating. The most important item to remember is that the trailer will go in the opposite direction of the tow vehicle. It is helpful to have another person help you back the trailer and watch for objects. Turn the vehicle’s wheels to the right to make the trailer go left, and vice versa. Put your hand at the bottom of the steering wheel. The trailer will go in the same direction your hand moves (moving your hand to the right will cause the trailer to go right, and vice versa). Sharp steering wheel corrections will cause the trailer to jackknife and may cause damage to the rear of the tow vehicle or the front of the trailer.
Caution: Large “Engine Compartment Doors” on each side of enclosure must remain closed during operation. If doors remain open, engine will overheat due to insufficient air flow around engine.

WARNING: If the trailer is not properly secured to the tow vehicle's tow hitch, the trailer may separate from the tow vehicle and cause severe injury or property damage. Always ensure that the tow hitch and trailer tongue are properly connected, in good working condition and that safety chains are properly connected from the trailer to the tow vehicle.

Safety Checks

The following items should be checked before each use and once every 100 miles of towing:

1. Verify the tow vehicle is designed to tow the trailer before trailer is connected to the vehicles hitch. Using a tow vehicle that is too small is very dangerous.
2. Verify the stop, tail and turn signals are working properly. Replace damaged lenses, reflectors or bulbs.
3. Check wires for good connections and possible fraying or wearing of insulation.
4. Check and properly maintain the trailer, hitch, jack, ball and coupler.
5. Inspect hitch and ball for damage. Ball or hitch can be damaged in parking, hitting curbs, dragging when crossing ditches or railroad tracks.
6. Check and properly tighten all bolts on trailer, hitch, ball and coupler (including trailer wheels).
7. Check safety chains for wear and do not allow them to drag on ground or roadway.
8. Test breakaway system.
   Hydraulic surge brake system, normally have a cable or chain connected to the tow vehicle. In a break away condition, this cable or chain activates the master cylinder and operates the brakes as the trailer stops.
   An electric brake system, the emergency breakaway system has a battery, charger, breakaway switch with a pull pin and cable connected to the tow vehicle. In a break away condition, this cable operates the electric brakes (power provided by the brake battery) as the trailer stops.
9. Check all generator mounting hardware for tightness.
10. Check tow vehicle tires for wear and proper inflation. (Check vehicle’s owner manual for proper level of inflation of tires for towing a trailer).
11. Check trailer tires for wear and proper inflation. Replace only with a tire of the same size and capacity ratings.
12. Carry emergency flares, reflectors and fire extinguisher.
13. Carry spare light bulbs and fuses.
14. Wheel bearings should be checked and regreased after the first 100 miles, and every 4000 miles thereafter or at least once a year. Wheel bearing grease or a good grade of multi-purpose grease should be used for packing wheel bearings. If you don't know how to repack your wheel bearing, take your trailer to a service shop. Be sure to properly tighten the axle nut and wheel nuts during assembly.
15. For proper tow vehicle maintenance while towing a trailer, check vehicle’s owner manual and manufacturer’s specifications.
**Towing Instructions**  
See Figure 4-1 for component identification.

1. Be sure the generator is off.
2. Shut all enclosure doors and latch the locks.
3. Back the tow vehicle to within a few inches of the trailer coupler (Pintle or Ball).
4. Be sure the Coupler Handle is in the “UP” (open) position or the Pintle Hook is Open.
5. Adjust the trailer jack for the height of the hitch on the tow vehicle.
6. Back the tow vehicle so the trailer coupler is directly over the tow vehicle ball hitch or the Pintle hook.
7. Lower the trailer so the trailer coupler rests securely on the ball hitch of the tow vehicle.  
   Move the Coupler Handle to the horizontal position and lock it in place to securely hold the ball hitch of the tow vehicle.
   OR
   Latch the Pintle and lock the Pintle device securely.

   **Note:** If this is not done properly, the trailer may become unhitched when it is towed.
8. Retract the front jack, pull the jack pin and rotate the jack 90 degrees from vertical to the horizontal position, making sure the self-locking pin reseats and the jack is secured to the tow bar (stowed position).
9. Connect safety chains, making sure to cross them. If a safety chain is too long, simply twist it a few turns to shorten the chain before attaching to the tow vehicle.
10. Connect the trailer light connector to the tow vehicle.
11. Test the trailer lights to ensure they are operational.
12. Check tires for proper inflation.
13. Check wheel lug nuts for correct tightness (see Lug Nut Tightness). Wheel nuts/bolts should be torqued before the first road use and after each wheel removal. Check and re-torque after the first 50 miles and again at 100 miles. Check periodically thereafter.
14. Verify that all jacks, pins, cables, and doors are secured and trailer tongue is level.
15. Remove tire chocks (if used). These prevent the trailer from moving when parked.

**Lug Nut Tightness**  
Be sure to use only the fasteners matched to the cone angle of your wheel (usually 60 or 90 degrees.) The proper procedure for attaching your wheel is as follows, see Figure 4-2:

1. If a wheel is removed and installed, start each nut by hand to prevent cross threading.
2. Tighten lug nuts in the following sequence.
   a. Tighten each bolt in the sequence shown in Figure 4-2 and tighten to one half the torque specified until all lug nuts are tightened to one half the torque.
   b. Tighten each bolt in the sequence shown in Figure 4-2 and tighten to three fourths the torque specified until all lug nuts are tightened to three fourths the torque.
   c. Tighten each bolt in the sequence shown in Figure 4-2 and tighten each to the specified torque until all lug nuts are tightened to the correct torque.

**Figure 4-2 Lug Nut Tightening Specifications**

<table>
<thead>
<tr>
<th>Description</th>
<th>Application</th>
<th>Min Torque (ft-lbs.)</th>
<th>Max Torque (ft-lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; Cone nut</td>
<td>12&quot; - 13&quot; Wheel</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>14&quot; - 16&quot; Wheel</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>5/8&quot; Cone nut</td>
<td>Flat Disc Wheel</td>
<td>175</td>
<td>225</td>
</tr>
<tr>
<td>5/8&quot; Cone nut</td>
<td>Clamp Ring</td>
<td>190</td>
<td>210</td>
</tr>
<tr>
<td>3/4&quot; Hex nut</td>
<td>Demountable Ring Clamp</td>
<td>210</td>
<td>260</td>
</tr>
</tbody>
</table>

Lug Nut Tightness

- Be sure to use only the fasteners matched to the cone angle of your wheel (usually 60 or 90 degrees.)
- The proper procedure for attaching your wheel is as follows, see Figure 4-2:
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     c. Tighten each bolt in the sequence shown in Figure 4-2 and tighten each to the specified torque until all lug nuts are tightened to the correct torque.

**Figure 4-2 Lug Nut Tightening Specifications**

<table>
<thead>
<tr>
<th>Tightening Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Bolt</td>
</tr>
<tr>
<td>5 Bolt</td>
</tr>
<tr>
<td>6 Bolt</td>
</tr>
<tr>
<td>8 Bolt</td>
</tr>
<tr>
<td>10 Bolt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Application</th>
<th>Min Torque (ft-lbs.)</th>
<th>Max Torque (ft-lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; Cone nut</td>
<td>12&quot; - 13&quot; Wheel</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>14&quot; - 16&quot; Wheel</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>5/8&quot; Cone nut</td>
<td>Flat Disc Wheel</td>
<td>175</td>
<td>225</td>
</tr>
<tr>
<td>5/8&quot; Cone nut</td>
<td>Clamp Ring</td>
<td>190</td>
<td>210</td>
</tr>
<tr>
<td>3/4&quot; Hex nut</td>
<td>Demountable Ring Clamp</td>
<td>210</td>
<td>260</td>
</tr>
</tbody>
</table>
Trailer Setup

See Figure 4-1 for component identification. Carefully read all instructions before starting.

1. Locate a suitable, level location. Also be sure there are no overhead wires or obstructions.
   The trailer is balanced so the majority of the weight rests on the tow bar (Jack).
   If on a minor incline, the safest way to position the trailer is to have the tow bar facing
down the incline (front of the trailer lower than the rear of the trailer).
2. Install tire chocks if used. These prevent the trailer from moving when parked.
3. Disconnect the safety chains and the trailer light connector from the tow vehicle.
4. Pull the pin on the front jack and rotate the jack 90 degrees to the vertical position.
   Lock the jack in the vertical position using the pin to secure it.
5. Move the Coupler Handle to the vertical position to release the ball hitch.
   OR
   Release the Pintle hook.
6. Use the jack to raise the trailer coupler from the ball hitch of the tow vehicle.
7. The tow vehicle can now be moved away from the trailer.
8. Use the jack to level the trailer for operation.

Voltage Selection

WARNING: High voltage is present whenever the engine is running. Electrical shock can cause serious or fatal injury. Always stop engine before connecting or disconnecting power cords or external devices.

WARNING: High voltage is present whenever engine is running. Electrical shock can cause serious or fatal injury. Never operate electrical equipment while standing in water, on wet ground or with wet hands, feet or shoes or while barefoot.

Hard Wire Load Terminal Block, shown in Figure 3-5.

1. Ensure the generator is off.
2. Place voltage select switch in the correct position 208/120, 240/120 or 480/277VAC.
   Refer to Table 4-2 for voltages available in each position. To ensure the switch position
   is not accidentally changed, it should be padlocked as shown in Figure 4-3.

   Insert padlock through the hole in the handle.
   This activates an internal mechanism that prevents handle rotation.

3. Carefully inspect all Individual load cables for broken insulation or other signs of damage. Never use a damaged cable. Replace it before usage.
4. L1, L2, L3, Neutral and Ground cables must be brought into load block compartment
   through access hole in base of enclosure.
5. Ensure that wires are properly connected and connections are secure.
6. Use disconnect at the load to turn off the load. Do not start engine with load switched
   “on”. Allow engine to come up to speed and warm up before load is switched on.
   Note: When the generator is running, opening load block door will cause load disconnect to trip.
7. Observe the output voltage indicator and set the Voltage Adjust (Figure 4-5) for proper voltage.
8. If left unattended, lock all doors to prevent tampering or injury.
Table 4-2  Three/Single Phase Operation

<table>
<thead>
<tr>
<th>Switch Position</th>
<th>Alternator Winding Connection</th>
<th>Voltage Adjust Position</th>
<th>Voltage at Terminal Lugs</th>
<th>Voltage at Plug Receptacles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Voltage at Terminal Lugs</td>
<td>Voltage at Plug Receptacles</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Line To Line Voltage</td>
<td>120VAC Receptacles</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Line To Neutral Voltage</td>
<td>240VAC Receptacles (Twist Lock)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L1-L2</td>
<td>L2-L3</td>
</tr>
<tr>
<td>480/277</td>
<td>Series High Wye</td>
<td>Minimum</td>
<td>416</td>
<td>416</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle</td>
<td>460</td>
<td>460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum</td>
<td>480</td>
<td>480</td>
</tr>
<tr>
<td>208/120</td>
<td>Parallel Low Wye</td>
<td>Minimum</td>
<td>208</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum</td>
<td>240</td>
<td>240</td>
</tr>
</tbody>
</table>

Note: No connection at Terminal Lug #2.

Receptacle Panel Load Connections, see Figure 4-4.

1. 240/120VAC voltage is present at the receptacle panel at all times when generator is running.
2. Carefully inspect all individual load cables for broken insulation or other signs of damage. Never use a damaged cable. Replace it before usage.
3. Individual load cables may be routed into the receptacle compartment through the Enclosure Electrical Access Panel.
4. Individual load cables may be connected or disconnected while generator is running. Use extreme care not to touch any electrical wire or terminal to avoid shock hazard.
5. Keep Enclosure Electrical Access Panel closed at all times. This prevents rain or other harmful elements from entering the compartment. Output metering and gages can be observed through the window in the Enclosure Electrical Access Panel.

Figure 4-4  Receptacle Panel  (Single Phase)

Circuit Breakers (Single or Double pole)
Circuit Breakers provides protection on some units. To reset a breaker, place it in the OFF then the ON position.

Note: Single phase power is always available.

Meters, switches, lights and other operator control components are located in various places on each panel. Figure 4-5 can be used to identify the function and features of each operator control regardless of where it is located on your panel.
Figure 4-5  Operator Control Panel Components

**Volts**
- Analog display of generator output voltage in RMS volts.

**AMPS**
- Analog display of generator output current in RMS amps.

**HERTZ**
- Analog display of generator RPM which relates to the output frequency in Hertz.

**Amps Switch** switch (On–Off)
- Selects what is displayed on AC Amperes meter.
  - Off - No AC Ampere display.
  - 1 - Phase 1 current display.
  - 2 - Phase 2 current display.
  - 3 - Phase 3 current display.

**Voltage Select Switch** switch
- Selects 208/120, 240/120 or 480/277VAC.

**Battery**
- Displays the voltage of the engine starting battery.

**Water Temp**
- Displays the temperature of the engine coolant.

**Oil Press**
- Displays engine oil pressure.

**Horn**
- A Horn (annunciator or buzzer) sounds an alarm when operator attention is needed.

**Shore Power Inlet**
- Connect an extension cord that has an appropriate rating from utility power to this outlet. To power onboard battery charger, block heater, etc.

**Panel Lights**
- Lamps to illuminate the operator panel.

**Panel Lights switch (On–Off)**
- Turns on the panel lights.

**Fuse**
- Fuses provides protection on some units. (Do not remove while generator is running).

**Auto Start**
- Connection for external two wire starting from transfer switch or other controller. Strip the insulation from the remote start wires. Simply press while inserting the wire then release to secure the connection.

**Voltage Reconnect and Adjustment**

The digital engine controller runs software called voltage auto–detect. Every time the engine is started and after the timer in the Engine Params: Stabil Time has elapsed, the nominal voltage will be detected and locked in. Various set points in the engine controller are then calculated as a percentage of this nominal voltage. For example: The over–voltage set point is set to 110%. This means that when the unit is providing 208V, the over–voltage set point will lock in at 229V. When the unit is operating in 480V the over–voltage set point will lock in at 528V.

Example: To change the voltage from 208V nominal to 240V nominal, the voltage adjustment must be made before the controller locks in the nominal voltage.

1. Set the Voltage Select Switch to 240/120V position.
2. Start the engine.
3. Immediately adjust the Voltage Adjust for 240VAC nominal before the 20 second timer expires.
4. The new 240V nominal voltage is now locked in.

This procedure must be performed whenever the nominal voltage is changed.

**Note:** Some features are optional and may not be installed on your system.
**Pre–Start Procedure**

Before attempting to start the generator set, several things must first be verified or performed. These are:

- Fill system fuel tank with clean, fresh diesel fuel.
- Fill engine crankcase to full mark with clean, fresh lubricating oil per engine manufacturer operating guide.
- Radiator coolant should be checked at the beginning of each day and filled in compliance with the engine manufacturer’s guidelines.
- Secure the generator for operation.
  a. Skid mounted – the power generating system should be mounted to a smooth, hard surface suitable for supporting the system under all stress conditions.
  b. Trailer mounted – block wheels to prevent accidental movement.
  c. Use jack (Figure 4-1) to level the generator.
  d. Adequate clearance must be provided for access doors to fully open.

Note: The exhaust also exits radiator end. When positioning a generator system ensure position does not cause a concentration of toxic emissions.

- Place voltage select switch in the correct position 208/120, 240/120 or 480/277VAC and pad lock it in position if required (Figure 4-3).
- Carefully inspect all Individual load cables for broken insulation or other signs of damage. Never use a damaged cable. Replace it before usage.
- L1, L2, L3, Neutral and Ground cables must be brought into load block compartment through access hole in base of enclosure.
- Ensure that wires are properly connected and connections are secure.
- Ensure that an external ground connection is made when required for safety.
- Ensure that the Remote Start wires are properly connected, if used.
- Use disconnect at the load to turn off the load. Do not start engine with load switched “On”. Allow generator to come up to speed and perform the Voltage Reconnect and Adjustment within the allotted time.
- Stop the engine.

**Caution:** Large “Engine Compartment Doors” on each side of enclosure must remain closed during operation. If doors remain open, engine will overheat due to insufficient air flow around engine.

- Ensure that Engine Compartment doors are closed for proper ventilation.

Note: Receptacle Panel Load cables may be routed into the receptacle compartment through the Enclosure Electrical Access Panel after generator is started and has warmed up.

**Operating Procedures**

The engine–generator controller is designed to start and stop an engine from either AUTO “Automatic” mode or Manual “NOT IN AUTO”. Refer to Figure 4-6.

**Manual Start Procedure**

1. Press PAGE until the “OFF AUTO MAN” display is shown.
2. Press Mode until control is in MAN mode.
3. Press “Start”.
4. The controller will start the engine.

**Manual Stop Procedure**

1. Use disconnect at the load to turn OFF the load. Allow generator to cool down if needed.
2. Press “Stop”. Press Mode until control is in OFF mode.

**AUTO Start Procedure**

1. Press Mode until control is in AUT mode.
   - In Auto mode, the generator will start when the remote start input closes.
   - In Auto mode, the generator will stop when the remote start input opens.
Note: The operator control panel is equipped with a heater element that allows the LCD display to operate to −40°C (not the entire generator set, see generator specifications). This heater operates from the main battery power.

**LED Indicators**
- **Alarm (red)** – Alarm (shutdown) condition occurred. Annunciates & shuts down generator.
- **Not In Auto (red)** – Control is not in auto mode and cannot provide standby power.
- **Running (green)** – Generator is running, no alarms or warnings.
- **Warning (yellow)** – A warning condition has occurred. Annunciates only.
- **Ready/Auto (green)** – Control is in Auto mode and ready to provide standby power.
- **Supplying Load (green)** – Generator is providing output voltage to load.

### Table 4-3 Alarm & Warning Conditions

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>High Coolant temperature</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Low Oil pressure</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Low Fuel level</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Generator Under/Over Voltage</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Generator Under/Over Frequency</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Generator Over Current</td>
</tr>
<tr>
<td></td>
<td>Generator Overspeed</td>
</tr>
<tr>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Coolant temperature Low</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Starting battery Under/Over Voltage</td>
</tr>
</tbody>
</table>

**Manual Run**
- Immediately begins the crank cycle to start engine and produce power (MAN mode only).

**Start**
- Start generator set operation (MAN mode only).

**Stop**
- Stops the Engine and generator set (MAN mode only).

**Display**
- Displays setpoints, adjustments, Alarms and Warning conditions and Operating Mode selections.

**Page**
- Changes menu displayed – Measurement, Adjustment or History.

**Mode ▼ and ▲**

**Horn Reset**
- Deactivates the Horn output.

**Fault Reset**
- Reset Alarms and Warnings.

**▲ and ▼**
- Selects the menu choice, select the setpoint or select the menu or increase/decrease the setpoint value.

**Enter**
- Confirm and accept changed setpoint value.

**Enter + ▲ and ▼**
- Adjusts display contrast.

**Enter+ Fault Reset**
- Clears engine ECU faults.
Digital Engine Controller Description  EM0046A45 (MRS19) Continued

Operating Mode  
Press Mode ◀ or ▶ to scroll though the list of operating modes: Off, Manual and Automatic.
The control mode is shown in the highlighted area at the top of the display, Figure 4-7.
When the desired Control Mode is highlighted, press Start to begin operation.
Press Stop to terminate operation.
OFF – Generator set operation is not allowed.
MAN – Press Start to manually start the generator set immediately.
         Press Stop to stop the generator set immediately.
AUT – Start and Stop buttons are ignored.
The binary input terminal conditions start and stop the generator set.

Display Menus

Three display menus are available: Measurement, Adjustment and history.
Press the Page button repeatedly to display each menu. Use ▲, ▼ and Enter keys to change
and accept setpoint values or press the Page button to cancel changes.

Measurement Menu

The measurement menu, shown in Figure 4-7 displays the operating mode, and operating
parameters such as kW, engine RPM etc.

Figure 4-7 Measurement Menu

OFF MAN AUT

OFF MAN AUT = Control operating mode (highlighted)
! = Alarm indication is active

Ready = Status
kW = Active power produced by generator
PF = Power Factor
RPM = Engine speed in revolutions per minute
Timer = Event counting time (e.g. prestart, cooling etc.)

OFF Mode
Starting of the generator set is not possible. Outputs STARTER (BO1) and FUEL SOLENOID
(BO2) or “ECU PWR Relay” (for units with engine ECU’s) are not active.
No action if buttons START and STOP are pressed.

MAN Mode
START button starts the generator set.
STOP stops the generator set.
This operation is further defined in Table 4-4.

AUT Mode
No action if START button is pressed. The STOP button can be programmed either active or
inactive when controller is on the AUTO mode.
Engine Start/Stop request is given by binary input REM Start/Stop (B11).
### Table 4-4 Manual Mode Sequence Description

<table>
<thead>
<tr>
<th>Menu</th>
<th>Status</th>
<th>Condition of Transition</th>
<th>Action</th>
<th>Next State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready</td>
<td>Start</td>
<td>Prestart time elapsed</td>
<td>STARTER on, FUEL SOLENOID on, MaxCrank time counter started</td>
<td>Cranking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPM &gt; 2 or Oil pressure detected or</td>
<td>STOP SOLENOID on, CrankFail pause timer started</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gen voltage &gt; 10V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off mode selected or Shut down alarm active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Ready</td>
<td>Prestart</td>
<td>Prestart time elapsed</td>
<td>STARTER off, FUEL SOLENOID off, MaxCrank time counter started</td>
<td>Shutdown (Stop fail)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPM &lt; 2, Oil pressure not detected, Vgen &lt; 10V, no shutdown</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>alarm active, other than OFF mode selected</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cranking</td>
<td>RPM &gt; Start RPM</td>
<td>STARTER off, PRESTART off</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D+ input activated or oil pressure detected or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gen voltage &gt; 25% Vgnom</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MaxCrank time elapsed, 1st attempt</td>
<td>STARTER off, FUEL SOLENOID off, STOP SOLENOID on, MaxCrank time</td>
<td>Crank pause</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time counter started</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MaxCrank time elapsed, last attempt</td>
<td>STARTER off, PRESTART off</td>
<td>Shutdown</td>
</tr>
<tr>
<td></td>
<td>Crank</td>
<td>CrankFail pause elapsed</td>
<td>READY TO LOAD on, FUEL SOLENOID on, MaxCrank time counter started</td>
<td>Cranking</td>
</tr>
<tr>
<td></td>
<td>Pause</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30% Nominal speed reached</td>
<td>READY TO LOAD on, FUEL SOLENOID on, MaxCrank time counter started</td>
<td>Running</td>
</tr>
<tr>
<td></td>
<td>Starting</td>
<td>Stop request</td>
<td>READY TO LOAD off, Cooling time timer started</td>
<td>Cooling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPM = 0 or any other shutdown condition</td>
<td>READY TO LOAD off, FUEL SOLENOID off</td>
<td>Shutdown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Running</td>
<td>Stop request</td>
<td>READY TO LOAD off, FUEL SOLENOID off</td>
<td>Shutdown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPM = 0 or any other shutdown condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loaded</td>
<td>Stop request</td>
<td>READY TO LOAD on</td>
<td>Running</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPM = 0 or any other shutdown condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cooling</td>
<td>Stop request</td>
<td>READY TO LOAD on</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPM = 0 or any other shutdown condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stop</td>
<td>Stop request</td>
<td>READY TO LOAD on</td>
<td>Ready</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 sec.Elapsed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some output conditions are optional and may require additional programming of field connection. See appropriate wiring diagram.

### Adjustment Menu

The adjustment menu, Figure 4-8 allows setting engine and generator values such as Passwords, Pre–Start Time, Crank Time, Cool Down Time, Alarm Conditions and values, Shutdown Conditions and values, power transfer settings, etc.

#### Figure 4-8 Adjustment Menu

Use ▲ and ▼ to move the cursor to the desired parameter.
Press ENTER to select the parameter group.
Press PAGE to move to the next page of menu items.

#### Alarm List
Shows the active alarms and warnings. Press fault reset to clear the list.

#### ECU Alarm List
Shows the active ECU (engine control unit) fault codes. Press ENTER + fault reset to clear the list.
Alarms

Following alarms are available:

**Sensor fail (FLS)** see Table 4-5
Sensor fail is detected when measured value is 6% out of selected sensor characteristic.
Sensor fail is indicated by ###### symbol instead measured value.

**Warning (WRN)** see Table 4-5
When warning comes up, only alarm outputs and common warning output are closed.

**Shut down (SD)** see Table 4-5
When the shut-down alarm comes up, InteliLite opens outputs GCB CLOSE/OPEN, FUEL SOLENOID, STARTER and PRESTART to stop the engine immediately. Alarm outputs and common shutdown output are closed. Active or not reset protection disables start.

<table>
<thead>
<tr>
<th>Events specification</th>
<th>Protection type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrm Oil press</td>
<td>WRN</td>
</tr>
<tr>
<td>Sd Oil press</td>
<td>SD</td>
</tr>
<tr>
<td>Wrm Water temp</td>
<td>WRN</td>
</tr>
<tr>
<td>Sd Water temp</td>
<td>SD</td>
</tr>
<tr>
<td>Wrm Wtemp Low</td>
<td>WRN</td>
</tr>
<tr>
<td>Wrm Fuel Level</td>
<td>WRN</td>
</tr>
<tr>
<td>Sd Fuel Level</td>
<td>SD</td>
</tr>
<tr>
<td>Battery voltage &lt;, &gt;</td>
<td>WRN</td>
</tr>
<tr>
<td>Battery flat</td>
<td>SD</td>
</tr>
<tr>
<td>Start fail</td>
<td>SD</td>
</tr>
<tr>
<td>Vgen &lt;, &gt;</td>
<td>SD</td>
</tr>
<tr>
<td>Vgen unbl</td>
<td>SD</td>
</tr>
<tr>
<td>Fgen &lt;, &gt;</td>
<td>SD</td>
</tr>
<tr>
<td>Igen unbl</td>
<td>SD</td>
</tr>
<tr>
<td>Overload</td>
<td>SD</td>
</tr>
<tr>
<td>RPM over</td>
<td>SD</td>
</tr>
<tr>
<td>RPM under</td>
<td>SD</td>
</tr>
<tr>
<td>PickupFault</td>
<td>SD</td>
</tr>
<tr>
<td>Stop fail</td>
<td>SD</td>
</tr>
<tr>
<td>WmServiceTime</td>
<td>WRN</td>
</tr>
<tr>
<td>Emergency Stop</td>
<td>SD</td>
</tr>
<tr>
<td>ECU Common Warning</td>
<td>WRN</td>
</tr>
<tr>
<td>ECU Shutdown</td>
<td>SD</td>
</tr>
</tbody>
</table>
**Inputs and Outputs**

Any Binary input or output can be configured to any controller terminal. Inputs are BI1 – BI7, Outputs are BO1 – BO7) or changed to different function by LiteEdit software. There is fixed 1 sec delay when any binary input is configured as protection.

**Table 4-6 Binary Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td>Alarm type Warning or Shut down</td>
</tr>
<tr>
<td></td>
<td>Alarm active All the time, or Engine running only</td>
</tr>
<tr>
<td>Rem start/stop</td>
<td>External request for engine run. AUT mode only.</td>
</tr>
<tr>
<td>Emergency stop</td>
<td>If the input is opened, shut down is immediately activated. Input is</td>
</tr>
<tr>
<td></td>
<td>inverted (normally closed).</td>
</tr>
<tr>
<td>Rem start/stop</td>
<td>External request for engine run. AUT mode only.</td>
</tr>
</tbody>
</table>

**Table 4-7 Binary outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starter (relay output)</td>
<td>The closed relay energizes the starter motor.</td>
</tr>
<tr>
<td></td>
<td>The relay opens if:</td>
</tr>
<tr>
<td></td>
<td>• The firing speed is reached or</td>
</tr>
<tr>
<td></td>
<td>• Maximum time of cranking is exceeded or</td>
</tr>
<tr>
<td></td>
<td>• Request to stop occurs</td>
</tr>
<tr>
<td>Fuel solenoid (relay output)</td>
<td>Closed output opens the fuel solenoid and enables the engine start.</td>
</tr>
<tr>
<td></td>
<td>The output opens if:</td>
</tr>
<tr>
<td></td>
<td>• Emergency stop occurs or</td>
</tr>
<tr>
<td></td>
<td>• Cooled gen–set is stopped or</td>
</tr>
<tr>
<td></td>
<td>• In pause between repeated starts</td>
</tr>
<tr>
<td>ECU PWR Relay</td>
<td>The output closes at the beginning of Prestart and OPENS if the engine is</td>
</tr>
<tr>
<td></td>
<td>stopped.</td>
</tr>
<tr>
<td>Prestart</td>
<td>Output is closed prior to the engine start (Prestart) and opens when</td>
</tr>
<tr>
<td></td>
<td>START RPM speed is reached.</td>
</tr>
<tr>
<td></td>
<td>During repeated crank attempts the output is closed too.</td>
</tr>
<tr>
<td></td>
<td>The output could be used for pre–glow, pre–heat or prelubrication.</td>
</tr>
<tr>
<td>Common Sd</td>
<td>Output closes when any shut–down alarm appears.</td>
</tr>
<tr>
<td></td>
<td>The output opens, if alarm is not active and FAULT RESET is pressed.</td>
</tr>
<tr>
<td></td>
<td>Used for shunt trip.</td>
</tr>
</tbody>
</table>
**Analog Inputs**

Three analog inputs for resistive sensor 0 to 2400 ohms measuring are available on IL controller. Use LiteEdit software to modify configuration. The Analog inputs values assignment (AI1 = Oil press, AI2 = Water temp, AI3 = Fuel level) is fix. It is possible to configure on each Analog input:

- Reading from IL Analog inputs or from Engine Control Unit via CAN bus (J1939)
- Sensor characteristics – from the list,
- Value dimension (e.g. psi – bars, °F – °C, % – l)
- Number of decimal points (0, 1, 2, ...).

Note: Corresponding Analog input terminal is dead when reading is switched to ECU.

All values from ECU shall show ####, but no alarm is displayed when CAN communication is interrupted.

Warning and shut–down limits are adjusted in Engine protection group.

<table>
<thead>
<tr>
<th>Table 4-8 Analog Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI1 Oil press</td>
</tr>
<tr>
<td>AI2 Water temp</td>
</tr>
<tr>
<td>AI3 Fuel level</td>
</tr>
</tbody>
</table>

**Set points**

<table>
<thead>
<tr>
<th>Table 4-9 Basic Setpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnterPassword</td>
</tr>
<tr>
<td>ChangePassword</td>
</tr>
<tr>
<td>Gen–set name</td>
</tr>
<tr>
<td>Nomin power(3ph)</td>
</tr>
<tr>
<td>Nomin power(1ph)</td>
</tr>
<tr>
<td>CT Ratio</td>
</tr>
<tr>
<td>PT ratio</td>
</tr>
<tr>
<td>Nominal freq</td>
</tr>
</tbody>
</table>
| Gear teeth                | Number of teeth on the engine gear for the pick–up. Set to zero, if no pick–up is used. Engine speed is counted from the generator frequency. Step: 1; Range: 0 – 500 
Note: Generator frequency can be used only when generator voltage (min 5V) is present before reaching of the firing speed (Starting RPM) after start. |
| Nominal RPM               | Nominal engine speed. Step: 1RPM; Range: 100 – 4000 RPM |
| FLTRESGOTOMAN             | DISABLED: Controller stays in AUT mode after Fault reset . ENABLED: Automatic switch from AUT (or TEST) to MAN mode after Fault reset to avoid automatic engine start. This function is active for Shut down protection only. |
| DispBackLightTO           | Timeout after which the display backlight is switched off. Step: 1 min Range: 0 – 60 min Default value: 0 = the display lights all the time |
| Mode IL [ OFF, MAN, AUT ] | Equivalent to Controller mode changes by MODE▶ or MODE◀ buttons. Note: Controller Mode change can be separately password protected. |
| Num rings AA              | Number of rings prior to open modem connection. Step: 1; Range: 1 – 30 Note: NumberRings AA change is not activated immediately. It is activated after controller is switched on or when modem is connected to controller. |
Table 4-10 Engine Setpoints

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start RPM</strong></td>
<td>“Firing” speed when IL controller stops cranking (starter goes OFF). Step: 1% of nominal RPM; Range: 5 – 50%</td>
</tr>
<tr>
<td><strong>Starting POil</strong></td>
<td>When reached controller stops cranking (starter goes OFF). Step: 0.1 psi; Range: -100 – 10000</td>
</tr>
<tr>
<td><strong>Prestart time</strong></td>
<td>Time of closing of the PRE-START output prior to the engine start. Set to zero if you want to leave the output PRE-START open. Step: 1s; Range: 0 – 600 s</td>
</tr>
<tr>
<td><strong>MaxCrank time</strong></td>
<td>Maximum time limit of cranking. Step: 1s; Range: 1 – 60 s</td>
</tr>
<tr>
<td><strong>CnkmFail pause</strong></td>
<td>Pause between crank attempts. Step: 1s; Range: 5 – 60 s</td>
</tr>
<tr>
<td><strong>Crank attempts</strong></td>
<td>Max number of crank attempts. Step: 1; Range: 1 – 10</td>
</tr>
<tr>
<td><strong>Idle time</strong></td>
<td>Idle time delay starts when RPM exceeds Start RPM. Start fail is detected when during Idle state RPM decreases below 2. During the Idle time timer running the binary output IDLE/NOMINAL is opened, when it elapses the IDLE/NOMINAL output closes. Binary output IDLE/NOMINAL opens during Cooling period again. Step: 1 s; Range: 0 – 600 s</td>
</tr>
<tr>
<td><strong>GCB CloseDelay</strong></td>
<td>GCB can be closed earliest GCB CloseDelay after Stabil time when all electric values are in overunder voltage and over–under frequency limits. Step: 1 s; Range: 0 – 300 s</td>
</tr>
<tr>
<td><strong>Stabil time</strong></td>
<td>Generator Nominal voltage is detected during genset start after starter is switched off and Idle time elapses. Electric generator protections are active since detection. Step: 1 s; Range: 0 – 300 s</td>
</tr>
<tr>
<td><strong>MinStpValvTime</strong></td>
<td>Binary output Stop solenoid closes when stop sequence begins and closes at least for MinStpValvTime. Example MinStpValvTime = 20 sec. a) When engine stops (RPM=0) in 10 seconds, Binary output Stop solenoid still stays closed for 10 sec. b) When engine stops in 30 seconds, Binary output Stop solenoid opens 10 seconds after RPM=0 and Vg =0 and Oil pressure = 0. Those 10 sec is fix time for safe stop. Step: 1s; Range: 0 – 180 s</td>
</tr>
</tbody>
</table>

Note: If the Idle function not supported on the governor, set the Idle time nevertheless to minimum 5s to avoid Underspeed possibly caused by instability of the engine short after start.

 Idle Function

- **Start RPM**
- **RPM = 2**
- **BO Starter**
- **BO IDLE/RATED**
- **Idle time**
- **Min stab time**
- **Start Fail**
- **Electric protections active**

Stabil Time

- **BO: STARTER**
- **Idle time**
- **Stabil time**
- **GCB CloseDelay**
- **BO: GCB close/open**

Voltage autodetection

- **open**
- **closed**

MN2417

Operation 4-15
### Table 4-10 Engine Setpoints Continued

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling time</td>
<td>Runtime of the unloaded gen→ set to cool the engine before stop. Step: 1s; Range: 0 – 3600 s</td>
</tr>
<tr>
<td>AfterCoolTime</td>
<td>Runtime of engine after cooling pump. Binary output Cooling pump is closed when the engine starts and opens AfterCool time delayed after gen→ set stops. Step: 1s Range: 0 – 3600s</td>
</tr>
<tr>
<td>CoolingSpeed</td>
<td>Selects the function of the Binary output IDLE/NOMINAL during engine Cooling state. NOMINAL: Cooling is executed at Nominal speed and generator protections are active. IDLE: Cooling is executed at Idle speed and generator protections are switched off. Hint: Binary output IDLE/NOMINAL must be configured and connected to speed governor. Engine Idle speed must be adjusted on speed governor.</td>
</tr>
<tr>
<td>D+ function</td>
<td>ENABLED: The D+ terminal is used for both functions “running engine” detection and charge fail detection. CHRGFAIL: The D+ terminal is used for charge fail detection only DISABLED: The D+ terminal is not used. Note: Magnetization current is independent of this setpoint value.</td>
</tr>
</tbody>
</table>

### Table 4-11 Engine Protect Setpoints

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECUFreqSelect</td>
<td>This setpoint should be used only for Volvo and Scania engines.</td>
</tr>
<tr>
<td>ECU Speed Adjust</td>
<td>This setpoint should be used only for Volvo and Scania engines.</td>
</tr>
<tr>
<td>WTBF Accept RPM</td>
<td>The WTBFAcceptRPM delay setpoint will start to count down since cranking. Controller waits before communicating with the ECU for this time. This is because the JD engine passes some erroneous RPM signals during the first 500ms. Step: 0,1s Range: 0 – 3s</td>
</tr>
<tr>
<td>Eng prot del</td>
<td>During the start of the gen→ set, some engine protections have to be blocked (e.g. Oil pressure). The protections are unblocked after the Protection del time. The time starts after reaching Start RPM. Step: 1s; Range: 0 – 300 s</td>
</tr>
<tr>
<td>Horn timeout</td>
<td>Max time limit of horn sounding. Set to zero if you want to leave the output HORN open. Step: 1s; Range: 0 – 600 s</td>
</tr>
<tr>
<td>Overspeed</td>
<td>Threshold for over speed protection. Step: 1% of nominal RPM; Range: 100 – 150%</td>
</tr>
<tr>
<td>Wm Oil press</td>
<td>Warning threshold level for ANALOG INPUT 1. Step: 1 psi; Range: Sd Oil press – 10000</td>
</tr>
<tr>
<td>Sd Oil press</td>
<td>Shutdown threshold level for ANALOG INPUT 1. Step: 1 psi; Range: –100 – Wm Oil press</td>
</tr>
<tr>
<td>Oil press del</td>
<td>Delay for ANALOG INPUT 1. Step: 1 s; Range: 0 – 180</td>
</tr>
<tr>
<td>Sd Water temp</td>
<td>Warning threshold level for ANALOG INPUT 2. Step: 1 °C; Range: Wm Wtemp – 10000</td>
</tr>
<tr>
<td>Wm Water temp</td>
<td>Warning threshold level for ANALOG INPUT 2. Step: 1 °F; Range: Wm Wtemp low – Sd Water temp</td>
</tr>
<tr>
<td>Wm Wtemp low</td>
<td>Warning threshold level for low value on ANALOG INPUT 2. Step: 1 °F; Range: –100 – Wm Water temp</td>
</tr>
<tr>
<td>Water temp Low del</td>
<td>Delay for ANALOG INPUT 2 Wm Wtemp low. Step: 1 s; Range:1–180 s</td>
</tr>
<tr>
<td>Water temp del</td>
<td>Delay for ANALOG INPUT 2 alarm. Step: 1 s; Range: 0 – 180 s</td>
</tr>
<tr>
<td>Fuel Level del</td>
<td>Delay for ANALOG INPUT 3. Step: 1 s; Range: 0 – 180 s</td>
</tr>
<tr>
<td>Batt overvolt</td>
<td>Warning threshold for high battery voltage. Step: 0,1 V; Range: Batt undervolt – 40V</td>
</tr>
<tr>
<td>Batt undervolt</td>
<td>Warning threshold for low battery voltage. Step: 0,1 V; Range: 8V – Batt overvolt</td>
</tr>
<tr>
<td>Batt volt del</td>
<td>Delay for low battery voltage alarm. Step: 1s; Range: 0 – 600 s</td>
</tr>
<tr>
<td>NextServTime</td>
<td>Counts down when engine running. If reaches zero, an alarm appears. Step: 1h; Range: 0 – 65535h</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Overload</td>
<td>Threshold for generator overload (in % of Nominal power)</td>
</tr>
<tr>
<td></td>
<td>Step: 1% of Nominal power; Range: 0 – 200%</td>
</tr>
<tr>
<td>Overload Wrn</td>
<td>Threshold for generator overload warning (in % of Nominal power)</td>
</tr>
<tr>
<td></td>
<td>Step: 1% of Nominal power; Range: 0 – 200%</td>
</tr>
<tr>
<td>Overload del</td>
<td>Delay for generator overload alarm. Step: 0.1s; Range: 0 – 60.0 s</td>
</tr>
<tr>
<td>Ishort</td>
<td>Shutdown occurs when short circuit limit Ishort limit is reached.</td>
</tr>
<tr>
<td></td>
<td>Step: 1 % of Nominal current; Range: 100 – 500 %</td>
</tr>
<tr>
<td>2lnom del</td>
<td>IDMT curve shape selection. 2lnom del is Reaction time of IDMT protection for 200% overcurrent Igen = 2 * Nominal current. Step: 0.1 s; Range: 0.1 – 20 s IDMT is &quot;very inverse&quot; generator over current protection. Reaction time is not constant but depends on generator over current level according following formula. Reaction time is limited up to 900 sec = 15 minutes. IDMT protection is not active for Reaction time values longer than 15 minutes. Reaction Time = ( \frac{2\text{nom del} \times \text{Nomin current}}{\text{Igen} – \text{Nomin current}} )</td>
</tr>
<tr>
<td>Curr unbal</td>
<td>Threshold for generator current asymmetry (unbalance). Step: 1% of Nominal current; Range: 1 – 100% of Nominal current</td>
</tr>
<tr>
<td>Curr unbal del</td>
<td>Delay for generator current asymmetry. Step: 0.1 s; Range: 0 – 60.0 s</td>
</tr>
<tr>
<td>Gen &gt;V</td>
<td>Shutdown level for generator overvoltage. All three phases are checked. Maximum out of three is used. Step: 1% of Nominal voltage; Range: Gen &gt;V Wrn –200%</td>
</tr>
<tr>
<td>Gen &gt;V Wrn</td>
<td>Warning level for generator overvoltage. All three phases are checked. Maximum out of three is used. Step: 1% of Nominal voltage; Range: Gen &lt;V Wrn – Gen &gt;V</td>
</tr>
<tr>
<td>Gen &lt;V Wrn</td>
<td>Warning level for generator undervoltage. All three phases are checked. Minimum out of three is used. Step: 1% of Nominal voltage; Range: Gen &lt;V – Gen &gt;V Wrn</td>
</tr>
<tr>
<td>Gen &lt;V</td>
<td>Shutdown level for generator undervoltage. All three phases are checked. Minimum out of three is used. Step: 1% of Nominal voltage; Range: 0% – Gen &lt;V Wrn</td>
</tr>
<tr>
<td>Gen V del</td>
<td>Delay for generator under voltage and over voltage alarm. Step: 0.1s; Range: 0 – 60 s</td>
</tr>
<tr>
<td>Volt unbal</td>
<td>Threshold for generator voltage unbalance alarm. Step: 1% of Nominal voltage; Range: 0 – 100% of Nominal voltage</td>
</tr>
<tr>
<td>Volt unbal del</td>
<td>Delay for generator voltage unbalance alarm. Step: 0.1s; Range: 0 – 60.0 s</td>
</tr>
<tr>
<td>Gen &gt;f</td>
<td>Shutdown level for generator over frequency. Step: 0.1% of Nominal frequency; Range: Gen &gt; f Wrn – 200.0%</td>
</tr>
<tr>
<td>Gen &gt;f Wrn</td>
<td>Warning level for generator over frequency. Step: 0.1% of Nominal frequency; Range: Gen &lt; f Wrn – Gen &gt;f Wrn</td>
</tr>
<tr>
<td>Gen &lt;f</td>
<td>Shutdown level for generator under frequency. Step: 0.1% of Nominal frequency; Range: 0.0 – Gen &lt; f Wrn</td>
</tr>
<tr>
<td>Gen &lt;f Wrn</td>
<td>Warning level for generator under frequency. Step: 0.1% of Nominal frequency; Range: Gen &lt; f – Gen &gt;f Wrn</td>
</tr>
<tr>
<td>Gen f del</td>
<td>Delay for generator under frequency and over frequency alarm. Step: 0.1s; Range: 0 – 60.0 s</td>
</tr>
</tbody>
</table>
### Table 4-13 Sensor Spec Setpoints

<table>
<thead>
<tr>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibr AI1, AI2, AI3</td>
<td>Calibrating constant to adjust the measured value of IL analog inputs.</td>
</tr>
<tr>
<td></td>
<td>Physical dimension of calibrating constant is corresponding to Analog input.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-1000$ to $+1000$</td>
</tr>
<tr>
<td>AnOut–kW/20mA</td>
<td>Conversion coefficient from gen–set power to IG–IOM or PTM analog output.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: 1 to 32000</td>
</tr>
</tbody>
</table>

### Table 4-14 IOM/PTM Module Setpoints

<table>
<thead>
<tr>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnlInIOM1 lev1</td>
<td>The level for IOM ANALOG INPUT 1 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM1 lev2</td>
<td>The level for IOM ANALOG INPUT 1 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM1 del</td>
<td>Delay for IOM ANALOG INPUT 1 alarm. Step: 1 s; Range: 0 – 180 s</td>
</tr>
<tr>
<td>AnlInIOM2 lev1</td>
<td>The level for IOM ANALOG INPUT 2 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM2 lev2</td>
<td>The level for IOM ANALOG INPUT 2 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM2 del</td>
<td>Delay for IOM ANALOG INPUT 2 alarm. Step: 1 s; Range: 0 – 180 s</td>
</tr>
<tr>
<td>AnlInIOM3 lev1</td>
<td>The level for IOM ANALOG INPUT 3 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM3 lev2</td>
<td>The level for IOM ANALOG INPUT 3 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM3 del</td>
<td>Delay for IOM ANALOG INPUT 3 alarm. Step: 1 s; Range: 0 – 180 s</td>
</tr>
<tr>
<td>AnlInIOM4 lev1</td>
<td>The level for IOM ANALOG INPUT 4 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM4 lev2</td>
<td>The level for IOM ANALOG INPUT 4 alarm detection.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-100$ to $+10000$</td>
</tr>
<tr>
<td>AnlInIOM4 del</td>
<td>Delay for IOM ANALOG INPUT 4 alarm. Step: 1 s; Range: 0 – 180 s</td>
</tr>
<tr>
<td></td>
<td>The protection of IOM/PTM inputs is activated by over crossing the limits.</td>
</tr>
<tr>
<td>Calibr AnlIOM 1-4</td>
<td>Calibrating constant to adjust the measured value of IOM/PTM analog inputs.</td>
</tr>
<tr>
<td></td>
<td>Physical dimension of calibrating constant is corresponding to Analog input.</td>
</tr>
<tr>
<td></td>
<td>Step: 1; Range: $-1000$ to $+1000$</td>
</tr>
</tbody>
</table>
Figure 4-9 Controller Connection Diagram
Digital Engine Controller Description  EM0046A45 (MRS19) Continued

Figure 4-10 Controller Connection Diagram

[Diagram showing connection points and labels for various components including ECU, Diesel/Gas Engine, Generator, and various signal connections (L1, L2, L3, N, 8-pole Deutsch connector, BO ECU PwrRelay, BO ECU CommOK (EDCIII) / ECU CommError (EMSII), Emergency Stop Control Signals, Remote S/S Access, Lock, S/RINKLER, ANALOG OUTPUTS, DIESEL/GAS ENGINE GENERATOR, RS-232C Interface, and Binary Outputs).]
WARNING: Never “jump start” a generator to start the engine. If the battery charge is insufficient to start the engine, charge or replace the battery and try to restart. Jump starting a battery can cause the battery to explode and cause severe injury or death to anyone in the area.

Caution: If a dead battery is suspected charge battery (or replace), and then attempt starting. Damage to engine control may result from jump starting.

Maintenance
This manual contains only very minimal engine maintenance instructions. Refer to the engine manufacturer’s owner’s manual for specific engine maintenance instructions for your generator set. Any maintenance instructions or recommendations in the engine owner’s manual take precedence over any of the following general recommendations.

**General:**
1. Inspect the fuel system for leaks. Replace all defective components immediately.
2. Inspect and replace any fuel line that shows signs of deterioration.
3. Inspect all the fuel clamps to ensure they are tight.
4. Make sure the fuel cap fits snugly on the fuel tank and that the fuel tank contains no leaks.
5. Inspect and clean the battery posts and the associated battery cable terminals.
6. Inspect the external wire cables and connectors used with the generator set for cuts, fraying, or loose connections. Repair or replace any problems prior to using the unit.

**Engine:**
1. Clean and/or replace any fuel, oil, and/or air filters per the engine manufacturers’ guidelines.
2. Check oil level regularly; at least every 5 to 8 operating hours. Maintain the proper oil level.
3. Change the oil as is recommended in the engine manufacturer’s owner’s manual.
4. Clean the cooling fins on the engine to keep the engine’s heat dissipation potential at its maximum.
5. Inspect and clean all governor and fuel supply linkages so they operate properly.

**Alternator:** (also called Generator End)
This generator set must be run at its proper speed to obtain the correct electrical power at its output. All engines have a tendency to slow down when a load is applied to it. The engine governor is designed to hold the operating speed as nearly constant as possible. When the electrical load is increased, the engine is more heavily loaded and engine speed drops slightly. This slight decrease in engine speed results in a slight decrease in generator voltage and frequency output. This voltage and frequency variation has no appreciable effect in the operation of motors, lights, and most appliances and tools. However, timing devices and clocks may not keep perfect time.

1. Clean the generator set and remove any and all dust, dirt, or other foreign material.
2. Inspect and clean the cooling air intake and exhaust louvers of the generator end. Make sure they are clean. Remove dirt or any buildup that may restrict the cooling air flow.
3. Clean the generator set and its components with a damp cloth or sponge. Never use a water hose or pressure washer as this may damage electrical components.
4. Inspect and replace any control panel components that are broken or not working properly (receptacles, circuit breakers, switches, etc.)
## Troubleshooting and Maintenance

Problems and Solutions

Some of the more common problems are listed in Table 5-1. This information is intended to be a check or verification that simple causes can be located and fixed. It is not an exhaustive “how to” for all types of problems. Procedures that require in depth knowledge or skills (like flashing the field) should be referred to an authorized service department.

**Table 5-1 Troubleshooting Guide**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine will not start</td>
<td>No fuel.</td>
<td>Check that fuel valves are ON. Check fuel level in fuel tank.</td>
</tr>
<tr>
<td></td>
<td>Restricted air flow.</td>
<td>Check/replace air filter.</td>
</tr>
<tr>
<td></td>
<td>Damaged glow plug</td>
<td>Check/replace glow plug(s). Check that engine switch is in Start position.</td>
</tr>
<tr>
<td>Engine will not crank</td>
<td>Dead battery.</td>
<td>Remove battery and trickle charge or replace with new battery.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Never Jump Start.</td>
</tr>
<tr>
<td>Engine starts but will not run smoothly</td>
<td>Fuel or ignition problem</td>
<td>Refer to engine manual.</td>
</tr>
<tr>
<td>Engine overheats</td>
<td>Excessive load</td>
<td>Remove one or more electrical loads.</td>
</tr>
<tr>
<td></td>
<td>Debris or dirt buildup on engine</td>
<td>Remove debris. Clean engine surfaces to allow cooling.</td>
</tr>
<tr>
<td></td>
<td>Low Coolant Level</td>
<td>Replenish coolant</td>
</tr>
<tr>
<td>Output voltage varies</td>
<td>Irregular speed</td>
<td>Check engine for malfunction or load for fluctuation</td>
</tr>
<tr>
<td></td>
<td>Fluctuating speed</td>
<td>Stabilize load. The addition of a lamp load (resistance load) may</td>
</tr>
<tr>
<td></td>
<td></td>
<td>compensate partially for load changes caused by intermittent motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>operation. Do not overload.</td>
</tr>
<tr>
<td></td>
<td>Loose terminal or load connections</td>
<td>Verify all connections are proper and check tightness torque of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>terminals.</td>
</tr>
<tr>
<td></td>
<td>Defective alternator bearing (uneven air gap)</td>
<td>Replace worn bearing</td>
</tr>
<tr>
<td>Low Voltage (0-15 VAC output)</td>
<td>Bad Voltmeter</td>
<td>Measure the voltage across the voltage meter with an accurate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>voltmeter to verify.</td>
</tr>
<tr>
<td></td>
<td>Bad/Open Circuit Breaker/Fuse</td>
<td>Check continuity across Breaker/Fuse. Replace if defective.</td>
</tr>
<tr>
<td></td>
<td>Bad Connection</td>
<td>Check wiring including grounds, crimps and connection points.</td>
</tr>
<tr>
<td></td>
<td>Loss of Residual Magnetism</td>
<td>Repair defects.</td>
</tr>
<tr>
<td></td>
<td>Bad Voltage Selector Switch</td>
<td>The generator needs to be flashed. Contact service center to</td>
</tr>
<tr>
<td></td>
<td>Bad Stator Windings</td>
<td>perform this procedure.</td>
</tr>
<tr>
<td>Low Voltage (15-20 VAC output)</td>
<td>Bad Voltmeter</td>
<td>Measure the voltage across the voltage meter with an accurate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>voltmeter to verify.</td>
</tr>
<tr>
<td></td>
<td>Incorrect Engine Speed</td>
<td>Remove electrical load, output should be 61-62 Hertz adjust engine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>speed if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check continuity across Breaker/Fuse. Replace if defective.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check wiring including grounds, crimps and connection points.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repair defects.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace switch, contact service center to perform this procedure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contact service center to perform this procedure.</td>
</tr>
<tr>
<td>Incorrect voltage output</td>
<td>Bad Voltmeter</td>
<td>Measure the voltage across the voltage meter with an accurate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>voltmeter to verify.</td>
</tr>
<tr>
<td></td>
<td>Incorrect Engine Speed</td>
<td>Remove electrical load, output should be 61-62 Hertz adjust engine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>speed if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check continuity across Breaker/Fuse. Replace if defective.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check wiring including grounds, crimps and connection points.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repair defects.</td>
</tr>
<tr>
<td></td>
<td>Bad Voltage Adj. Rheostat</td>
<td>Replace rheostat, contact service center to perform this procedure.</td>
</tr>
<tr>
<td></td>
<td>Bad Voltage Regulator</td>
<td>Replace regulator, contact service center to perform this procedure.</td>
</tr>
<tr>
<td></td>
<td>Bad Rotor Diodes</td>
<td>Contact service center to perform this procedure.</td>
</tr>
<tr>
<td></td>
<td>Bad Rotor Windings</td>
<td>Contact service center to perform this procedure.</td>
</tr>
<tr>
<td>High output voltage</td>
<td>Excessive speed</td>
<td>Check engine for malfunction</td>
</tr>
<tr>
<td>Problem</td>
<td>Possible Cause</td>
<td>Remedy</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Genset will not pull load</td>
<td>Incorrect Engine Speed</td>
<td>Remove electrical load, output should be 61–62 Hertz adjust engine speed if necessary.</td>
</tr>
<tr>
<td></td>
<td>Load not connected properly</td>
<td>Verify voltage at the load and the connections to the proper receptacle or load terminal block.</td>
</tr>
<tr>
<td></td>
<td>Load too large for unit</td>
<td>Verify load amperage is less than the generator set rated. Note: For inductive loads, use the starting amperage rating of the load (not the running amperage rating). Starting amps may be as much as 5 times the running amps.</td>
</tr>
<tr>
<td>Electrical shock when frame is touched</td>
<td>Static charge.</td>
<td>Ground generator frame at local reference ground (see Section 3). Contact service center.</td>
</tr>
<tr>
<td></td>
<td>Grounded armature or field coil.</td>
<td></td>
</tr>
<tr>
<td>Mechanical noise (alternator)</td>
<td>Defective bearing</td>
<td>Replace bearing.</td>
</tr>
<tr>
<td></td>
<td>Rotor rubbing on stator</td>
<td>Bad bearing – replace.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bent shaft – contact service center.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose end bell – tighten.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose drive Discs – tighten</td>
</tr>
<tr>
<td></td>
<td>Loose or misaligned coupling</td>
<td>Tighten; align coupling and alternator shaft to engine shaft.</td>
</tr>
<tr>
<td>Trailer lights inoperable</td>
<td>Trailer to tow vehicle connection</td>
<td>Connect trailer lighting connector to tow vehicle trailering connector</td>
</tr>
<tr>
<td></td>
<td>Trailer electrical connection not compatible</td>
<td>Use adapter plug to convert from connector style found on trailer to connector style found on tow vehicle or replace connector with compatible mate</td>
</tr>
<tr>
<td></td>
<td>Insufficient Ground connection</td>
<td>Verify there is a ground wire connection from the tow vehicle to the trailer. Do not rely on the trailer tow coupling for the battery ground connection. Repair as necessary. Replace as necessary</td>
</tr>
<tr>
<td></td>
<td>Faulty light bulb</td>
<td></td>
</tr>
<tr>
<td>Trailer sways during towing</td>
<td>Tow vehicle trailering ratings too small</td>
<td>Check tow vehicle ratings meet or exceed the Gross Vehicle Weight Rating (GVWR) of the trailer. Use larger tow vehicle as necessary. Seek expert advise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjust trailer or tow vehicle as necessary for trailer tong to be level or slightly higher than rear of tow vehicle when additional supports have been removed. View and make adjustments while vehicle and trailer are on level surface. Seek expert advise. Reduce tow vehicle speed and use caution while braking. Obey all local laws and regulations, never exceed the posted speed limit, and use reasonable care when towing any type of trailer. Contact local authority having jurisdiction.</td>
</tr>
<tr>
<td></td>
<td>Trailer tongue not level on tow vehicle</td>
<td>Adjust trailer or tow vehicle as necessary for trailer tong to be level or slightly higher than rear of tow vehicle when additional supports have been removed. View and make adjustments while vehicle and trailer are on level surface. Seek expert advise. Reduce tow vehicle speed and use caution while braking. Obey all local laws and regulations, never exceed the posted speed limit, and use reasonable care when towing any type of trailer. Contact local authority having jurisdiction.</td>
</tr>
<tr>
<td></td>
<td>Towing at excessive speed</td>
<td>Reduce tow vehicle speed and use caution while braking. Obey all local laws and regulations, never exceed the posted speed limit, and use reasonable care when towing any type of trailer. Contact local authority having jurisdiction.</td>
</tr>
</tbody>
</table>

Note: After the engine is stopped, there is a 15 second restart delay before engine cranking.

**Fault Shutdowns** Under certain operating conditions, onboard sensors determine that a condition may cause damage if operation continues. The onboard controller is programmed to sound an alarm or immediately stop (shutdown) the generator. These conditions are as follows:

1. An alarm fault is indicated by an alarm light located on the operator panel:
   a. Overspeed – indicates the engine governor allowed speed to exceed safe limits.
   b. Overcrank – indicates engine failed to start within programmed time period.
   c. Low Oil Pressure – Safe engine operating oil pressure was not maintained.
   d. Overtemperature – indicates safe operating coolant temperature was exceeded.
2. Engine cannot be restarted until the alarm condition is corrected.
3. Reset the alarm condition (after alarm condition is corrected) by pressing “Reset”. Operation can be attempted, observe the operator panel when operation is resumed to ensure alarm condition is removed.

**Overload** When maximum current output exceeds the output breaker limit, the main breaker will trip. When this occurs, the load must be reduced and the breaker reset before operation can be resumed.

Note: The Main Breaker cannot be reset if load connection box door is open. This door must be closed before the breaker can be reset to connect the electrical load.

**Service & Parts** Service and parts for your generator can be obtained from an authorized service center. Please have the following information available prior to contacting the service center:

- The model number and serial number of the generator set.
- A complete and accurate description of the part (part number if known).

Note: Engine parts can usually be obtained from a local distributor by using the information in the engine manufacturer’s owner’s manual.
Replacement Parts  Engine parts are identified in the engine manual that was provided with your generator set.

IMPORTANT:  Fuses are installed in the control box to protect the engine controller and associated control circuits. When replacing fuses, use the exact replacement fuse (manufacturer and part number).

Wiring Diagrams  Wiring diagrams for these generators are contained on the following pages of this appendix.
Figure A-1 TS25 Diagram

VOLTAGE REGULATOR

ROTATING RECTIFIER

EXCITER ROTOR

MAIN ROTOR

EXCITER STATOR

MAIN STATOR

SEE SELECTOR SWITCH DRAWING FOR STATOR CONNECTIONS

VR3

2K OHM PANEL MOUNTED VOLTAGE MODIFYING RHEOSTAT

63

63

62

62

VR4

All Wire 16 AWG UNLESS Otherwise Noted
Figure A-2 TS25 Diagram

All Wire 16 AWG UNLESS Otherwise Noted
Figure A-3 TS25 Diagram
Figure A-5 TS25 Diagram
Figure A-11 TS35 Diagram

- **BATT-12** 16 AWG
- **ACT-22** 18 AWG
- **ACT-23** 18 AWG
- **VAC-7** RED 22 AWG
- **VAC-6** DLK 22 AWG
- **ALT** ALTERNATOR
- **SM** STARTER MOTOR
- **GP** GLOW PLUG
- **OPS** OIL PRESSURE SENDER
- **WTS** WATER TEMP SENDER
- **FLS** FUEL LEVEL SENDER
Figure A-16 TS45 Diagram

All Wire 16 AWG UNLESS Otherwise Noted.
Figure A-18 TS45 Diagram
Figure A-21 TS60 Diagram

All Wires 16 AWG UNLESS Otherwise Noted
Figure A-22 TS60 Diagram
Figure A-24 TS60 Diagram
Figure A-29 TS80 Diagram

If the controller has a "COM" terminal for the analog inputs connect wire #125R. If the controller doesn't have a "COM" terminal for the analog inputs feed wire #125R back to the harness.

All Wire 16 AWG UNLESS Otherwise Noted
Figure A-34 TS80 Diagram

Customer Output Connection Box

GCB - Generator Circuit Breaker 225 Amp

Selector Switch

Customer is responsible for determining that packaging product will perform similarly in the intended application.

All Wire 6 AWG UNLESS otherwise noted.
Figure A-38  TS130

Wiring Diagrams A-39

Customer is responsible for determining that Baldor's product will perform suitably in the intended application.

Baldor • Dodge • Reliance

REV: DESCRIPTION: PART-NUMBERS
DATE: 04-05-2020
FILE: VPCA5000070,591

CABLE MOUNTING AIDS:

1. CAN HIGH
2. CAN LOW
3. CAN COMM

CABLE CONNECTIONS:

1. TS130

12 PIN CONNECTOR #1

1. V1
2. V0
3. V3
4. N
5. G1
6. G0
7. C9
8. C6
9. -
10. -
11. -
12. LLI
13. 62
14. 63
15. -

6 PIN CONNECTOR #2

1. 2A
2. 2B
3. 4F
4. 21
5. 22
6. 77
7. 201
8. 33
9. 37
10. 35
11. 83
12. -

6 PIN CONNECTOR #3

1. 33
2. LLI
3. 6
4. N
5. LI
6. -

5 PIN CONNECTOR #4

1. -
2. 77
3. 800
4. 57
5. 4
6. 83

5 PIN CONNECTOR #5

1. -
2. 77
3. 800
4. 57
5. 4
6. 83

CAN BUS CABLES MUST BE CONNECTED IN SERIES FROM THE COMPONENT TO THE NEXT (AND ALL SUBSTEPS), NO STEPS, AND TO BRANCHES.

CAN BUS WIRE TO TERMINAL RESISTANCE WHICH MAY BE PART OF THE CAN BUS TERMINAL RESISTORS WHICH MUST BE INTERNAL TO THE CABLE CONNECTORS. CAN BUS TERMINAL RESISTORS MAY BE IN SERIES WITH THE CAN BUS TERMINAL RESISTORS.
Figure A-41  TS175

VOLTAGE REGULATOR

ROTATING RECTIFIER

EXCITER ROTOR

MAIN ROTOR

EXCITER STATOR

MAIN STATOR

SEE SELECTOR SWITCH DRAWING FOR STATOR CONNECTIONS

2K OHM PANEL MOUNTED VOLTAGE ADJUSTING Rheostat

All Wire 16 AWG UNLESS Otherwise Noted
Figure A-53  TS250

ROTATING RECTIFIER

EXCITER ROTOR

MAIN ROTOR

EXCITER STATOR

MAIN STATOR

SEE SELECTOR SWITCH DRAWING FOR STATOR CONNECTIONS

2K OHM PANEL MOUNTED VOLTAGE ADJUSTING RHEOSTAT

VR3

VR4
Figure A-65  TS350
Figure A-68 TS400
Figure A-71  TS400
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Battery posts, terminals and related accessories are known to the state of California to cause cancer, birth defects and other reproductive harm.