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## ***IDLC Generator***

***(Industrial Diesel Liquid Cooled)***

**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

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#### **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. Contact Baldor for repairs or any questions you may have about the safe installation and operation of this system.

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 contact Baldor 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, contact Baldor or your nearest authorized Baldor representative. We are happy to make sure you understand the information in this manual so that you can safely enjoy the full use of this generator.

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## Symbols

	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.
	or  Hot Surface
	Rotating Parts
	PHASE
	AC
	OPEN
	CLOSE
	<b>GROUND</b> This symbol is shown throughout the manual to indicate a connection to ground reference point.

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

### Operation

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

**WARNING:** To reduce the risk of fire, replace fuse only with the same recommended type and rating.

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#### **Operation Warning Statements** Continued

- 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:** 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 negative battery terminal to prevent accidental engine rotation during servicing.
- 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 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:** 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:** 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.
- WARNING:** Never operate the engine when the air cleaner is removed. An engine backfire can cause serious burns.
- 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:** 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:** Do not smoke near generator during operation or while refueling. Diesel fuel is flammable and can cause fire, explosions, injury or death.
- WARNING:** Stop engine and allow engine to cool before refueling. Diesel fuel is flammable and can cause fire, explosions, injury or death.
- WARNING:** Never store the generator with fuel in the tank. Never store the generator indoors or in an enclosed area or in a poorly ventilated enclosure where fumes may reach an open flame, electrical spark or pilot light as on a furnace, water heater, clothes dryer, etc. Diesel fuel is flammable and can cause fire, explosions, injury or death.
- WARNING:** Keep generator at least four 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:** Keep a fire extinguisher near the generator while generator is in use. An extinguisher rated “ABC” by the National Fire Protection Association is appropriate.

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**Warning Statements** Continued

**Installation**

- 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:** 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:** An open bottom stationary engine generator set must be installed over noncombustible materials and shall be located such that it prevents combustible materials from accumulating under the generator set.
- 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. Contact Baldor for installation or repairs.
- WARNING:** Be sure all wiring complies with the National Electrical Code (NEC) and all regional and local codes. 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:** 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, contact Baldor 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.
- 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:** 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:** 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 to yourself or others. Always remain a safe distance from the object and always wear protective head gear (hard hat).

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## **Warning Statements** Continued

### **Burn**

- 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.

### **Maintenance**

- WARNING:** Before servicing the generator set, be sure to disconnect the battery terminals to prevent accidental engine rotation or starting.
- 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 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:** 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:** 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:** 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:** Check all fuel tanks, supply piping, and their connections monthly for fuel leaks. Diesel fuel is flammable and can cause fire, explosions, injury or death. If a leak is found, replace only with approved pipe or components.
- 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:** 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:** Before servicing the generator set, be sure to disconnect the negative battery terminal to prevent accidental engine rotation or starting.
- 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:** Determine if battery is inadvertently grounded. When inadvertently grounded, remove source of ground. Contact with any part of a grounded battery is capable of resulting in electrical shock. The risk of electrical shock is reduced when such grounds are removed during installation and maintenance (applicable to a generator not having a grounded supply circuit).

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### **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 return the generator to the factory for repair, 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:** Always allow the engine to cool (run at reduced speed with no load) before stopping the engine. Stopping a hot engine under full load can result in overheating and wear or damage to engine components.
- 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.

## Section 2

### General Information

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

Baldor Generators will replace or repair free of charge any part or parts of the generator of their manufacture that are defective in workmanship and materials for a period of time as set forth in the Warranty Period chart below. All Baldor products requiring warranty service shall be transported or shipped freight pre-paid, at the risk of the party requiring warranty service, to a Baldor Generator repair facility, or to Baldor Generators' Customer Service Department in Oshkosh, Wisconsin. Written notification of the alleged defect in addition to a description of the manner in which the Baldor generator is used, and the name, address and telephone number of the party requiring warranty service must be included. Baldor is not responsible for removal and shipment of the Baldor product to the service center or for the reinstallation of the Baldor product upon its return to the party requiring warranty service. Problems with Baldor products can be due to improper maintenance, faulty installation, non-Baldor additions or modifications, or other problems not due to defects in Baldor workmanship or materials. If a Baldor Generator repair facility determines that the problem with a Baldor product is not due to defects in Baldor workmanship or materials, then the party requesting warranty service will be responsible for the cost of any necessary repairs. EXCEPT FOR THE EXPRESSED WARRANTY SET FORTH ABOVE, BALDOR GENERATORS DISCLAIMS ALL OTHER EXPRESSED AND IMPLIED WARRANTIES INCLUDING THE IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY. NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WHETHER OR NOT SIMILAR IN NATURE TO ANY OTHER WARRANTY PROVIDED HEREIN, SHALL EXIST WITH RESPECT TO THE GOODS SOLD UNDER THE PROVISIONS OF THESE TERMS AND CONDITIONS. ALL OTHER SUCH WARRANTIES ARE HEREBY EXPRESSLY WAIVED BY THE BUYER. UNDER NO CIRCUMSTANCES SHALL BALDOR GENERATORS BE LIABLE OR RESPONSIBLE IN ANY MANNER WHATSOEVER FOR ANY INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, OR ANTICIPATED PROFITS RESULTING FROM THE DEFECT, REMOVAL, REINSTALLATION, SHIPMENT OR OTHERWISE. This is the sole warranty of Baldor Generators and no other affirmations or promises made by Baldor Generators shall be deemed to create an expressed or implied warranty. Baldor Generators has not authorized anyone to make any representations or warranties other than the warranty contained herein.

#### **Warranty Period**

<b>Generator Series</b>	<b>Labor*</b>	<b>Parts</b>
Portable Products (Premier, Powerchief, DG Series, K Series)	1 Year	3 Years
Towable Products (TS)	1 Year or 3,000 Hours Whichever comes first	3 Years or 3,000 Hours Whichever comes first
POW'R LITE Light Towers	1 Year or 3,000 Hours Whichever comes first	3 Years or 3,000 Hours Whichever comes first Excluded from any warranty coverage regardless of time period: Light Fixture, Lamps and Ballasts
3600 RPM Standby Systems (Some AE Models)	1 Year or 1,000 Hours Whichever comes first	3 Years or 1,000 Hours Whichever comes first
1800 RPM Standby Systems (Some AE Models, DLC, GLC)	1 Year or 3,000 Hours Whichever comes first	3 Years or 3,000 Hours Whichever comes first
Industrial Standby Systems	1 Year or 1,000 Hours Whichever comes first	2 Years or 1,000 Hours Whichever comes first
Industrial Prime Power Systems	1 Year or 1,000 Hours Whichever comes first	1 Year or 1,000 Hours Whichever comes first
International	1 Year or 1,000 Hours Whichever comes first	1 Year or 1,000 Hours Whichever comes first

\*For products covered under labor coverage, travel expenses will be allowed up to 7 hours straight labor or 300 miles, whichever occurs first and only applies to permanently wired and mounted products (AE, DLC, GLC, IDLC).

No warranty registration card is necessary to obtain warranty on Baldor Generators.

You must save the purchase receipt. Proof of purchase, date, serial number and model number will be required for all portable and Towable products to qualify for any warranty consideration.

For all other products, a start-up inspection form/warranty registration must be completed in its entirety and submitted to Baldor Generators within 30 days of start-up to qualify for any warranty consideration.



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## **Installation Guidelines**

Large generator sets have requirements that smaller generator sets do not. Vibration, noise, heat, air flow, fuel supply issues become more critical for very large power generation systems. The purpose of this document is to assist the consultant in the design and installation of this land based generator set. Closely following these recommendations will assure that the generator is properly installed and will provide many years of trouble free dependable service. These are general guidelines and if your installation requires some detail that is not described in this document, please contact your Baldor representative before you proceed.

### **Intended Use**

This document describes techniques that should be followed to properly install Baldor Generators for stationary land based applications.

### **Important**

Be sure you are completely familiar with all Safety Instructions detailed in product service manual. Do not proceed if you are unsure of any detail. Contact your Baldor Distributor, they are experienced and are happy to assist you and to answer your questions.

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. In addition to these suggestions, before installing your generator you should obtain the most up to date copies of the following documents from the National Electrical Code and other authorities:

- National Electric Code, Articles 230, 250, 445, 517, 700.
- National Fire Protection Association
  - No. 30 – Storage, Handling and Use of Flammable Liquids.
  - No. 37 – Stationary Combustion Engines and Gas Turbines.
  - No. 99 – Essential Electrical Systems for Health Care Facilities.
  - No. 101 – Life Safety Code No. Systems.
  - No. 110 – 1985 Emergency and Standby Power Systems.
- NEMA MG1
- Local Codes applicable to Genset Installation. See your local building inspector.

NFPA (National Fire Protection Association) (617) 770-3000 (includes NEC)  
1 Batterymarch Park, Quincy, MA 02169-7471 USA

NEMA (National Electrical Manufacturers Association) (703) 841-3200  
1300 N. 17th Street, Suite 1847, Rosslyn, VA, 22209 USA

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## Site Planning

### Room Size

Open frame generators must be protected from the environment while having good ventilation and cooling. Here are some considerations for planning a generator room or enclosure:

- Never use the Genset room for storage.
- The room must be large enough to contain the Genset and all the accessories, such as batteries and their charging system, transfer switch and other controls, and elements of the cooling and fuel systems.
- 4 feet minimum must be allowed on all sides for air flow and service access. Allow clearance between hot parts of the system (exhaust) and structural members of the building.
- On the generator end of the engine, allow a space equal to the length of the generator (generator length only, not the entire Genset).
- Certain safety and building codes may require the Genset room not to be used to house any other mechanical or electrical equipment.

**Room Location** Often a separate building located on the site away from the main building is the most simple and cost effective. Major considerations when housing the Genset in a separate building are:

- Maintain the building at a satisfactory temperature year round (to meet applicable codes).
- Assure the Genset is not located so far from the emergency loads that reliability is compromised.
- The floor's load carrying capacity must be checked and must exceed the weight of the Genset and its associated equipment.
- **Engine Cooling System**  
A Genset with an engine mounted radiator is the least costly to install; however, the room must be located in a place where sufficient radiator cooling air can be brought into and exhausted from the room.
- **Exhaust System**  
The exhaust system must minimize exhaust restriction. Exhaust restriction must be correct to ensure proper engine operation. Refer to product specifications for correct exhaust pressure (inches Hg). The exhaust system should be as short and have as few bends as possible. Engine exhaust must be directed away from occupied buildings, windows and doorways.  
For aesthetic reasons, consider exhaust placement in relation to the building. Over a period of time, exhaust gas carbon deposits will tend to accumulate on any nearby wall or structure. Attention must also be given to exhaust noise in selecting placement of the exhaust system.
- **Room Air**  
If the Genset is cooled with an engine mounted radiator, and sufficient air is brought into and exhausted from the room to satisfy the radiator cooling requirements and the combustion air requirements, the room will not overheat when the Genset is running. If a remote mounted radiator or a heat exchanger is used, and adequate air is circulated through the room to keep it at a reasonable temperature, there will be adequate air for combustion.
- **Fuel Tanks (Diesel Only)**  
Locate the fuel storage tank as near the Genset as possible. This will minimize the cost of fuel system installation and will maximize fuel system reliability.
- **Controls and Transfer Switch**  
Locate the control switch gear as close to the emergency loads and the Genset as practical. This will minimize the chances that a failure of the power line to the emergency load will go undetected. In locating the switchgear, accessibility for service and maintenance must be considered.

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## Room Location Continued

- **Genset Noise**

Internal combustion engines produce noise, so the room should be located away from occupied buildings. In addition the Genset room can be treated to reduce noise transmission. In locating the Genset room, both engine, fan and exhaust noise must be considered.

If noise within the Genset room, or noise transmitted to the surrounding parts of the building are a concern, then the room must be made large enough to allow for installation of noise attenuating walls and noise absorbing walls.

Light weight concrete blocks filled with sand or special “sound block” concrete blocks are commonly used. Noise attenuating, tight fitting windows and doors also help reduce noise transmission to the rest of the building.

A double-walled room should be considered. Vibration isolators under the Genset rails will also reduce the transmission of noise through the floor.

- **Code Requirements**

Building and safety codes deal with engine location. These requirements are concerned with fire rated walls, a location that minimizes the possibility of damage to the Genset and interruption of the emergency system due to storms, floods, fire, vandalism, etc.

Codes often deal with the need to maintain certain temperatures in the Genset room and with fuel system location. The most important codes in the USA are the National Fire Protection Association Code Numbers 99 and 110, but local codes must also be observed.

**Utility Power** During periods when the generator is not running, utility power must be provided to power critical components. Battery chargers, block heaters, space heaters and other devices must have power to maintain the generator set components and allow fast easy starting.

## Foundation Design

**WARNING: An open bottom stationary engine Generator Set must be installed over noncombustible materials and shall be located such that it prevents combustible materials from accumulating under the Generator Set.**

### Foundation Checklist

- A. Evaluate if a separate, isolated foundation is required for the application.
- B. Observe local codes on soil bearing capacity freezing and thawing.
- C. Design the separate foundation for the Genset and specify the appropriate concrete mix.
- D. Determine if the application requires vibration isolators and if so, order as a factory option.

The foundation must be strong enough to support the weight of the Genset and its associated equipment, must prevent any deflection of the Genset base and absorb vibration produced by the rotating and reciprocating masses.

### Setting The Genset On An Existing Concrete Floor Slab

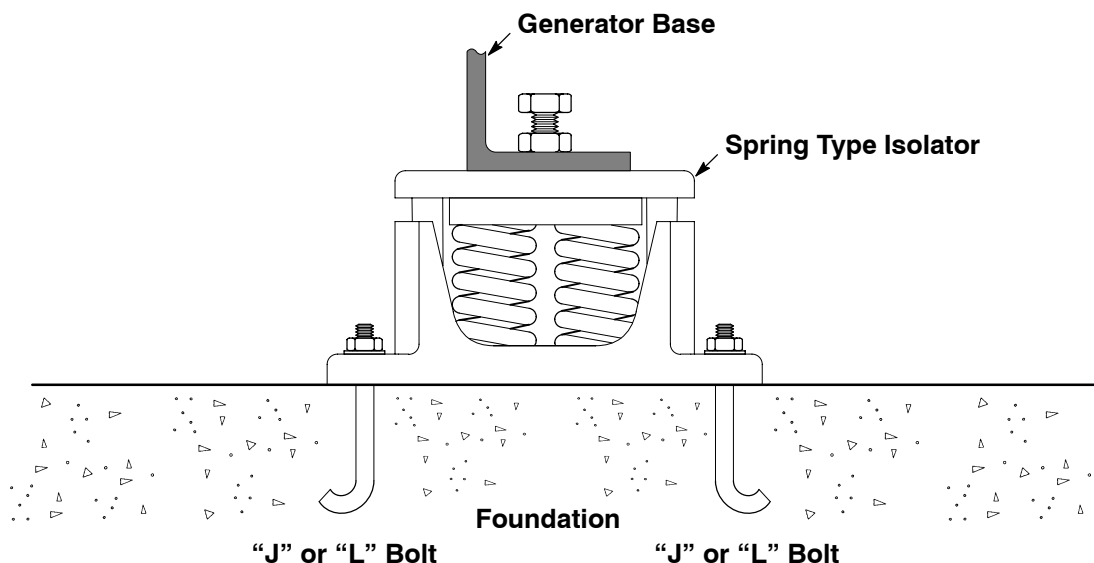
- If an existing floor is used, the floor slab must be strong enough to carry 1.50 times the Genset wet weight (including coolant and oil) to accommodate dynamic loads.
- The actual mounting arrangement (ie., surface area in contact with the floor) will determine the compressive strength required.
- The Genset should be securely fastened to the floor slab with expansion anchors that fit the mounting holes shown on the Genset installation diagram.
- For installations not expected to be permanent, elastomer pad with non-slip surface placed between the base and the floor will also prevent movement.
- Any floor/slab surface should be as flat as possible to prevent sub-base deflection.

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## Vibration Isolators

- Vibration isolators are commonly used to mount the Genset to a concrete pad, Figure 2-1. The purpose of vibration isolators is to reduce the noise and vibration which would be transmitted from the Genset to the foundation or supporting structure.
- A simple and effective method of mounting and applying pad type isolators is to place non-skidding type isolation pads directly between the sub-base and floor. The number of pads required is determined by the rating of the pads and the Gensets weight.

**Figure 2-1 Typical Installation of Spring Type Isolator**



- Steel spring isolators are a very effective and commonly used. Steel spring isolators are typically 95–98% efficient (reduces the transmitted vibration 95–98%) while a pad type can be 75–88% efficient. Spring isolators also level the Genset sub-base in the event the foundation pad is not perfectly level. The base should be mounted to the foundation pad as shown in Figure 2-1 or as recommended by the isolator manufacturer.

A common practice is to pour a concrete pad directly on top of the floor slab and to mount the Genset on this pad. The purpose of the pad is for cleaning around the Genset and to provide a more level base. When using this method, floor strength must support the pad and the Genset. The pad should be at least 6in (150mm) thick and extend beyond the Genset in all directions 12in (300mm).

## Weight of the Genset

The dry weight of the entire Genset is shown on the Generator Set Specification Sheet. The wet weight includes the fluids (coolant and oil).

### Designing an Isolated Foundation

If the Genset cannot be mounted directly on a floor slab, or if it is desirable to isolate it from the floor slab, then a separate foundation slab must be designed.

A massive concrete foundation is not required. Outside dimensions of the foundation should exceed the outside Genset dimensions by 12in (300mm).

For single Genset installation, the foundation weight should be a minimum of 1.50 times the Genset wet weight.

For multiple Genset installation, the foundation weight should be a minimum of 2.0 times the Genset wet weight.

Figure 2-2 shows a method to calculate foundation thickness and the soil bearing load of the foundation and Generator Set. The soil load bearing capacity under the foundation must equal or exceed the load from the foundation and Genset. If it does not, then a footing must be added to spread the load over a larger area.



**Caution:** Check the local building codes for load bearing capacity requirements.

**Caution:** If the soil is subject to freezing and thawing, the foundation must be extended below the frost line. Check the local building codes.

**Figure 2-2 Calculate Soil Bearing Load (SBL) Capacity**

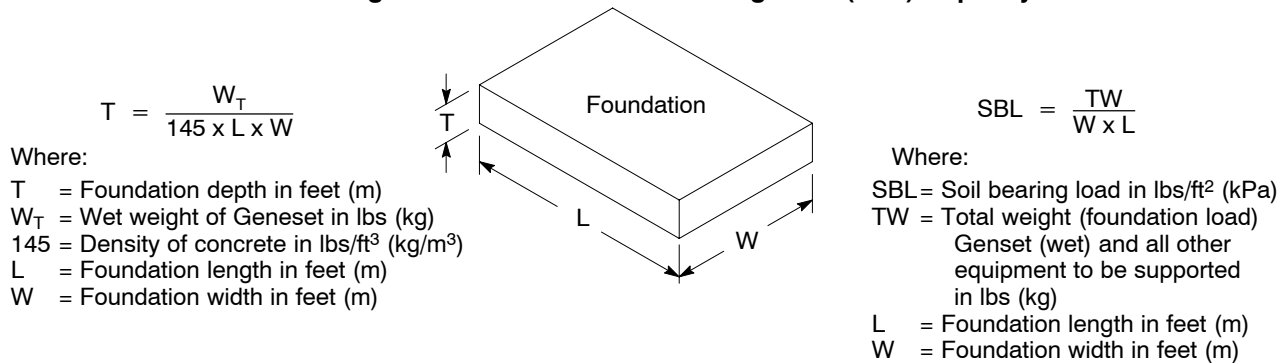


Table 2-1 shows approximate load bearing capacities for various types of soil if the actual load bearing capacity of the soil under the foundation is not known.

**Table 2-1 Approximate Load Bearing Capacities of Various Soil Types**

Soil Type	Safe Bearing Capacity	
	lb per ft <sup>2</sup>	kilo Pascals
Hard Rock – Granite etc.	50,000 – 200,000	2,395 – 9,576
Medium Rock – Shale etc.	20,000 – 30,000	958 – 1,436
Hardpan	16,000 – 20,000	766 – 958
Soft Rock	10,000 – 20,000	479 – 958
Compacted Sand and Gravel	10,000 – 12,000	479 – 575
Hard Clay	8,000 – 10,000	383 – 479
Gravel and Coarse Sand	8,000 – 10,000	383 – 479
Loose, Medium and Coarse Sand	8,000 – 10,000	383 – 479
Compacted Fine Sand	6,000 – 8,000	287 – 383
Medium Clay	4,000 – 8,000	192 – 383
Loose Fine Sand	2,000 – 4,000	96 – 192
Soft Clay	2,000	96

- Reinforce the foundation with No. 8 gauge steel wire mesh placed horizontally on 6in (150mm) centers. As an alternative, use No. 6 re-bars on 12in (300mm) centers horizontally. Minimum cover over the bars should be 3in (76mm).
- Suggested concrete mixture by volume is 1 part cement, 2 parts sand, and 3 parts aggregate. Maximum slump of 4in (100mm) and a 28-day compressive strength of 3000 psi (20,600 kPa).
- The size of the bolts holding the sub-base to the foundation should be sized to fit the mounting holes shown on the installation diagram.
- Three-inch (76mm) iron pipe sleeves should be placed around the bolts in the foundation to allow for any mislocation of the bolts after the foundation hardens. “J” or “L” type bolts are recommended for the foundation bolts.
- After the foundation is cured and the Geneset is located, the sleeves are filled with grout.

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## **Exhaust System**

### **Exhaust Checklist**

- A. Exhaust outlets are not located upwind or near any building air intakes.
- B. Flexible piping section is used at engine exhaust outlet.
- C. Exhaust piping material is adequate for expected service.
- D. Exhaust piping sizing is adequate to prevent back pressure.
- E. Exhaust piping components are insulated as necessary to prevent operator burns and reduce pipe radiant heat losses.
- F. Pipe sleeves or fire proof materials are used where exhaust pipe passes through building materials as per local and state codes.
- G. Exhaust pipe includes rain cap or is horizontal.

The purpose of the exhaust system is to safely discharge the engine combustion products into the atmosphere outside the building. A silencer should be installed in the exhaust system to reduce noise levels. Compliance with local noise codes is always required.

**WARNING: Never allow the exhaust outlet to be positioned so that the exhaust gases are directed towards any openings or air entry routes (doors, windows, vents, etc.) of an occupied building. When discharging the hot exhaust gases out of the building do not direct them towards anything that could catch fire or explode.**

For aesthetic reasons, consider exhaust placement in relation to the building. Over a period of time, exhaust gas carbon deposits will tend to accumulate on any nearby wall or structure. Attention must also be given to exhaust noise in selecting placement of the exhaust system.

### **Level Of Attenuation**

In general, manufacturers offer three grades of silencers: industrial, residential, and critical. Check the attenuation curves for the silencer to assure the desired level of silencing is met.

### **Multi-Engine Installations**

**Caution: Do not connect multi-engine exhaust systems together. Each engine must have its own exhaust system for proper operation.**

Exhaust gases from an operating engine will migrate back through a non-operating engine and cause a hydraulic lock. This may interfere with starting of the second engine. The migrating gases will also tend to turn the turbos which are not being provided lubrication if the engine is not running. Do not use check valves in the exhaust system because they can "stick".

### **Exhaust Manifold**

There are two exhaust manifold types. Dry type which is standard and the optional water cooled. The dry type is simply exposed to the surrounding air and becomes very hot. Shields, insulating wraps, or other types of guards can be used to limit operator contact with the hot surfaces. This practice is common where engine room size is small, creating cramped conditions.

Water cooled exhaust manifolds are not available on all engine models. This type manifold has passages through which engine coolant is circulated to remove heat from the manifold surface. It also will help protect the operator from contact with the hot manifold surface. This will reduce the amount of heat that is radiated by the engine to the surrounding air by approximately 20%. In addition, this type manifold significantly increases the amount of heat the cooling system must dissipate. Marine and Mining Safety Administration (MSA) codes may require water cooled manifolds in all Genset installations. If you are in doubt on your particular application, consult your Baldor Distributor.

Note: If you are using a remote muffler a flexible coupling of 12" or more must be installed between the exhaust line and the manifold to absorb the engine's vibration. However, a short, solid section of pipe between 6" and 8" long should be placed between the connection of the manifold and the flexible coupling. This nipple will reduce the possibility of the hot gases burning up the flexible coupling.

## Exhaust Gas Restriction

The maximum allowable back pressure, or system restriction, is stated in the product specifications data (inches Hg). If this back pressure is exceeded, the air-fuel ratio is reduced due to incomplete scavenging of the cylinders, fuel economy and power output is reduced, engine life is reduced and exhaust temperatures and smoke levels increase. Any restriction of the exhaust gas reduces horsepower. Take every precaution to reduce restriction. Proper design and installation will provide safe Genset operation.

It is essential that engine exhaust systems have the least possible restriction to exhaust gas flow. This can be calculated as shown in Figure 2-3.

**Figure 2-3 Exhaust System Calculations**

$$P \text{ (psi)} = \frac{L \times SL \times Q^2}{5,184 \times D^5}$$

Where:

P = Backpressure in psi (kPa)  
 psi = 0.4912 x in Hg  
 kPa = 0.1333 x in Hg  
 L = Length of pipe in ft (m)  
 Q = Exhaust gas flow ft<sup>3</sup>/min (m<sup>3</sup>/min)  
 D = Inside diameter of pipe in (mm)  
 S = Specific weight of gas lb/ft<sup>3</sup> (kg/m<sup>3</sup>)

$$S \text{ (lb/ft}^3\text{)} = \frac{39.6}{\text{Exhaust Temperature} + 460^\circ\text{F}}$$

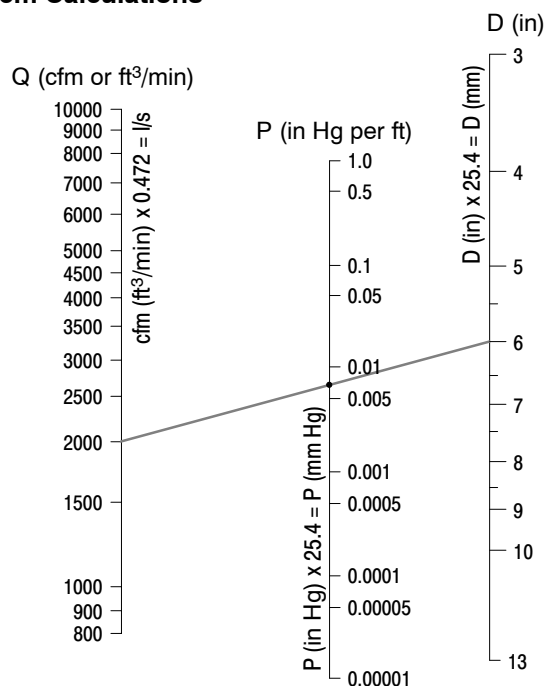
$$S \text{ (kg/m}^3\text{)} = \frac{352.05}{\text{Exhaust Temperature} + 273.16^\circ\text{C}}$$

To obtain equivalent length of straight pipe for each long radius 90° bend:

$$L \text{ (ft)} = 15 \times D \quad L \text{ (m)} = 15 \times D$$

$$L \text{ (in)} = \frac{15 \times D}{12} \quad L \text{ (mm)} = \frac{15 \times D}{1000}$$

Note: For 90° bends, radii of 1.5 times pipe diameter helps reduce resistance and backpressure.



## Exhaust Piping

**Caution:** The weight of the exhaust system must never be imposed on the turbo-charger outlet. Damage to the turbo-charger and other components may result.

An exhaust system must withstand the vibration and thermal expansion that they are subjected to, yet supported well enough to remain independent of the engine.

The most common method of providing flexibility is with the use of bellows type flexible piping.

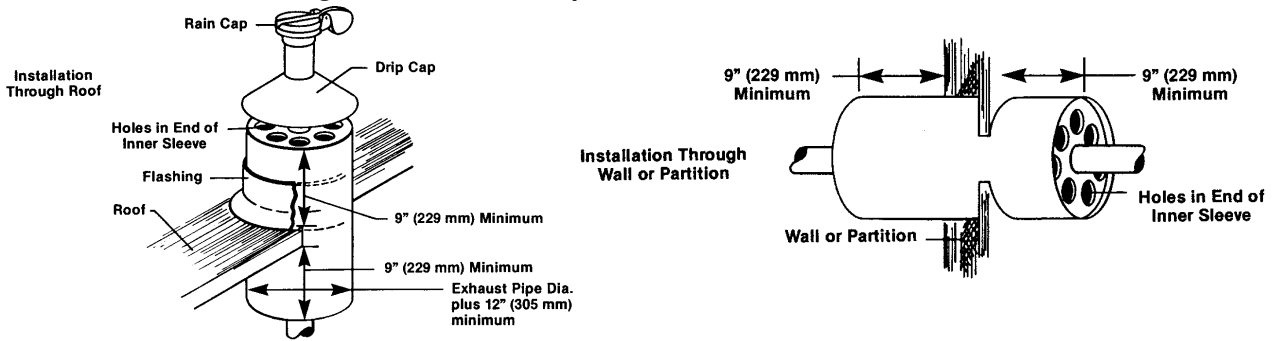
This piping component allows lateral and linear movement of the piping system without subjecting fixed components to excessive stress. A minimum of 12 inches of flexible connection must be provided at the engine exhaust manifold to allow for thermal expansion and vibration. If the engine is to be mounted on spring type vibration isolators, increase the length to 24 inches. This component can be specified to be provided by your Baldor distributor. Flexible pipe should never be used for pipe bends or to cure misalignment problems.

Exhaust piping systems may be supported by a wide variety of methods to long as the system remains flexible, and capable of withstanding thermal expansion.

The material most commonly used for straight runs and elbows in exhaust systems is Schedule 40 black iron. If hanging weight is a problem, other materials may be used. Galvanized piping should never be used in exhaust system. Where exhaust piping passes through combustible material, exhaust thimbles must be used. See Figure 2-4.

Note: Water is one of the by-products of combustion. This water must be kept from draining back into the engine. Slanting the horizontal section of the exhaust system piping downward slightly, away from the engine can do this. A water trap (tee extension with a drain cock) should also be used. The water trap should be located between the flex coupling and the muffler, but as close to the engine as possible on a horizontal section of the exhaust piping.

**Figure 2-4 Exhaust Pipe Thimble Installation**



#### **Wind Barrier** (Noise Barrier shown in Figure 2-5)

Wind blowing against air exhaust or intake openings of the Genset room must be considered, especially where the radiator and fan are located on the engine. Wind blowing against an exhaust opening creates restriction to the fan. Wind blowing against intake openings can blow open gravity louvers causing low temperature and moisture problems in bad weather. A turning vane may be required to prevent exhaust air recirculation between the exhaust louvers and the barrier surface. This will route the exhaust upward into the atmosphere.

#### **Rain Protection**

Moisture entering the engine through an exhaust system can cause extensive damage. Exhaust outlets must have a rain cap or be horizontal to prevent such damage, see Figure 2-4.

#### **Cooling System**

##### **Cooling System Checklist**

- Has noise been considered?
- Has system piping been properly sized?
- Has system been properly protected from freeze up and corrosion?
- Have standby equipment heaters been specified?
- Have all electrically driven devices been connected to load side of EPS connection points?
- Have system drain valves and air eliminators been installed?

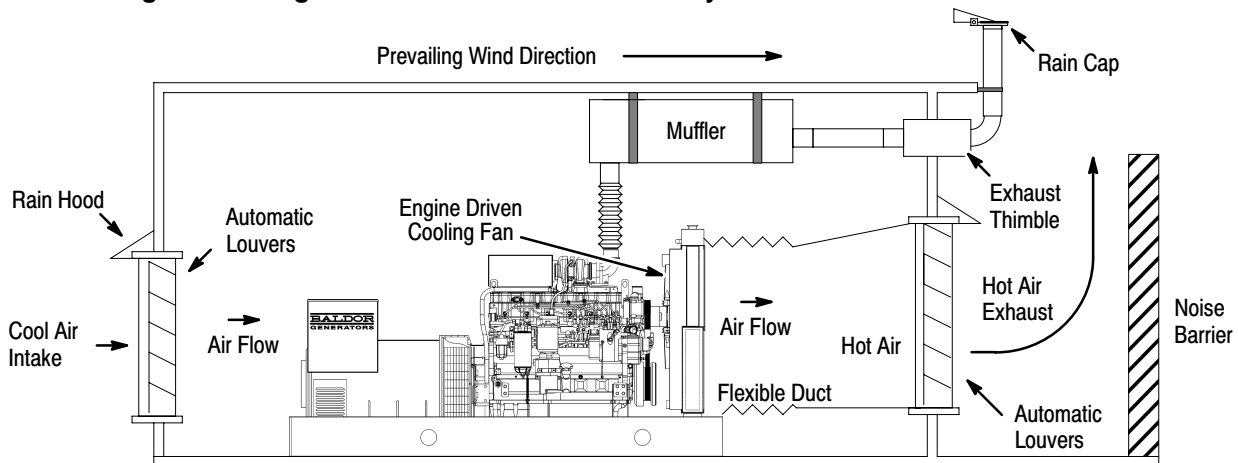
The system consists of the cooling medium which is generally a solution of water and ethylene glycol, a method of rejecting engine produced heat, and a means to transport cooling medium between the engine and heat rejection system. The first determination is the type of cooling system to use – radiator cooling or heat exchanger cooling.

#### **Engine Mounted Radiator Cooling**

The most simple is the engine mounted radiator shown in Figure 2-5. The radiator, water circulating pump, fan and fan drive are mounted to the Generator Set base rails by the factory. This method of engine cooling is the most economical, but may require large ventilation vents and ducts. An added advantage of this arrangement is that the cooling air removes radiated heat from the engine, generator, and other equipment located in the emergency power system room.

The only remaining design work with the engine mounted radiator is arranging a method of providing air to the room, and exhausting it from the radiator. See “Air Systems”.

**Figure 2-5 Engine Mounted Radiator Cooled System With Wind/Noise Barrier**



The ideal setup for cooling air would be to arrange the inlet or inlets such that relatively clean, cool, dry air is drawn across the electrical switchgear, generator, and engine. The air is then drawn into the radiator fan, and is blown through the radiator and exhausted by duct work outside the building. Air inlets must be sized to minimize air restriction and provide the quantity of air required by the radiator fan, engine combustion air, and any other air exhausts which might be used in the room. On engine mounted radiator cooled systems, the engine mounted fan will handle 0.25" of water column. This is combined intake and exhaust restriction.

The room air intakes must be located so as to minimize drawing exhaust fumes and other outside contaminants into the room. Be very cautious about the location of the engine exhausts in relation to room air intakes. Also, when locating the inlet and outlet, the consultant should consider prevailing winds and noise. Motor operated louvers or properly designed and sized gravity louvers should be used on the air intake and exhaust to minimize static pressure drop.

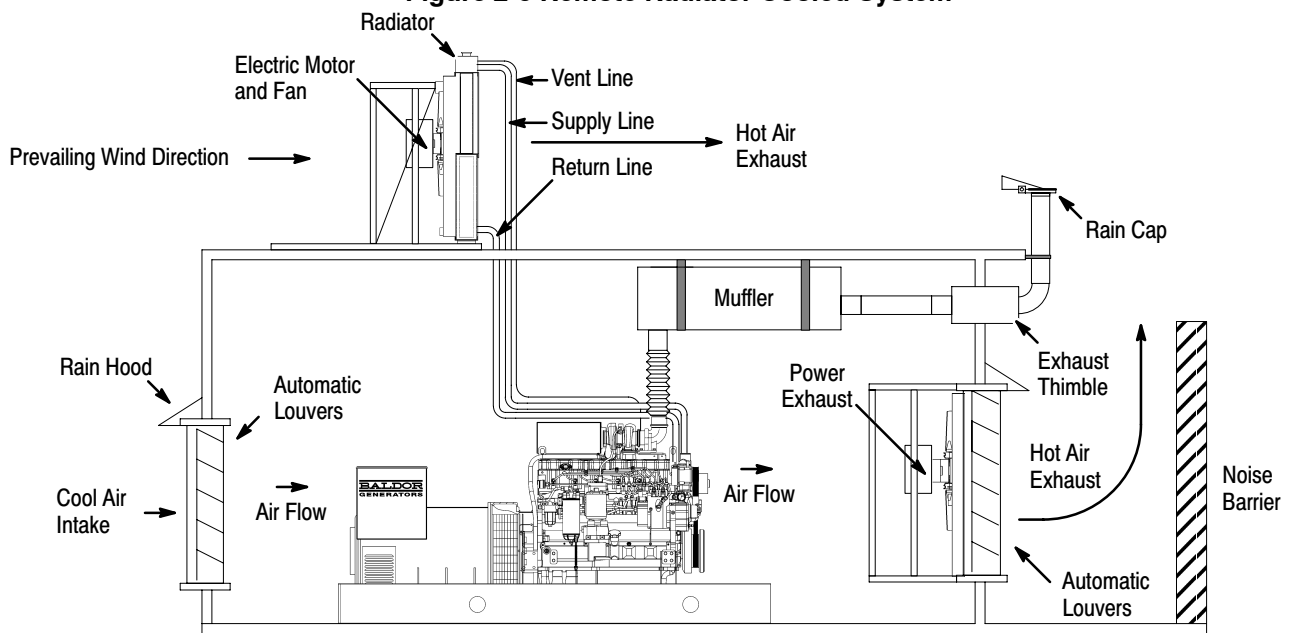
**Caution:** In cold climates, the high volume of outside air drawn into the Genset room can quickly reduce temperatures in the room to freezing. Any water piping or other equipment susceptible to freeze damage should be properly insulated or located elsewhere.

#### Remote Mounted Radiator Cooling

The radiator can be mounted remotely (not mounted directly at the engine). The remote/close system uses the same radiator type except it is mounted in another room or outside the building, but within close proximity to the Genset. See Figure 2-6.

The remote radiator may be mounted either vertically or horizontally. In general, the radiator will have an electric fan to provide cooling air and may be able to utilize the engine mounted coolant pump to provide coolant flow.

**Figure 2-6 Remote Radiator Cooled System**



The piping system friction and head loss between engine and radiator must be calculated and not exceed the capacity of the engine pump. If the maximum coolant friction head loss external to the engine is exceeded, a hot well system must be used. Before designing the piping system using an auxiliary pump and hot well, the consultant should look very closely at increasing the system's pipe size.

Electric motorized Power Exhaust louvers should be connected to the standby Genset and controlled to open whenever the Genset is running. Operable outlet louvers should be temperature actuated on remote radiator or heat exchanger cooled units. Louvers have resistance to air flow. Openings with louvers should be twice the area of an unobstructed opening to provide proper air flow. At times duct work is necessary to provide cooling air for the room. Duct work must be sized and installed according to SMACNA Standards.

The electric fan and auxiliary pump, if used, must be connected to the emergency power system. Radiator and cooling fan must be sized to provide the cooling capacity required at an acceptable sound level.

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Remote radiator and heat exchanger cooled engine cooling systems will not have an engine driven fan. As a result, the consultant must provide a means of supplying air to the room, and exhausting it. The air movement must be provided by an electrically driven fan. This fan may be located in the air inlet or exhaust opening. If the fan is located on the exhaust side, care must be taken to not create a high negative pressure in the room and starve the engine of combustion air.

### **Heat Exchanger Cooling**

In the heat exchanger system, engine coolant is circulated through the shell side of a heat exchanger, while city water, well water, or some other cooling medium, is circulated through the tube side. The primary consideration in this type cooling system is to remember that during certain types of disasters, these cooling mediums may not be available, especially city water. The system is relatively inexpensive to install and maintenance is low. Similar to Figure 2-6 except the heat exchanger mounts between the engine and hot air exhaust (no radiator).

The heat exchanger cooling system can be used with a cooling tower. These systems are complex, and consists of circulating pumps, heat exchanger for engine coolant, and cooling tower for heat rejection. The system design requires that several pieces of equipment be sized and installed. Overall, this system is more expensive than other methods of engine cooling.

### **Hot Well Installations**

One final consideration on the water side is the Maximum Static Head. This is the maximum height allowable from the engine crank center line to the highest point in the coolant system. The maximum static head is specified on generator specification sheets. If this number must be exceeded, a hot well tank system must be used.

The design of hot well tanks and piping systems is somewhat complex. Your authorized Baldor Distributor has experience in the design and installation of hot well systems. Consult your Baldor Distributor if the static head of the coolant system in your Genset application exceeds this criteria and requires a hot well system.

## **Cooling System Design**

### **Remote Radiator Cooling**

Remote Radiator Airflow generally assumed there will be no external restrictions to airflow. If this is not true, restriction must be considered in sizing and selection of a cooling fan and drive motor. Typical examples of restrictions include landscaping, nearby buildings, air turbulence created by buildings or other structures, and sight or noise "screens". See Figure 2-6.

Remote Radiator Fan Motor. Remote radiator cooling systems require the use of an electrically driven fan. This fan must be connected to the emergency power source. Size of the motor is determined by the fan size and fan speed.

1. To specify a radiator to cool the coolant you will need to determine the amount of heat rejected to the coolant. This is listed on the Engine Data Sheet as Heat Rejected to Coolant in BTU/min. for engines using dry or water cooled type exhaust manifolds, as applicable.
2. Determine the minimum water flow required at the engine, and the maximum top tank temperature. Using this information, determine the heat rejection capacity required of the radiator. Radiator systems should be sized with approximately 15% greater capacity than the engine's maximum full load heat rejection to allow for overload and cooling system deterioration. Whether water flow is produced by an engine mounted or auxiliary pump, total piping system friction loss must be calculated. To do this, Genset location, remote radiator location and friction loss within the radiator, and piping system must be estimated.
3. Pressure drop through the radiator must be obtained from radiator manufacturer.
4. If total piping system pressure exceeds the allowable Maximum Coolant Friction Head External to the engine as listed on the Engine Data Sheet, the coolant piping size should be increased and/or a radiator with less restriction must be used.
5. Pressure drop in pipelines and friction of water tables may be found in most mechanical handbooks such as "Cameron Hydraulic Data" handbook.

**Table 2-2**

Fitting Size	Flow Restriction of Fittings Expressed as Equivalent of Straight Pipe (in inches)											
	1.5	2	2.5	3	4	5	6	8	10	12	14	16
90 Elbow	4.4	5.5	6.5	8	11	14	16	21	26	32	37	42
45 Elbow		2.5	3	3.8	5	6.3	7.5	10	13	15	17	19
Long Sweep Elbow	2.8	3.5	4.2	5.2	7	9	11	14	17	20	24	27
Close Return Bend		13	15	18	24	31	37	51	61	74	85	100
Tee–Straight Run		3.5	4.2	5.2	7	9	11	14	17	20	24	27
Tee–Side Inlet or Outlet	9.3	12	14	17	22	27	33	43	53	68	78	88
Globe Valve Open		55	67	82	110	140						
Angle Valve Open		27	33	41	53	70						
Gate Valve Fully Open		1.2	1.4	1.7	2.3	2.9	3.5	4.5	5.8	6.8	8	9
Gate Valve Half Open		27	33	41	53	70	100	130	160	200	230	260
Check Valve		19	23	32	43	53						

### Other Considerations

#### General:

1. Deaeration of the coolant. This can be accomplished through the use of the system deaerators in very large systems, or simply ensuring the radiator top tank or surge tank is at the highest point in the piping system. Unvented piping systems can create air pockets which reduce coolant flow and can lead to engine overheating. Baldor furnished radiators are equipped with deaerating top tanks.
2. Flexible hoses must be installed at all engine connections and to the radiator to isolate vibration and allow for thermal expansion.
3. Drain valves must be installed at the lowest point of the cooling system to facilitate system cleaning and flushing.
4. Water treatment and antifreeze must be added to system coolant. Baldor recommends 50/50 ethylene glycol and coolant treatment for all engines.
5. Thermostatically controlled engine coolant heaters are required to be installed on all standby Gensets. These will increase starting reliability under cold conditions, and improve the start-up load handling ability.
6. According to the NFPA 110, priority level 1 equipment jacket water heaters shall maintain coolant at a minimum of 90 °F (32 °C). In outdoor installations where temperatures will be expected to drop below 32 °F (0 °C), a battery heater should be employed to keep the batteries at a minimum of 50 °F (10 °C), and will shut off at 90 °F (32 °C). All heaters will shut off when the engine is operating. Adequate antifreeze protection will be provided and ether starting aids will not be permitted.
7. The consultant should also consider oil sump heaters if conditions warrant.

#### Heat Exchanger Cooling:

1. If the engine is to be heat exchanger cooled, the system will require a reliable raw cooling water source and controls to regulate water flow during Genset operation.
2. The system will also need a reliable method of starting and stopping water flow automatically. The heat exchanger cooled system may be used with a cooling tower.
3. Baldor Gensets are available with heat exchangers factory mounted on the engine. If a heat exchanger cooled system is required, specify with order.
4. Shell and tube type heat exchangers are connected such that raw cooling water flows through the tube side of the heat exchanger, and engine coolant through the shell side. Tubes are more easily cleaned and the potential for fouling is much greater on the raw water side.
5. For economic reasons, the raw water flow can be regulated by varying the flow of raw cooling water through the heat exchanger. This control can be accomplished with a temperature actuated control valve. The thermostatic bulb for this control must be in the engine jacket water discharge line. The control valve should be a fully modulated type with a minimum flow setting. **NEVER attempt to regulate engine water flow.**
6. Water flow regulators are used only if raw water is from a city or well water source. Do not attempt to regulate flow if a cooling tower is used. Maintain at least 2 ft/second of water flow through the tube side of the heat exchanger.

7. Heat exchanger cooled systems using city or well water, and cooling, tower heat rejection, however, will not be protected on the tube side of the heat exchanger, nor interconnecting piping and cooling tower as engine coolant is not circulated through these components. These systems must be heat traced, and have sump heaters installed to protect the various components when the Genset is on standby.

It must also be noted that if an antifreeze solution is used in the shell side of the engine cooling system heat exchanger, local codes may restrict the discharge of the tube side cooling water after flowing through the heat exchanger.

#### Coolant Treatment:

1. Engine coolant should be treated for corrosion protection and freeze protection. Refer to engine manufacturers Operation and Maintenance manual for correct procedures and mixtures.
2. It is recommended that the consultant specify Baldor supplied DCA and water filters, and Baldor antifreeze.
3. When the proper solution concentration of antifreeze is used with radiators (engine mounted as well as remote mounted), and hot well systems, the system will be adequately protected from freeze-up.

#### Air Flow System

#### Air System Checklist

- A. Air inlet faces the direction of prevailing winds.
- B. Air outlet does not face noise sensitive areas without noise attenuating devices.
- C. All heat loads have been taken into consideration in sizing air flow.
- D. Gravity louvers face inward for air intake and outward for discharge.
- E. Where electrically operated ventilation devices are used, power must be present under all operating situations. Be certain these devices are on the emergency circuit.

The room in which the Generator Set is to be installed must have adequate air flow through it to provide combustion air, and remove heat radiated from the engine, exhaust system and generator. See Figure 2-7 for air flow calculations.

**Figure 2-7 Air Flow Calculations**

$$\text{BTU/minute} \quad V \text{ (cfm)} = \frac{Q_M}{0.0181 \times \Delta T_F}$$

$$\text{BTU/Hour} \quad V \text{ (cfm)} = \frac{Q_H}{1.085 \times \Delta T_F}$$

Where:

V = Ventilating air flow ft<sup>3</sup>/min (m<sup>3</sup>/min)

Q<sub>M</sub> = Heat disipated by the engine, generator and other equipment BTU/min

Q<sub>H</sub> = Heat disipated by the engine, generator and other equipment BTU/hr

kW•h = Heat disipated by the engine, generator and other equipment Kilowatt Hours

ΔT = Premissible room temperature rise in °F or °C

D = Inside diameter of pipe in (mm)

S = Specific weight of gas lb/ft<sup>3</sup> (kg/m<sup>3</sup>)

$$\text{Kilowatt•Hours} \quad V \text{ (m}^3\text{/min)} = \frac{\text{kW} \cdot \text{hr}}{0.02015 \times \Delta T_C}$$

Notes:

1. These calculations assume room ambient of 100°F (38°C)
2. Increase V by 10% for each 2,500 ft (762m) above sea level
3. Increase V by 10% if uninsulated mufflers are inside room
4. Engine data sheet specifies "Radiated heat to ambient" in BTU/min. This value is dry type ad water cooled exhaust manifolds.
5. Generator efficiency is 88 to 95% for Gensets 50kW to 1200kW. 1kW loss = 56.88 BTU/min.



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## **Fuel System (Diesel Only)**

The fuel system must provide adequate and continuous quantities of clean fuel to the Generator Set. Bulk fuel is stored in large tanks, usually outside the building, and fuel is transferred to a smaller tank (day tank) located near the engine.

### **Day Tank**

The quantity of the fuel to be stored by the day tank may be regulated by local or state agencies, and should be given consideration. If not, NFPA and the NEC require that enough fuel be stored to operate the Genset for a minimum of 2 hours depending on the type of facility. For practicality, the day tank should be sized to operate the Genset for two to four hours minimum depending on how critical the availability of standby power is to your client. Engine fuel consumption can be calculated based on Net Generator Output by using the engine performance curve.

High fuel level in the day tank should never be higher than the engine injector level unless the engine is equipped with factory installed check valves. If this condition is encountered, consult your Baldor Distributor. Lateral distance and the number of pipe fittings from the day tank to the engine injector pup should be minimized.

Baldor engines use a fuel bypass type injector. The unused fuel is bypassed and drained away from the engine. This fuel should be returned to the day tank and not the bulk tank. If fuel is returned to the bulk tank, be sure to size the day tank based on fuel flow to the fuel pump and not fuel consumption.

## **Fuel System Placement**

The first decision to be made in this section is where to place the bulk storage tank, the day tank, and how to route the interconnecting piping. Routing of the piping should be as direct as possible, and with few bends as possible. The bulk storage tank placement should receive careful consideration. For aesthetic reasons, the tank should be in an area that will not detract from the building. For practicality, the tank should be located as close as possible to the Genset.

To provide the quickest starting time, and to meet the 10 second starting code requirement imposed by the National Fire Protection Association (NFPA) 110, it is suggested that a "day tank" be used. This tank should be mounted adjacent to the engine. The quantity of the fuel to be stored may be regulated by local or state agencies, and should be given consideration. The U.S. National Electric Code, Article 700 calls for on-site fuel supplies to be capable of operating the Genset at full demand load for at least two hours. Consult NFPA 37 for additional information on fuel storage methods and quantities. NFPA 110 Level 1 lists Genset fuel quantities required by class of installation.

Pipe sizes must be determined and installed so as to not exceed injector pump inlet and injector return line restriction listed on the Engine Data Sheets. The head loss in the pipe system may be calculated. The graph and friction of viscous fluids tables may be found in most mechanical handbooks such as "Cameron Hydraulic Data" handbooks. Refer to product specifications for lift limits and fuel flow data.

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## **Bulk Tank**

Large capacity bulk storage tanks allow delivery of fuel in quantity, and minimize dirt and condensation contamination. Bulk tanks should be kept full to minimize condensation. Bulk tanks may be located above or below ground. For an above ground tank, consider insulating the tank to minimize condensation. Whether the tank is to be above or below ground, the consultant must keep EPA and NFPA, as well as the owner's insurance underwriters requirements in mind.

The bulk tank should be sized to provide several days of standby power. The quantity of the fuel to be stored must be determined based on the length of expected power outages, availability of fuel deliveries, and how critical the availability of long term standby power is to your client.

Engine fuel consumption can be calculated based on Net Generator Output by using the engine performance curve.

High fuel level in the main bulk tank may be above the engine injector level if a day tank is used, and a solenoid valve controlled by a float switch in the day tank is installed in the line to the day tank. The solenoid valve should be operated electrically from battery voltage and have a means for a manual bypass. The manual bypass should be of a "deadman" type to prevent day tank overfill. For safety, a manual shutoff valve should also be installed ahead of the solenoid valve, but should remain open under normal circumstances.

Lateral distances and the number of pipe fittings from the bulk tank to the day tank should be minimized. Piping sizes must be determined and installed so as to not exceed fuel lift pump head as listed on the day tank manufacturer's data sheet. The head loss in the piping system may be calculated using head loss calculation procedures. The consultant should never plan to use any line size smaller than 1 inch nominal between the bulk tank and day tank.

### **General Considerations**

In the design and layout of the fuel piping from the bulk tank to the day tank, it is advisable to either run the piping underground or insulate the line to minimize jelling problems during cold weather. In cold climates, provisions for heat tracing or preheating the fuel in outside enclosures may be necessary. Exposed fuel lines inside the Genset building should meet fire resistance qualifications.

Do not use flexible non-metallic piping unless it meets these requirements. Galvanized, zinc bearing alloy, solid copper, or brass should never be used for fuel piping or storage tanks. These materials can catalyze fuel decomposition and cause fuel filters to plug prematurely. Black steel is recommended.

Fuel tanks should be epoxy resin coated to minimize metal contact and corrosion. Provision should be made in the design of the bulk and day tanks to allow access for checking stored fuel, the addition of additives, and full filtration of stored fuel every 6 to 12 months. If at all possible, the bulk tank(s) should have gravity fill. Every two years, the owner should have the fuel checked and changed out as necessary to remove water, scale, and bacteria.

## **Fuel Type and Grade**

The recommended fuel grade for standby Genset operation is No. 2-D as specified in ASTM D 975. No. 1-D may be used, or a blend of 1-D and 2-D if climatic conditions warrant. The use of common bulk storage tank for a diesel standby Genset and No. 2 burning boilers is generally not recommended. If it is being considered, a careful review of fuel type, expected operating temperatures, and code requirements is necessary.

The Cetane rating of No. 2 boiler oil is usually lower than that required by a diesel engine to provide quick starts. This will reduce Genset start up reliability, especially in cold weather.

NFPA 110 does not allow the fuel supply for standby Gensets to be shared by other equipment on Level 1 type installations. The use of other fuels, including Jet-A and JP-4, in the operation of Gensets is not recommended, as they will result in loss of engine power, and reduction in the life of fuel system components.

## **Multi Engine Considerations**

In a multi-engine installations, fuel piping should not be manifold connections to each engine. Provide a day tank and fuel pump system for each Genset. Also, each day tank should be supplied from the bulk tank individually. If it is desired to operate more than one Genset from a common day tank, please consult your Baldor Distributor.

## Other Fuel System Considerations & Recommendations

1. Specify that a flexible section be used at all fuel system connections at the engine.
2. Tanks must be provided with drain connections or a means to allow condensate and other impurities to be removed periodically from the bottom of tanks.
3. Never allow unions to be installed at the high point in the fuel piping system as they allow air to enter the system.
4. Low fuel level alarm for main and day tanks.
5. Critical low fuel alarm and engine shutdown on day tank.
6. Fuel heater with thermostat in day tank should be used if temperatures around the day tank will be less than 20 °F (–7 °C).
7. High fuel level alarm on day tank.

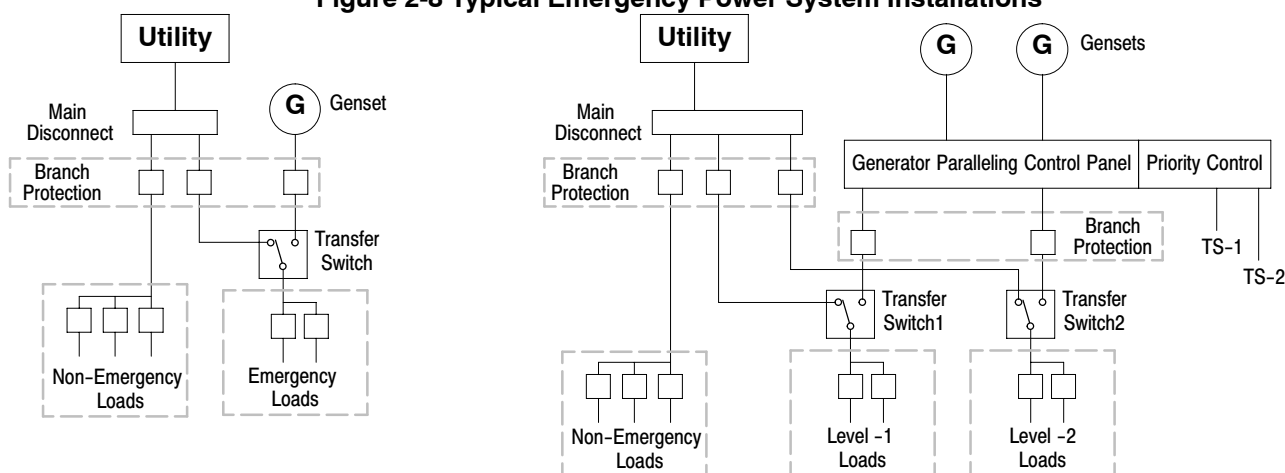
## Transfer Switch

### Transfer Switch Checklist

- A. Locate transfer switch in a clean, dry place, near the emergency load.
- B. Provide a circuit breaker between the Genset and the transfer switch.
- C. Put a flexible connection between the conduit and Genset.
- D. Observe applicable codes in wiring—in the transfer switch and Genset.

The transfer switch connects the Genset to the emergency power system. The emergency power system may include several Gensets and several transfer switches. Typically, the Genset is wired to the emergency power system through a transfer switch as shown in Figure 2-8.

**Figure 2-8 Typical Emergency Power System Installations**



Multiple Gensets can be arranged either in parallel or separately connected to dedicated emergency loads. Figure 2-8 also shows a typical arrangement of two Gensets in parallel with transfer switches for loads that have different levels of priority. A typical multiple Genset installation is shown for NFPA 110 Level 1 and Level 2 emergency power circuits and a priority control to select the appropriate transfer switch.

Wattmeters should be installed on each Genset so load sharing can be checked. The control system should include an automatic paralleling control. Paralleling identical Gensets is not difficult, but paralleling dissimilar sets can cause load sharing problems. When designing an installation that includes the paralleling of dissimilar generators, contract your nearby Baldor Distributor.

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## Transfer Switch Location

The transfer switch location is important and key considerations are:

1. Locate the transfer switch as close to the emergency load as practical to avoid interruptions of the emergency power system due to natural or man-made disasters, or to equipment failures. Consider several small transfer switches instead of one large one to increase reliability.
2. Locate the transfer switch in a clean, dry, well ventilated location, away from excessive heat. When the ambient air is above 104 °F (40 °C), fuses and circuit breakers must be derated. Allow adequate working space around the transfer switch.
3. A circuit breaker (or fuses) should be installed in the line between the generator and the transfer switch. Baldor Gensets are available with properly sized circuit breaker built into the generator control. The circuit breaker can be separately mounted. In the case of very large circuit breakers, a separate floor mounted circuit breaker is easier to wire up than a wall mounted breaker.
4. Install power and control wires in separate solid conduit with flexible sections at the Genset. The flexible sections prevent vibration from damaging the conduit. All power conduits from the Genset must contain all three phases.
5. Never install control wires in the same conduit as power conductors.
6. Conduit, wire, circuit protective device sizes, insulation etc. must conform to applicable local and national codes and regulations.
7. Be certain to seal around conduits that penetrate the walls of the Genset room to reduce the amount of noise that is transmitted to the surrounding areas of the building and maintain site fire code rating.

## Battery Starting System

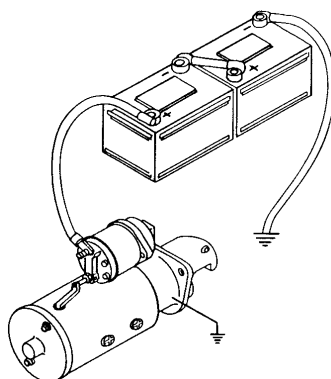
This section describes the battery starting system (nominal 12 or 24 volt rating of the battery supply) for the engine, battery charger, and precautions to take if the ambient temperature is expected to be below 70 °F (20°C).

**WARNING: If batteries are not mounted in the battery rack supplied with the Genset, protect batteries from vibration and do not locate them near a source of flame or spark. 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.**

### Battery Location

Locate batteries as close as possible to the Genset to minimize starting circuit resistance, see Figure 2-9. High starting circuit resistance substantially reduces starting cranking ability. The Genset data sheet lists the maximum allowable cranking system resistance. Mount batteries on a level rack away from dirt and liquids. Allow space for servicing (checking water level and level of charge). Baldor Gensets can be ordered with battery racks already installed. Cold ambient temperature at the battery location substantially reduces the battery output.

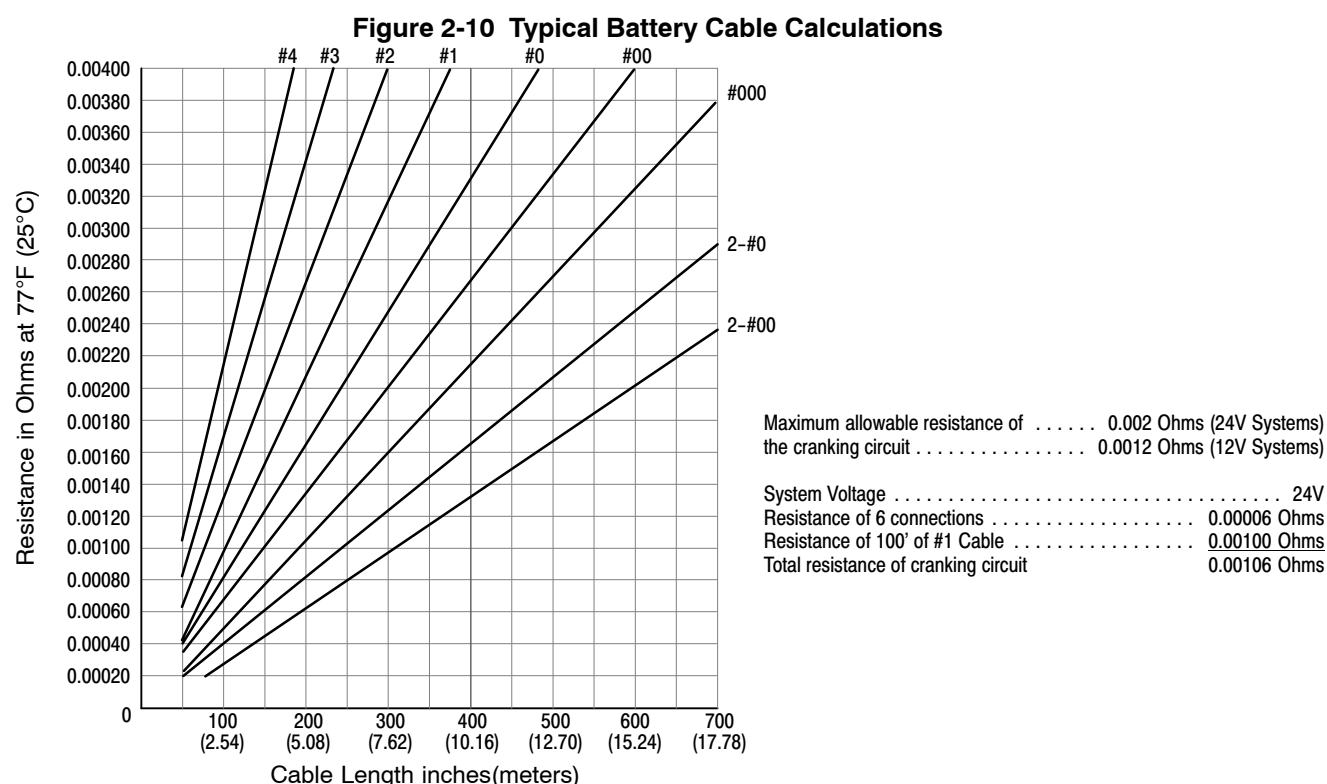
**Figure 2-9 Battery Starting System**



**Battery Size** The ability to start the engine depends upon battery capacity, ambient temperature and coolant and oil temperatures. The Engine/Generator Set Data Sheet lists minimum recommended battery capacity at various ambient temperatures. The recommended battery capacities are listed in the Electric Systems section of the Engine Data Sheet, cold cranking amps (CCA) at 0 °F (–18 °C). Battery capacities decrease as ambient temperatures decrease so it is important to specify batteries with the appropriate CCA rating at a temperature no higher than the minimum ambient temperature for the application. Baldor requires thermostatically controlled coolant heaters on all after cooled standby Gensets. After cooling is called out on the Engine Data Sheet under General Engine Data section as “aspiration”. Oil pan immersion heaters are recommended for standby Gensets housed outside where ambient temperatures may drop below 0 °F (–18 °C). Coolant heaters and oil pan immersion heaters are available from Baldor as factory installed options.

**Battery Charger** An engine mounted alternator to charge the batteries during operation is an available option. Standby Gensets require a solid state battery charger that is connected to utility power so the battery is charged continuously while the Genset is not running. The battery charger should be connected to the emergency circuit. The batteries on prime power Gensets are charged by the engine mounted alternator, if equipped. Harmonic wave forms from solid state battery charges and belt driven alternators can cause the electronic governor on the engine to act erratically. To avoid this, the output of the battery charger or the belt driven alternator must be connected directly to the battery or to the battery terminals on the starter. Make control connections to the Genset control using a conduit with a flexible section at the Genset to avoid damage due to Genset vibrations.

**Battery Cables** The wire size (wire gauge) of the cables connecting the starter to the batteries must be large enough to ensure the resistance of the cranking circuit is less than the “Maximum Allowable Resistance of the Cranking Circuit” as shown on the Engine–Generator Set Data Sheet. The total cranking circuit resistance includes the resistance of the cables from the starting motor to the battery and the resistance of all relays, solenoids, switches, and connections. The resistance of various sizes of cables is shown in Figure 2-10. For purposes of calculating cranking circuit resistance to select cable size, the resistance of each connection can be taken as .00001 ohms and the resistance of each relay, solenoid, and switch can be taken as .0002 ohms. Figure 2-10 illustrates an example of a typical cranking circuit resistance calculation.



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## Formulas

### Single Phase – Electric

Single Phase Power Factor is typically 1.0  
1 kW = 1 kilo Watt = 1,000 Watts

$$\text{Watts} = \text{Volts} \times \text{Amps} \times \text{Power Factor}$$

$$\text{Amps} = \frac{\text{Watts}}{\text{Volts} \times \text{Power Factor}}$$

### Three Phase – Electric

Three Phase Power Factor is typically 0.8  
1 kW = 1 kilo Watt = 1,000 Watts

$$\text{Watts} = (\text{Volts} \times \text{Amps} \times \text{Power Factor}) \times 1.732$$

$$\text{Amps} = \frac{\text{Watts}}{\text{Volts} \times \text{Power Factor} \times 1.732}$$

### Length

inches x 25.40 = mm  
feet x 0.305 = m  
yard x 0.914 = m

mm x 0.03937 = inches  
m x 3.280 = feet  
m x 1.094 = yard

### Area

inches<sup>2</sup> x 6.451 = cm<sup>2</sup>  
feet<sup>2</sup> x 0.0929 = m<sup>2</sup>

cm<sup>2</sup> x 0.394 = inches<sup>2</sup>  
m<sup>2</sup> x 10.764 = feet<sup>2</sup>

### Pressure

pounds/ft<sup>2</sup> x 0.006944 = pounds/in<sup>2</sup>  
psi x 6.8948 = kPa  
psi = 0.4912 inches Hg

pounds/in<sup>2</sup> x 144 = pounds/ft<sup>2</sup>  
kPa x 0.1450 = psi  
kPa = 0.1333 x inches Hg

### Temperature

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 0.55555$$

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32$$

### Torque

oz-in x 0.007062 = Nm  
lb-in x 0.11296 = Nm  
lb-ft x 1.356 = Nm

Nm x 141.6029 = oz-in  
Nm x 8.8495 = lb-in  
Nm x 0.7376 = lb-ft

### Velocity

ft/sec x 0.3048 = m/sec  
miles/hr x 1.6093 = km/hr  
miles/hr x 0.44704 = m/sec

m/sec x 3.2808 = ft/sec  
km/hr x 0.6214 = miles/hr  
m/sec x 3.2808 = ft/sec  
m/sec x 2.2369 = miles/hr

### Volume

inches<sup>3</sup> x 16.388 = mm<sup>3</sup>  
feet<sup>3</sup> x 0.0283 = m<sup>3</sup>  
gallons x 3.785 = liter  
gallons x 0.13337 = ft<sup>3</sup>

cm<sup>3</sup> x 0.06102 = inches<sup>3</sup>  
m<sup>3</sup> x 35.315 = feet<sup>3</sup>  
liter x 0.2642 = gallon

### Miscellaneous

Watt x 0.00134 = hp  
BTU/hr x 0.293 = Watts  
BTU/hr x 0.0003929 = hp

Watts x 3.4122 = BTU/hr  
hp x 2545.177 = BTU/hr

## Section 3

### Receiving & Installation

**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 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. The generator can weigh from 1,400 to 30,000 lbs. Be sure the lift or hoist equipment can safely move the generator over the terrain to avoid tipping over or becoming stuck. These generators are extremely heavy and extreme care must be used to move them into position for installation. If the shipping pallet is intact, use a fork lift to move the generator. If the shipping pallet has been removed, use two steel pipes through the “Lift Point” holes to lift the generator. See Figure 3-1.

**Figure 3-1 Generator Lifting**



**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**

If the generator is installed outdoors there should not be a cooling problem. The factory installed enclosure is designed to keep out undesirable weather elements while providing cooling and ventilation.

**When the Generator is installed in a building it is essential to provide:**

1. Adequate control and exhausting of the heated air.
2. An adequate and constant supply of incoming cooling air.
3. Adequate control and discharge of the engine's hot exhaust gases.
4. Adequate ventilation of the building when the engine shuts down.

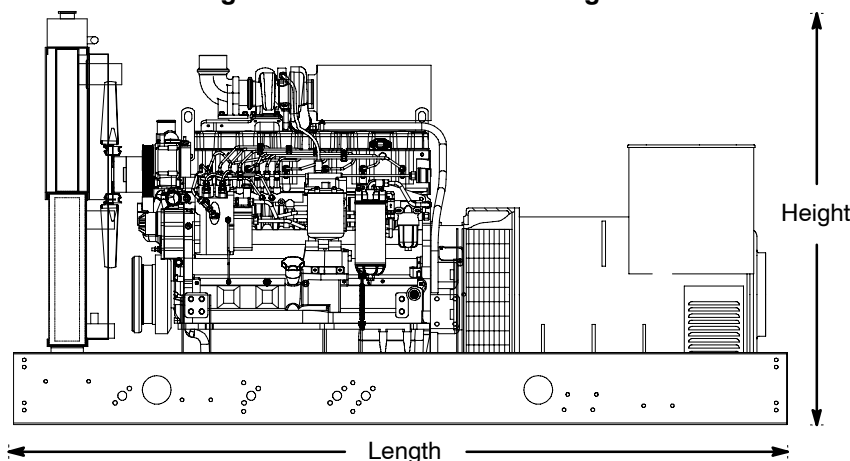
**WARNING: An open bottom stationary engine generator set must be installed over noncombustible materials and shall be located such that it prevents combustible materials from accumulating under the generator set.**

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 fuel supply and 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. Maximum Ambient temperature for IDLC 30–250 kW JD is 104 °F to –20 °F. An optional cooling package is available to extend the maximum ambient temperature to 122°F (50°C).

Other installation considerations are provided in great detail in Section 2 of this manual.

**Figure 3-2 Generator Mounting**



Installation drawings are provided with your generator set. These drawings list all mounting, clearance and other dimensions needed to install your generator set.

### **Secure the Generator**

Mounting holes are provided in the base frame to secure the generator to the concrete pad using suitable anchor hardware (not provided) in the base frame mounting holes. See Figure 3-2.



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**Engine Cooling** A sufficient flow of clean, cool air is required for combustion and to dissipate the heat produced by the engine. Approximately 60% of the heat value of the fuel used is given off as heat (cooling air and exhaust).

The air that will cool the engine must be brought in from outside the building. A sufficient air-flow of rate "Cubic Feet per Minute" (CFM) will allow the incoming fresh air to cool the engine. This requires a power ventilation system of sufficient CFM to be located at the highest possible point of the building to exhaust hot air and draw in cool fresh air.

Note: The exhaust fan must not be located where it could easily become blocked by leaves, snow, water, debris, etc.

It is recommended that the cool air intake have at least three (3) times the cross-sectional area of the power ventilation system. It is also recommended that the cool air intake be located as close as possible to the top of the generator set.

The exhaust fan must be connected to the AC power terminals of the generator set so that when the generator set starts it will provide immediate cooling air flow. The fan will operate until the generator set stops. To test the ventilation system, do the following:

**Ventilation Test**

1. Place a thermometer as close to the cool air intake of the engine's blower housing as you can without allowing the thermometer to touch any material surface.
2. Place another thermometer outside of the building or compartment in the open air (Keep the thermometer out of direct sunlight or any other heat sources).
3. Run the engine under maximum load for an extended period of time (at least one hour).
4. The temperature difference between the two should not exceed 15° F.

Note that opening any door, window or other opening can upset the air-flow pattern and result in a significant reduction in the cooling air-flow across the generator set. This may result in overheating, fire, or explosion. To find out if this is true with your specific application run the Ventilation Test with all doors and windows closed. Then repeat this test with different doors and windows open, and eventually with all the windows and doors open. If any of these tests result in a temperature difference in excess of 15° F, you must not run the generator set under those specific conditions.

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## Hot Exhaust Gasses

**WARNING:** Exhaust fumes/gases are extremely dangerous and can cause severe illness or death. Never breathe 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 gasses must never be directed toward anything that may catch fire or explode.

It is extremely important to discharge engine exhaust gasses away from the engine and out of the building. If these gasses remain in the cylinder, poor performance or eventual engine damage may result. This condition results from excessive back-pressure, which could be caused by any one or a combination of the following conditions:

1. Exhaust pipe too long or the diameter is too small.
2. Excessive number of sharp bends in the exhaust system.
3. Obstruction in the exhaust system.

**Backpressure must not exceed 20" of water column.**

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. In extreme cases this extremely hot air could cause dried grass or other debris to ignite.

Exhaust lines should be as short and straight as possible. Long pipe lengths and elbows tend to resist the flow of gases and accumulate carbon deposits. Each pipe fitting and elbow will further restrict the exhaust flow.

### Guidelines for Exhaust System

1. If you are using a remote muffler it should be mounted as close to the engine as possible, since it will clog with carbon if it's operating temperature is too low.
2. If you are using a remote muffler a flexible coupling of 12" or more must be installed between the exhaust line and the manifold to absorb the engine's vibration. However, a short, solid section of pipe between 6" and 8" long should be placed between the connection of the manifold and the flexible coupling. This nipple will reduce the possibility of the hot gases burning up the flexible coupling.
3. It is extremely important that you do not allow the hot exhaust gases to re-circulate into the engine's cooling air intake.
4. Water is one by-product of combustion and is present in the exhaust pipes or muffler. This water must be kept from draining back into the engine. This can be done by slanting the horizontal section of the exhaust system piping downward slightly, away from the engine. A water trap consisting of a tee extension with a drain cock should also be provided. This water trap should be located between the flex coupling and the muffler, but as close to the engine as possible on a horizontal section of the exhaust piping.
5. 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.
6. The exhaust system is subject to the engine's vibration and it must therefore be solidly secured to reduce mechanical stress and the potential for breakage.
7. The engine's exhaust system is the hottest component of the installation and extreme care and considerations must be given to it.

- 
8. As much of the exhaust piping as possible should be located near the power ventilation exhaust. This will reduce the radiant exhaust heat inside the building.
  9. Keep all fuel and its associated piping away from all components of the engine exhaust system.
  10. After the exhaust system is installed it should be inspected on a regular basis to assure there are no toxic exhaust gas leaks. In some areas this inspection may be provided by your local public service.
  11. A carbon monoxide tester may be installed to detect the presence of the deadly gas during times when you are in the building with the engine running (during testing or maintenance).

**WARNING: Never allow the exhaust outlet to be positioned so that the exhaust gases are directed towards any openings or air entry routes (doors, windows, vents, etc...) of an occupied building. When discharging the hot exhaust gases out of the building do not direct them towards anything that could catch fire or explode.**

**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.**

## **Installation**

The generator is completely assembled, tested and adjusted at the factory before it is shipped to you. 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. Fuel System.
2. Electrical Connections – power wiring (optional transfer switch) and control wiring.
3. Battery (not included).
4. 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: Diesel fuel is 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: 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.**

### **Fuel Connections**

External fuel storage must be used unless an optional sub base fuel storage tank is used. Guidelines and suggestions are provided in Section 2 of this manual. Proper fuel pipe and storage tank sizing is critical to proper operation. Allow a professional to install the bulk tanks and make all fuel connections to the generator. After fuel line connection, prime and bleed the fuel system. All air must be removed from the fuel lines and components to the fuel injectors. Refer to engine manual for procedure.

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**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 emergency 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.

**Circuit Protection** Circuit protection is not provided within the generator. Circuit Breaker protection is an option. If purchased with your generator, the breaker box is mounted to the generator prior to shipment.

**Wire Size** Proper lead wire from the circuit breaker to the automatic transfer switch (or load switching device) is mandatory. See transfer switch information for connection information. When connecting the generator output to an electrical load, a UL listed circuit breaker with the appropriate ratings must be provided within 25 feet of the generator set. Use only copper wires.

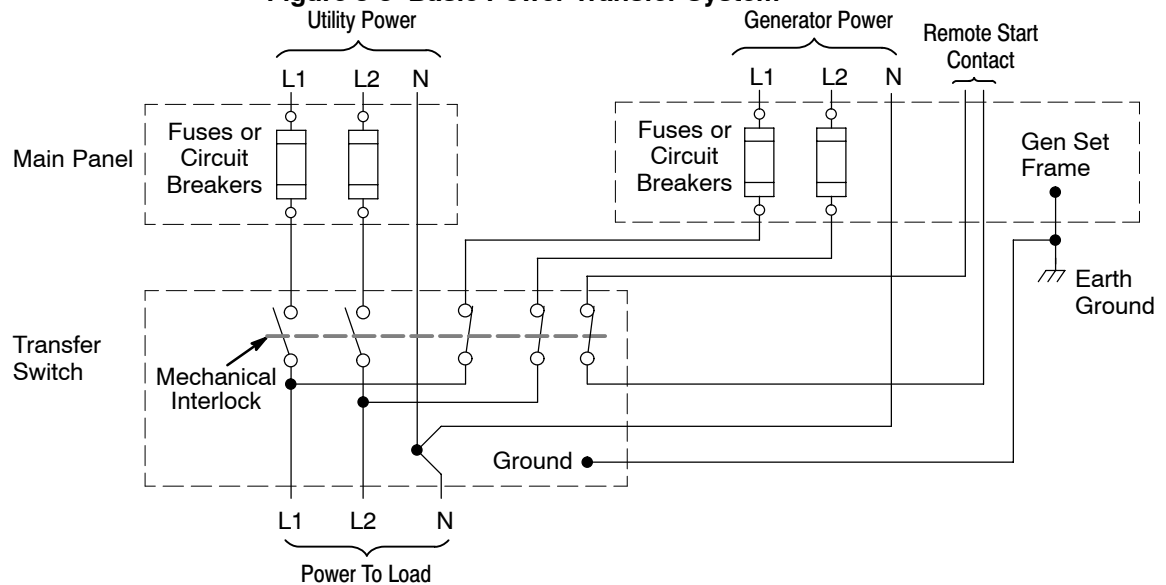
## Transfer Switch Considerations

A transfer switch provides isolation to ensure that Generator power and Utility power can never be connected to a load at the same time. One or the other is permitted, both is never permitted. This ensures that generator power will not backfeed onto the utility power lines and harm utility workers and damage your own equipment.

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 it's 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.

**Figure 3-3 Basic Power Transfer System**



### Remote Start

Connect the remote start contact (from transfer switch) to terminals 13 and 14 of the IDLC generator set.

### Power Connections

Output power connections must be fused within 25 feet of the generator. If the wires to the transfer switch are shorter than 25 feet, connect L1, L2 and N to the transfer switch being sure to follow NEC and local codes. If the wires to the transfer switch are longer than 25 feet, UL requires that branch circuit protection be provided.

### Battery Charger Considerations

1. Mount the battery charger on the generator or as close to the generator as possible.
2. If you mount the battery charger inside the building, mount it near the main breaker box or disconnect box.
3. If you mount the battery charger outside, you must protect it from the environment and the elements.
4. Do not mount the battery charger where flammable liquids or vapors are present.

### 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 hard wired 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.

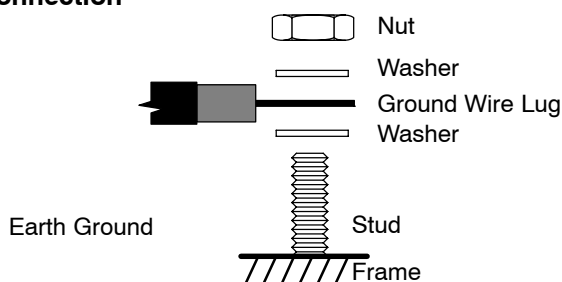
### Frame Ground Connection

**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. Customer ground connection is to be made as shown in drawing BW0571D in Appendix A of this manual.

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 3-4. Use the appropriate size wire as required by NEC and local codes.

**Figure 3-4 Frame Ground Connection**



1. Open the enclosure access panel door 2 ( Figure 3-2).
2. Connect the ground wire to the "earth ground" terminal shown in Figure 3-4. This ground is the local reference ground to ground the generator frame only.

---

**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.

**Battery Connections** The generator is shipped with no battery installed.

**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 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.

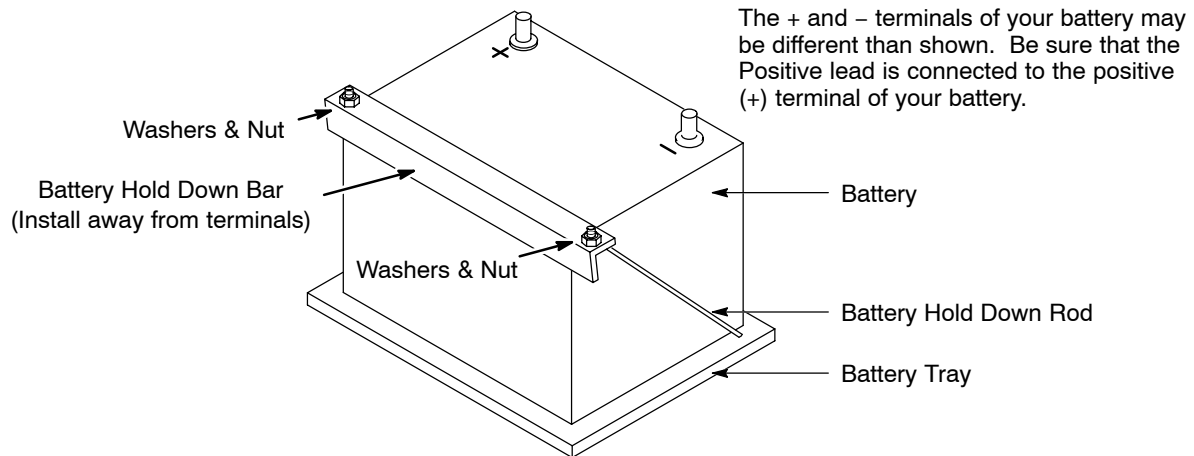
**WARNING:** Disconnect the battery's ground terminal before working in the vicinity of the battery or battery wires. Contact with the battery can result in electrical shock when a tool accidentally touches the positive battery terminal or wire. The risk of such shock is reduced when the ground lead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

**Procedure:** The correct type battery must be installed in the battery compartment provided. 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. Place the correct battery on the tray.
3. Install the Battery Hold Down Bar and Rods as shown in Figure 3-5.
  - 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 3-5 Battery Installation**



4. Connect the positive lead to the positive (+) battery terminal.
5. Connect the negative lead to the negative (-) battery terminal.
6. Do not lay tools or metal parts on top of batteries.
7. Connect charging source to the battery terminals.
8. 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 Battery Type**

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

**Table 3-3**

MODEL	SUMMER OIL	WINTER OIL	OIL CAPACITY	RECOMMENDED BATTERY	(AMPS) COLD CRANKING
IDLC All	20W/50*	5W/30*	*	BCI Group 31	925

\* See engine manufacturer's requirements.

### **Battery Replacement**

Should the battery need replacement, be sure to follow all of the Caution and Warning statements stated in Battery Connections section of this manual. In addition to those precautions, it is very important to remove the ground connection from the battery before performing any service. Also, be sure to disconnect the charging source before removing the old battery.

**WARNING: Determine if battery is inadvertently grounded. When inadvertently grounded, remove source of ground. Contact with any part of a grounded battery is capable of resulting in electrical shock. The risk of electrical shock is reduced when such grounds are removed during installation and maintenance (applicable to a generator not having a grounded supply circuit).**



# Appendix A

## Series IDLC Connection Information

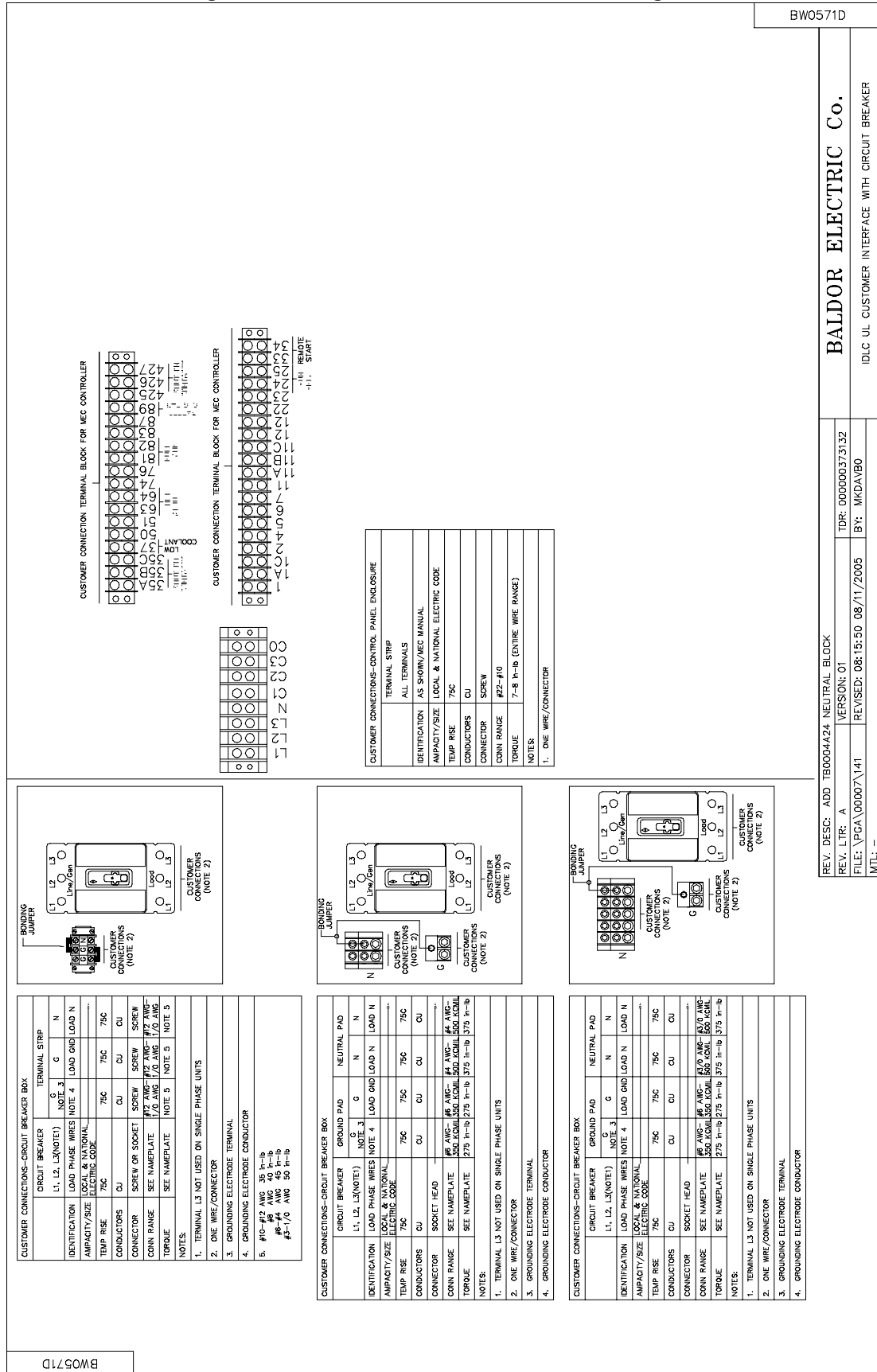
### IDLC Circuit Breaker & Electrical Data

IDLC Model	Alternator					Standby Power			Prime Power		
	Model	Voltage	PH	PF	Voltage Config	kW	Amp	CB Size	kW	Amp	CB Size
IDLC 30	BCI184G	480/277	3	0.8	Series WYE	30	45	50	25	38	40
IDLC 30	BCI184G	240/120	3	0.8	Series Delta	30	90	110	25	75	90
IDLC 30	UCI224C	208/120	3	0.8	// WYE	30	104	125	-	-	-
IDLC 30	BCI184G	208/120	3	0.8	// WYE	28	97	110	25	87	100
IDLC 30	BCI184G	120/240	1	1	Series	30	125	150	25	104	125
IDLC 40	UCI224C	480/277	3	0.8	Series WYE	40	60	70	35	53	60
IDLC 40	UCI224C	240/120	3	0.8	Series Delta	40	120	150	35	105	125
IDLC 40	UCI224C	208/120	3	0.8	// WYE	40	139	150	35	121	150
IDLC 40	UCI224D	120/240	1	1	Series	40	167	200	35	146	175
IDLC 50	UCI224D	480/277	3	0.8	Series WYE	50	75	90	45	68	80
IDLC 50	UCI224D	240/120	3	0.8	Series Delta	50	150	175	45	135	150
IDLC 50	UCI224E	208/120	3	0.8	// WYE	50	173	200	45	156	175
IDLC 50	UCI224D	208/120	3	0.8	// WYE	48	167	200	42	146	175
IDLC 50	UCI224E	120/240	1	1	Series	50	208	250	45	188	225
IDLC 60	UCI224F	480/277	3	0.8	Series WYE	60	90	110	55	83	100
IDLC 60	UCI224F	240/120	3	0.8	Series Delta	60	180	225	55	165	200
IDLC 60	UCI224F	208/120	3	0.8	// WYE	60	208	250	55	191	225
IDLC 60	UCI224F	120/240	1	1	Series	60	250	300	55	229	250
IDLC 70	UCI224F	480/277	3	0.8	Series WYE	70	105	125	60	90	110
IDLC 70	UCI224F	240/120	3	0.8	Series Delta	70	210	250	60	180	225
IDLC 70	UCI224G	208/120	3	0.8	// WYE	70	243	300	-	-	-
IDLC 70	UCI224F	208/120	3	0.8	// WYE	67	232	250	60	208	250
IDLC 70	UCI224G	120/240	1	1	Series	70	292	350	60	250	300
IDLC 80	UCI224G	480/277	3	0.8	Series WYE	80	120	150	70	105	125
IDLC 80	UCI224G	240/120	3	0.8	Series Delta	80	241	300	70	210	250
IDLC 80	UCI274C	208/120	3	0.8	// WYE	80	278	300	70	-	-
IDLC 80	UCI224G	208/120	3	0.8	// WYE	75	260	300	70	243	300
IDLC 80	UCI274C	120/240	1	1	Series	80	333	400	70	292	350
IDLC 100	UCI274D	480/277	3	0.8	Series WYE	100	150	175	90	135	150
IDLC 100	UCI274D	240/120	3	0.8	Series Delta	100	301	350	90	271	300
IDLC 100	UCI274D	208/120	3	0.8	// WYE	100	347	400	90	312	350
IDLC 100	UCI274E	120/240	1	1	Series	100	417	500	90	375	450
IDLC 125	UCI274E	480/277	3	0.8	Series WYE	125	188	225	110	165	200
IDLC 125	UCI274E	240/120	3	0.8	Series Delta	125	376	450	110	331	400
IDLC 125	UCI274E	208/120	3	0.8	// WYE	125	434	500	110	382	450
IDLC 125	UCI274F	120/240	1	1	Series	125	521	600	110	458	500
IDLC 150	UCI274F	480/277	3	0.8	Series WYE	150	226	250	140	210	250
IDLC 150	UCI274F	240/120	3	0.8	Series Delta	150	451	500	140	421	500
IDLC 150	UCI274F	208/120	3	0.8	// WYE	145	503	600	130	451	500
IDLC 150	UCI274G	208/120	3	0.8	// WYE	150	520	600	140	486	600
IDLC 150	UCI274H	120/240	1	1	Series	150	625	700	140	583	700
IDLC 180	UCI274G	480/277	3	0.8	Series WYE	180	271	300	165	248	300
IDLC 180	UCI274G	240/120	3	0.8	Series Delta	180	541	600	165	496	600
IDLC 180	UCI274G	208/120	3	0.8	// WYE	160	555	600	150	520	600
IDLC 180	UCI274H	208/120	3	0.8	// WYE	180	625	700	170	590	700
IDLC 180	HCI444E	120/240	1	1	Series	180	750	900	170	708	800
IDLC 200	UCI274H	480/277	3	0.8	Series WYE	200	301	350	175	263	300
IDLC 200	UCI274H	240/120	3	0.8	Series Delta	200	601	700	175	526	600
IDLC 200	UCI274J	208/120	3	0.8	// WYE	200	694	800	-	-	-
IDLC 200	UCI274H	208/120	3	0.8	// WYE	190	659	800	175	607	700
IDLC 200	HCI444E	120/240	1	1	Series	200	833	1000	175	729	900
IDLC 230	UCI274J	480/277	3	0.8	Series WYE	230	346	400	185	278	300
IDLC 230	UCI274J	240/120	3	0.8	Series Delta	230	692	800	185	556	600
IDLC 230	UCI274J	208/120	3	0.8	// WYE	215	746	900	185	642	800
IDLC 230	HCI444D	208/120	3	0.8	// WYE	230	798	900	-	-	-
IDLC 230	HCI444F	120/240	1	1	Series	230	958	1000	185	771	900
IDLC 250	HCI444C	480/277	3	0.8	Series WYE	250	376	450	225	338	400
IDLC 250	HCI444C	240/120	3	0.8	Series Delta	250	752	900	225	677	800
IDLC 250	HCI444D	208/120	3	0.8	// WYE	250	867	1000	225	781	900
IDLC 250	HCI444C	208/120	3	0.8	// WYE	225	781	900	212	736	900
IDLC 250	HCI444F	120/240	1	1	Series	250	1042	1200	225	938	1000

Circuit Breaker Size	Quantity per Phase	Minimum Wire Gauge	Recommended Wire Size	Ampacity @125°C
15	1	#16	1 - #14 EPDM PER PHASE	40
20	1	#16	1 - #14 EPDM PER PHASE	40
30	1	#14	1 - #8 EPDM PER PHASE	90
40	1	#12	1 - #8 EPDM PER PHASE	90
50	1	#10	1 - #8 EPDM PER PHASE	90
60	1	#8	1 - #8 EPDM PER PHASE	90
70	1	#8	1 - #8 EPDM PER PHASE	90
80	1	#6	1 - #8 EPDM PER PHASE	90
90	1	#6	1 - #6 EPDM PER PHASE	125
100	1	#6	1 - #6 EPDM PER PHASE	125
110	1	#6	1 - #6 EPDM PER PHASE	125
125	1	#4	1 - #4 EPDM PER PHASE	170
150	1	#2	1 - #4 EPDM PER PHASE	170
175	1	#2	1 - #1 EPDM PER PHASE	265
200	1	#1	1 - #1 EPDM PER PHASE	265
225	1	1/0	1 - #1 EPDM PER PHASE	265
250	1	2/0	1 - #1/0 EPDM PER PHASE	305
300	1	4/0	1 - #2/0 EPDM PER PHASE	355
350	1	4/0	1 - #3/0 EPDM PER PHASE	410
400	2	#1	1 - #4/0 EPDM PER PHASE	475
450	2	1/0	2 - #1/0 EPDM PER PHASE	610
500	2	1/0	2 - #1/0 EPDM PER PHASE	610
600	2	3/0	2 - #2/0 EPDM PER PHASE	710
700	2	4/0	2 - #3/0 EPDM PER PHASE	820
800	3	2/0	2 - #4/0 EPDM PER PHASE	950
900	3	3/0	3 - #2/0 EPDM PER PHASE	1065
1000	3	3/0	3 - #3/0 EPDM PER PHASE	1230
1200	3	250	3 - #4/0 EPDM PER PHASE	1425
1400	4	4/0	4 - #4/0 EPDM PER PHASE	1900
1600	4	250	4 - #4/0 EPDM PER PHASE	1900
2000	5	250	5 - #4/0 EPDM PER PHASE	2375
2500	6	250	6 - #4/0 EPDM PER PHASE	2850
3000	7	250	6 - #250 EPDM PER PHASE	3180
4000	8	300	8 - #250 EPDM PER PHASE	4240

**Wiring Diagrams**    Wiring diagrams for these generators are contained on the following pages of this appendix.

### Figure A-1 Customer Interface Connection Diagram





**Start-up Inspection Form** It is required that both sides of this form be completed, signed where indicated and returned to Baldor Generators within 30 days of initial Start-up and test.  
It is your responsibility to deliver copies to:

☒ Baldor Generators Factory ☒ Baldor Distributor ☒ Customer

**BALDOR**  
**GENERATORS**

# START-UP INSPECTION FORM

For Standby, Automatic Emergency and Prime Power Generators

## Distributor Information

## End User / Owner Information



Name:	Name:
Address:	Address:
Phone:	Phone:

Model Number:	Job Number:
_____ RPM _____ Hz _____ P.F.	<input type="checkbox"/> Standby <input type="checkbox"/> Continuous
_____ kW _____ Volts	_____ KVA _____ Amps.
Engine Model #:	Generator Model #:
Engine Serial #:	Generator Serial #:

List Items Installed by Distributor:	List Items Installed by Others:

Engine Hour Meter	Power Output kW No Load	Voltage (Phase-to-Phase)			Current				Oil Temp.	Oil Pressure	Water Temp.	Ambient Temp.
		1-2	2-3	3-1	1	2	3	Hz				

Start-up Performed by:	Date:
Address:	Technician:
Phone:	Customer Signature:

 Pre Start-up Check List	 Start-up Procedure
No freight damage (Components tight, straight, etc.).	Check that all applicable warning decals are in their proper place and are legible.
Proper belt alignment and tensions.	The ATS remote start wires and other DC wires, if any, must be properly connected.
Flex fuel lines installed between engine and tank.	All wiring connections are tight.
Fluid levels (Oil, Antifreeze, Battery, Governor, etc.) Check for leaks, tighten as necessary.	The equipment room is clean & all unrelated materials removed.
Correct fuel and exhaust plumbing.	The equipment is protected from possible fire damage by fire extinguisher system.
Adequate air flow.	Earthquake protection (when applicable) is adequate for the equipment.
Correct AC wire sizes and connections.	Open generator mainline breaker or remove fuses.
Correct DC wire sizes and connections (route separate from AC).	Turn down speed potentiometer (electronic governor) or speed screw (mechanical governor).
Block heater is operational.	Move switch to "manual". Let the engine start & run.
Bleed and prime the fuel system; check for leaks. Correct as necessary.	After a few minutes, check oil pressure & check for leaks.
Verify that generator load connectors of proper ampacity are connected to either the circuit breaker or the emergency side of the transfer switch.	Adjust the speed to 60/50Hz if equipped with electronic governor or 63/53 Hz with mechanical governor.
Fuel solenoid and valve are properly functioning.	If speed is unstable, adjust per engine or governor manual.
Exhaust line and flexible connections are properly installed without excessive bends and restrictions.	Adjust the AC voltage to match the normal source.
Exhaust system termination properly located to prevent entry of exhaust gas into building.	Let the unit run until engine reaches proper water temp.
Batteries properly filled with electrolyte & properly connected to the engine.	Close generator mainline breaker or replace fuses.
Battery charger must be properly installed & connected to the battery. Battery must be fully charged prior to start-up.	Manually over-speed the unit until engine shutdown (68-70 Hz for 60 Hz generators ; 58-60 Hz for 50 Hz generator sets).
The nameplate voltage & frequency of the Genset matches that of ATS (automatic transfer switch) & normal source.	Test automatic shut-downs (low oil pressure, low coolant level, high coolant temperature, Overspeed set to _____ Hz Other_____)
	<b>*** Instruct End User On Functions Of Unit ***. Set times to customer's request and run a simulated power outage.</b>
	<b>Instruct the customer in proper operation &amp; maintenance of the system and make sure they have correct manuals.</b>

Return this completed form to:

**BALDOR GENERATORS**  
**P.O. Box 2400**  
**Ft. Smith, AR 72902-2400**

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FAX: 586-978-9969  
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GRAND RAPIDS, MI 49504  
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FAX: 616-785-1788

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FAX: 901-365-3914

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FAX: 780-438-2600

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FAX: 905-829-3302

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PORT COQUITLAM, BC V3C 5M5  
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FAX: 604-421-3113

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SEVEN HILLS, NSW 2147,  
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FAX: (61) (2) 9674 2495

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AUSTRALIA  
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RESIDENCIAL PINARES DE SUIZA  
POL. 15 #44, NVA. SAN SALVADOR  
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808 HONG QIAO ROAD  
SHANGHAI 200030  
PHONE: 86-21-64473060  
FAX: 86-21-64078620

### GERMANY

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D-85551 KIRCHHEIM  
MUNICH, GERMANY  
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FAX: (49) (89) 90508 - 492

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KANAGAWA-KU  
YOKOHAMA, 221-0835, JAPAN  
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FAX: 81-45-412-4507

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COMMERCIAL COOPERATIVE  
396-16 CHEONGCHEON 2-DONG,  
BUPYEONG-GU  
INCHEON, KOREA, 403-858  
PHONE: 82 32 508 3252  
FAX: 82 32 508 3253

### MÉXICO

KM. 2.0 BLVD. AL AEROPUERTO  
LEÓN 37545, GUANAJUATO, MÉXICO  
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FAX: 52 477 761 2010

### MIDDLE EAST & NORTH AFRICA

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SUITE 100W  
ARLINGTON HEIGHTS, IL 60004  
PHONE: 847 590 5547

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K B WAREHOUSE COMPLEX  
SINGAPORE 417863  
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FAX: (65) 6 747 1708

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CH-8245 FEUERTHALEN  
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### TAIWAN

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TUNHUA S ROAD,  
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