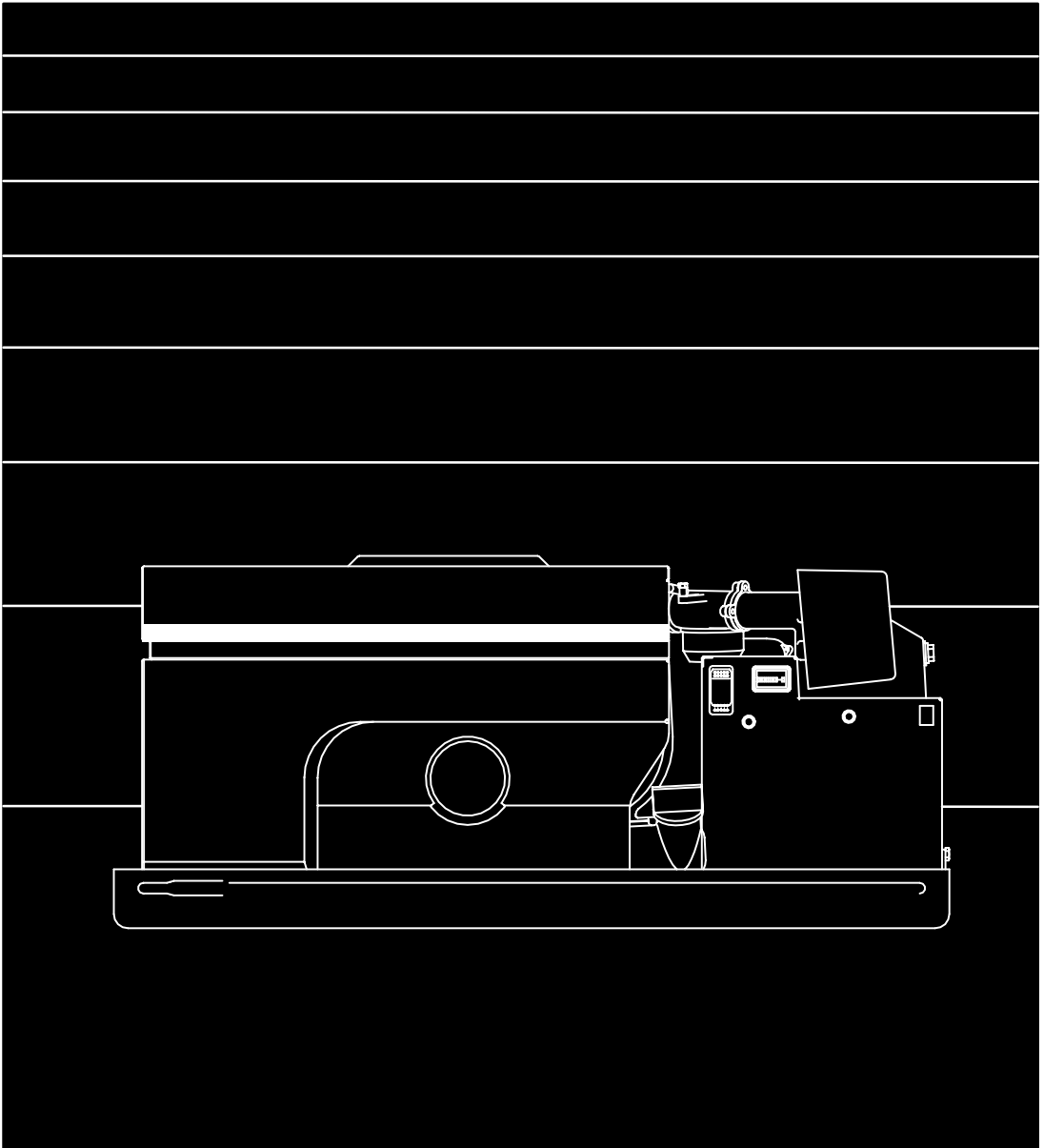


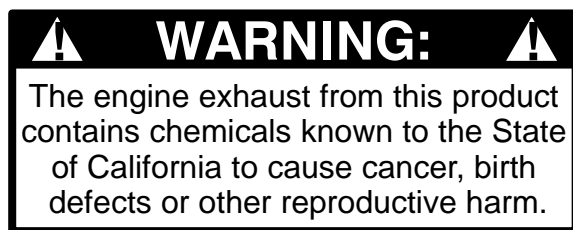
**Caution: This document contains mixed page sizes (8.5 x 11 or 11 x 17), which may affect printing. Please adjust your printer settings according to the size of each page you wish to print.**



# Installation Manual

TGHAA





**This generator set is for stationary applications only. Non-stationary applications may be in violation of Federal regulations**

# Table of Contents

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TITLE	PAGE
<b>SAFETY PRECAUTIONS</b> .....	2
<b>INTRODUCTION</b> .....	4
About this Manual .....	4
Installation Overview .....	4
<b>MECHANICAL</b> .....	5
Location .....	5
Access and Mounting .....	5
Housing .....	5
Engine Exhaust .....	7
Fuel .....	7
<b>ELECTRICAL CONNECTIONS</b> .....	9
AC Power Output .....	9
Transfer Switch .....	9
Cabinet Interface .....	9
Major/Minor Alarm .....	10
Network Interface .....	10
Battery and Engine Oil Heaters .....	10
Batteries .....	10
<b>INSTALLATION REVIEW AND STARTUP</b> .....	12
Installation Review .....	12
Startup .....	12
<b>SPECIFICATIONS</b> .....	13
<b>TYPICAL GENSET OUTLINE</b> .....	14
<b>TYPICAL GENSET OUTLINE WITH ENCLOSURE</b> .....	15
<b>GENERATOR RECONNECTION DIAGRAMS</b> .....	16
<b>TYPICAL AUTOMATIC TRANSFER SWITCH (ATS) CONNECTIONS</b> .....	17

# Safety Precautions

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Thoroughly read the **OPERATOR'S MANUAL** before operating the genset. Safe operation and top performance can be obtained only when equipment is operated and maintained properly.

The following symbols in this manual alert you to potential hazards to the operator, service person and equipment.

**⚠ DANGER** alerts you to an immediate hazard which will result in severe personal injury or death.

**⚠ WARNING** alerts you to a hazard or unsafe practice which can result in severe personal injury or death.

**⚠ CAUTION** alerts you to a hazard or unsafe practice which can result in personal injury or equipment damage.

Electricity, fuel, exhaust, batteries and moving parts present hazards which can result in severe personal injury or death.

## GENERAL PRECAUTIONS

- Keep ABC fire extinguishers handy.
- Make sure all fasteners are secure and torqued properly.
- Keep the genset and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Before working on the genset, disconnect the negative (-) battery cable at the battery to prevent starting.
- Use caution when making adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Used engine oil has been identified by some state and federal agencies as causing cancer

or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.

- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.

## GENERATOR VOLTAGE IS DEADLY!

- Generator output connections must be made by a qualified electrician in accordance with applicable codes.
- The genset must not be connected to the public utility or any other source of electrical power. Connection could lead to electrocution of utility workers and damage to equipment. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry and stand on a dry wooden platform.

## FUEL IS FLAMMABLE AND EXPLOSIVE

- Keep flames, cigarettes, sparks, pilot lights, electrical arc-producing equipment and switches and all other sources of ignition well away from areas where fuel fumes are present and areas sharing ventilation.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.
- Leaks can lead to explosive accumulations of gas. Natural gas rises when released and can accumulate under hoods and inside housings and buildings. LPG sinks when released and can accumulate inside housings and basements and other below-grade spaces. Prevent leaks and the accumulation of gas.

### **ENGINE EXHAUST IS DEADLY!**

- Learn the symptoms of carbon monoxide poisoning in this manual.
- The exhaust system must be installed in accordance with the genset Installation Manual.
- Do not use engine cooling air to heat a room or compartment.
- Make sure there is ample fresh air when operating the genset in a confined area.

### **BATTERY GAS IS EXPLOSIVE**

- Wear safety glasses and do not smoke while servicing batteries.

- When disconnecting or reconnecting battery cables, always disconnect the negative (-) battery cable first and reconnect it last to reduce arcing.

### **MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH**

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, etc.

# Introduction

---

## ABOUT THIS MANUAL

This manual is a guide for the installation of the Series TGHA generator sets (gensets). *Mechanical and Electrical Connections* cover most aspects of the installation. *Installation Review and Startup* covers the steps necessary to place the genset in service. *Specifications* tabulates features of the genset important for installation, operation and maintenance. Refer to the model-specific Outline Drawing (Figures 7 and 8), Specification Bulletin and Data Sheet for more information.

See the Operator's Manual for operation and maintenance and the Service Manual for service.

## INSTALLATION OVERVIEW

Proper *application* and *installation* are essential for *reliability* and *safety*.

**Application:** The proper application of a genset to an emergency/standby power system requires the seasoned judgment of a professional engineer. This manual does not cover application. *The end user must determine whether the genset and emergency/standby system selected will be the proper one for its needs.*

**Installation:** The proper installation of the genset and all the other equipment included in the emergency/standby power system requires the skill of qualified personnel such as electricians, mechanics and plumbers. This manual covers as specifically as possible each aspect of the installation of the genset and its connections. Call an authorized Onan Distributor if questions remain.

**Reliability and Safety:** It is essential for reliability and safety that these instructions be followed closely and that the emergency/standby system, as a whole, complies with all applicable codes at the time it is placed in service.

**⚠WARNING** *The improper application or installation of a genset can result in severe personal injury or death and property damage. The application must be made by a professional engineer and the installation by those qualified in the required electrical and mechanical trades. The emergency/standby power system must comply with all applicable codes.*

**IMPORTANT NOTICE:** Depending on the location of the genset and its use, it may be necessary to obtain an air quality emissions permit before installation begins. Check with the local pollution control or air quality authority.

# Mechanical

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## LOCATION

Genset location is a matter for system design and application. See *Introduction*.

*These gensets are designed for installation out-of-doors in a weather-protective housing.* The genset is available as a housed unit. See Figure 1.

Factors to consider when deciding where to locate the genset include:

- Proximity of genset, transfer switch, loads and fuel supply lines (Natural Gas) or tanks (LPG).
- Access for maintenance and service.
- Security from vandalism, flooding and vehicular traffic.
- Noise levels and proximity of property lines.
- Safe dispersal of engine exhaust and cooling air away from buildings and people.
- Possible obstructions to ventilation caused by snowdrifts, plant growth, lawn clippings and falling leaves.

## ACCESS AND MOUNTING

Housing design and clearances around the genset must be such that the genset can be changed out within the prescribed time limit for bringing the system back up to operation if it cannot be repaired on the spot.

Space with access will also be required below the genset for changing engine oil and connecting the fuel supply line.

The foundation, floor or roof must be level and be able to support the weight of the genset, resist the dynamic loads and not transmit objectionable noise and vibration. The genset has a base pan with rubber vibration isolators. Generally, additional vibration isolation is not required.

See the genset outline drawing (Figure 7) for the anchor bolt hole locations in the base pan. ***The anchor bolts must not extend more than 1/4 inch (6 mm) beyond the base pan weldnuts.***

## HOUSING

The housing must:

- Provide protection from the weather and security from vandalism.
- Keep out rodents, birds and insects. Use 1/4 inch (6 mm) mesh metal screen on all openings.
- Protect against contact with moving parts, hot surfaces and live electrical parts.

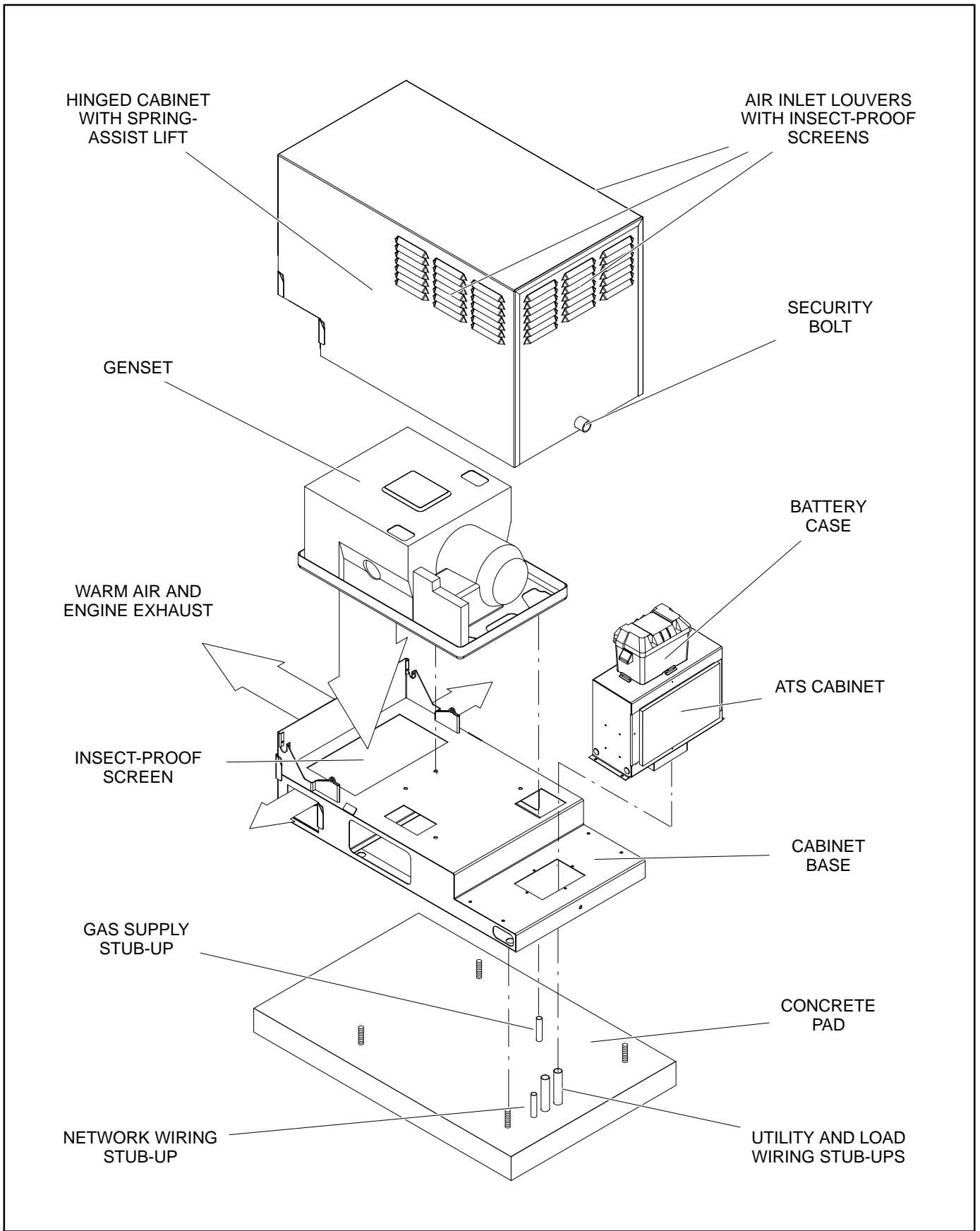
**⚠ WARNING** ***Contact with the genset cooling fan can cause severe personal injury. A guard must be provided to prevent contact with the fan.***

- Allow sufficient air flow for cooling and ventilation. The free area of inlet and outlet openings must not be less than 173 inch<sup>2</sup> (1117 cm<sup>2</sup>). Each housing design should be tested to determine that the oil temperature, as measured by a thermocouple on the end of the oil dip stick, does not exceed 270°F (132° C) when the genset is operated under full load long enough for temperatures to stabilize.

**⚠ CAUTION** ***Insufficient air flow through the genset housing can cause the genset to overheat and shut down resulting in a loss of standby electrical power.***

- Allow discharge of engine exhaust. See ENGINE EXHAUST in this section.
- Not allow gaseous fuel or battery gases to accumulate inside the housing. See FUEL in this section and BATTERIES under *Electrical Connections*.
- Allow easy access for maintenance and service.





**FIGURE 1. TYPICAL INSTALLATION IN AN OUTDOOR HOUSING ON A CONCRETE PAD**

## ENGINE EXHAUST

The engine exhaust system must be gas-tight and disperse the gases and noise away from people and buildings.

**⚠️WARNING** *EXHAUST GAS IS DEADLY! The exhaust system must be gas-tight and terminate away from building vents, windows and doors and sheltered spaces that may not have ample fresh air ventilation.*

The muffler is mounted inside the genset housing (Figure 2). The genset is shipped from the factory with an elbowed tailpipe adapter mounted on the muffler outlet flange, pointing down. The adapter can be remounted to extend through a knockout in the side (end) of the housing. A straight tailpipe adapter is available to extend through a knockout in the back of the housing.

It is preferred that engine exhaust be discharged with the engine cooling air stream. If a short tailpipe is connected to the adapter, use 1-1/4 inch I D, 18-gauge aluminized steel tubing or equivalent.

Do not use genset discharge air or engine exhaust for heating a room or enclosed space.

**⚠️WARNING** *Engine discharge air and exhaust carry carbon monoxide gas (odorless and invisible) which can cause asphyxiation and death. Never use engine discharge air or exhaust for heating a room or enclosed space.*

Liability for damage, injury and warranty expense due to the modification of the exhaust system or due to the use of unapproved parts becomes the responsibility of the person performing the modification or installing the unapproved parts. Contact an Onan distributor for approved exhaust system parts.

## FUEL

See *Operation* in the Operator's Manual for fuel recommendations and the instructions for converting the genset for LPG (if required).

Gaseous fuel supply system design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance must comply with the applicable codes. See NFPA Standards No. 37, 54 and 58.

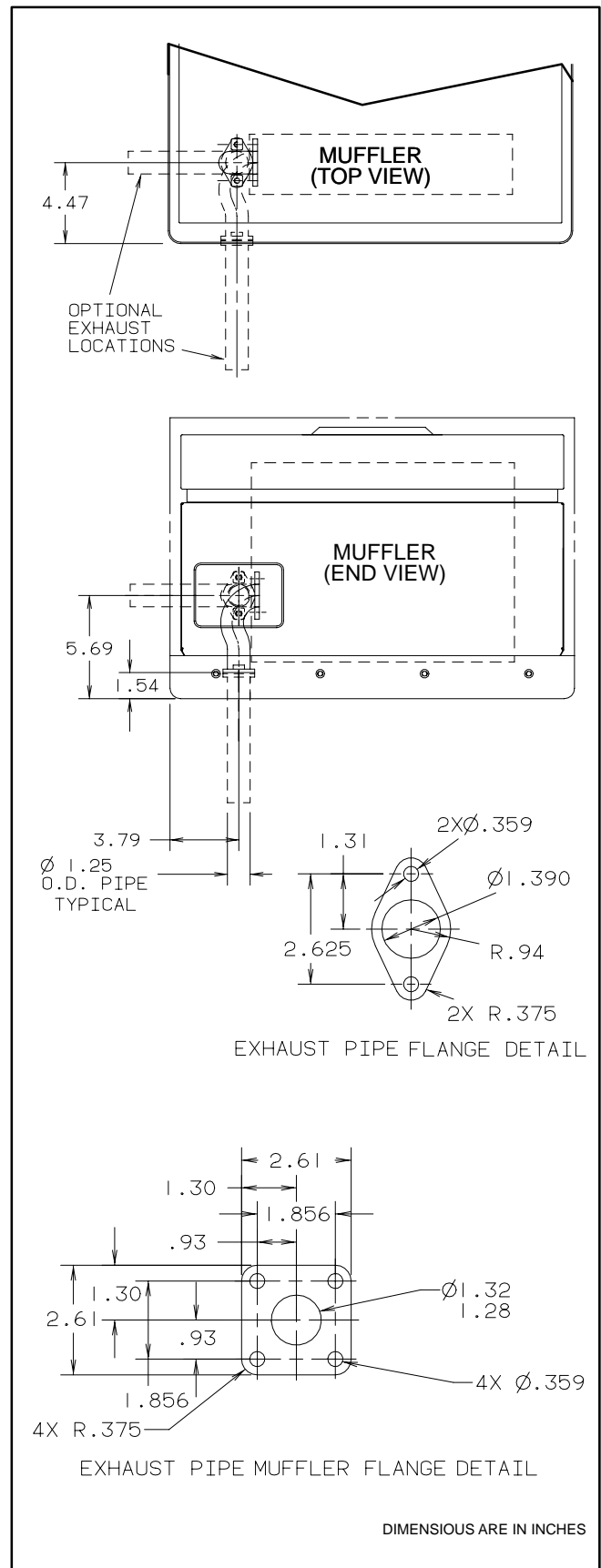


FIGURE 2. EXHAUST TAILPIPE CONNECTIONS

**⚠WARNING** *Gaseous fuels are flammable and explosive and can cause severe personal injury or death. Do not smoke if you smell gas or are near fuel tanks or fuel-burning equipment or are in an area sharing ventilation with such equipment. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other sources of ignition well away. Keep a type ABC fire extinguisher handy.*

**NFPA Standard No. 58** requires all persons handling and operating LPG to be trained in proper handling and operating procedures.

For satisfactory performance the gas must be supplied at the specified pressure. See *Specifications*.

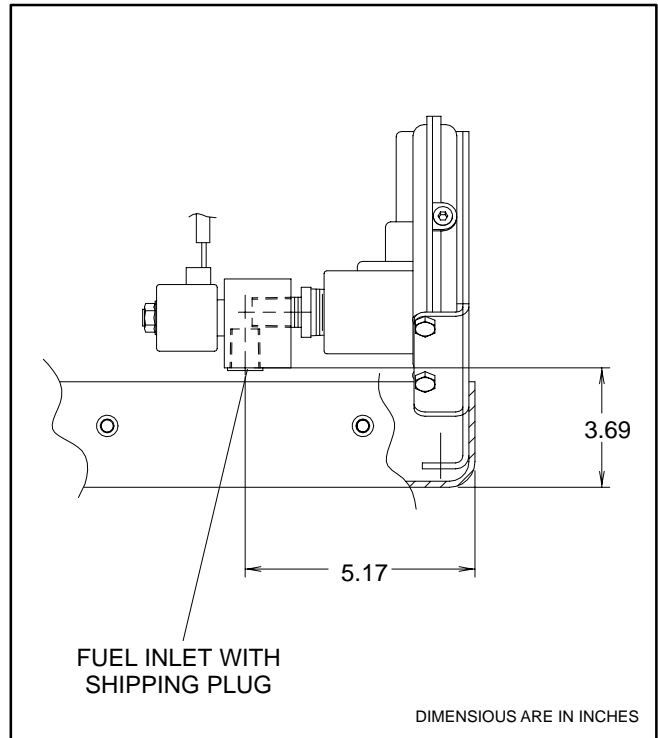
**⚠WARNING** *High gas supply pressure can cause gas leaks which can lead to fire and severe personal injury or death. Gas supply pressure must be adjusted to Specifications by qualified personnel.*

The gas supply connection at the genset is a 3/8-18 NPTF fitting (Figure 3).

Install a manual gas shutoff valve within sight of the genset. Cap the fuel line stub-up at the genset until the genset is connected to prevent dirt from entering and gas discharging if the gas supply shutoff valve is opened inadvertently.

Install a dry-type fuel filter ahead of the service pressure regulator to protect the sensitive pressure regulating components and orifices downstream from rust, scale and other solid substances carried along in the gas stream.

**⚠WARNING** *Gaseous fuel leaks into an inadequately ventilated space can lead to explosive accumulations of gas. Natural gas rises when released into the air and can accumulate under overhanging hoods and inside housings and buildings. LPG sinks when released into the air and can accumulate inside housings and basements and other below-grade spaces. Precautions must be taken to prevent gas leaks and the accumulation of gaseous fuel in the event of a leak.*



**FIGURE 3. FUEL CONNECTION**

# Electrical Connections

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To prevent injury due to accidental start-up, do not connect the battery cables to the battery until the installation has been completed and it is time to start up the set. See STARTUP in *Installation Review and Startup*.

**⚠WARNING** *Automatic startup of the genset while performing maintenance or service can cause severe personal injury or death. Push the control switch to Off and disconnect the negative (-) battery cable from the battery to keep the genset from starting up while working on it.*

## AC POWER OUTPUT

### Wiring Connections

The genset is equipped with No. 10 AWG leads for power output connections. The leads are approximately 24 inch (600 mm) long and exit through a 1/2 inch trade size flexible conduit connector. They are protected by circuit breakers mounted in the control box.

The National Electrical Code (NFPA No. 70) should be used as a guide for all AC wiring connections.

The junction box where the generator leads are terminated must be close enough to the genset so that there will be slack in the leads and conduit to take up the movement of the genset on its vibration isolators.

AC wiring, control wiring and fuel lines must be separated from each other by barriers or separate conduit.

**⚠WARNING** *Electrical sparks can ignite gaseous fuels causing fire or explosion and severe personal injury or death. Keep fuel lines physically separated from electrical wiring.*

### Grounding

The generator set, power supply wiring and all connected electrical equipment must be bonded to a

common grounding point in accordance with applicable codes or standards.

**⚠WARNING** *Faulty grounding can lead to fire and electrocution, resulting in severe personal injury or death. The genset must be grounded in accordance with the applicable codes.*

### Generator Reconnections

When it is necessary to reconnect a generator to provide the voltage required for the application, remove the control panel and reconnect the leads at terminal block **TB1** and circuit breakers **CB1** and **CB2**. See Figure 9.

## TRANSFER SWITCH

An approved device must be used to prevent the genset and utility from being interconnected. Figure 10 shows the control, line, load and utility connections to the transfer switch that is available in the housed configuration of the genset. Use the drawing as a guide when the transfer switch is provided by others. Connector P8 (8-pin) in Figure 4 is provided for transfer switch control connections.

**⚠WARNING** *Interconnecting the genset and the public utility (or any other power source) can lead to the electrocution of personnel working on the utility lines, damage to equipment and fire. An approved switching device must be used to prevent interconnections.*

## CABINET INTERFACE

Connector P10 (3-pin) in Figure 4 is provided for low gas supply pressure and other cabinet faults (water level, shear).

Pin A is for cabinet faults

Pin B is for low gas pressure

Pin C is for ground.

The fault signal device contacts should close to ground on sensing a fault.

## MAJOR/MINOR ALARM

Connector P3 (8-pin) in Figure 4 is for remote alarm and start circuits. See the wiring schematic in Figure 5. A minor alarm indicates that the genset needs maintenance attention due to a condition such as low oil level or a weak battery. A major alarm indicates that a fault shutdown has occurred. See *Troubleshooting* in the Operator's Manual for a listing and explanation of each warning or fault alarm.

Pin 1 is for the remote start switch

Pin 3 is for minor alarm output

Pin 4 is for major alarm output

Pins 5 and 6 are for the alarm and switch grounds

Use No. 18 AWG insulated copper conductors for distances up to 100 ft (30 m) and No. 16 AWG copper conductors for distances from 100 to 500 ft (from 30 to 150 m).

Use 12 VDC alarm devices rated not more than 1 amp.

## NETWORK INTERFACE

Connector P9 (12-pin) in Figure 4 is for serial communications with a network.

## BATTERY AND ENGINE OIL HEATERS

Thermostatically controlled heaters for the engine oil sump and battery are recommended for more reliable starting in ambient temperatures down to -30 ° F (-22° C). The heaters should be connected to the load side of the transfer switch.

## BATTERIES

The genset has a 12 VDC, negative-ground control and engine cranking system. It is equipped with an automatic, 10-amp nominal battery charging circuit.

## Battery Capacity

Battery capacity and battery cable size must be sufficient to obtain a minimum of 10 volts at the starter motor terminals during cranking under the coldest ambient temperatures expected. See *Specifications* for minimum battery requirements.

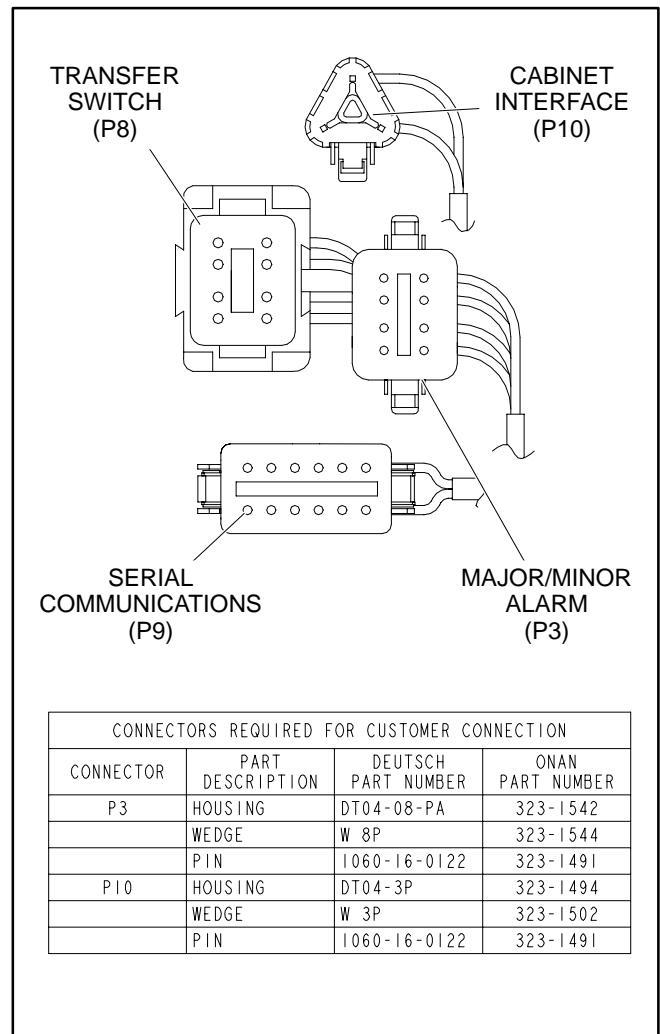


FIGURE 4. CONTROL AND ALARM CONNECTORS

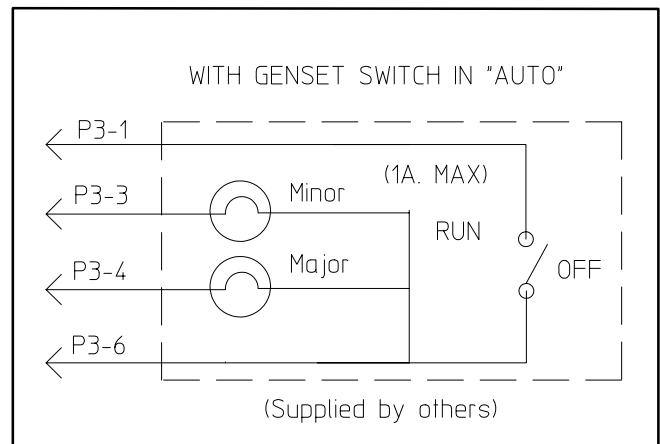


FIGURE 5. REMOTE START AND ALARM WIRING SCHEMATIC

## Battery Compartment

Unless the genset is equipped with the factory housing or you have experience in designing battery compartments, the battery must be located in a separate compartment from that of the genset and away from spark-producing equipment.

An enclosed compartment must have openings of at least 1.7 square inches (11 square centimetres) at the top and bottom for ventilation of battery gasses. It should be mounted such that spills and leaks will not drip acid on fuel lines, wiring and other equipment that could be damaged.

**⚠WARNING** *Arcing can ignite the explosive hydrogen gas given off by the battery, causing severe personal injury. The battery compartment must be ventilated and must isolate the battery from spark-producing equipment.*

## Battery Cables

To prevent injury due to accidental start-up, do not connect the battery cables to the battery until the installation has been completed and it is time to start up the set. See STARTUP in *Installation Review and Startup*.

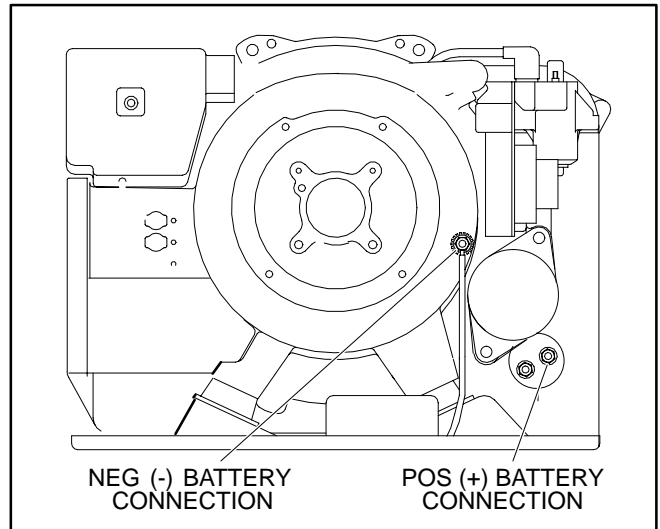
Size battery cables according to Table 1, if necessary. Total cable length is the sum of the lengths of the positive (+) and negative (-) cables. In other words, total cable length will be approximately twice the distance between the battery and the genset.

**⚠WARNING** *Electric sparks can ignite gaseous fuel, leading to fire that could cause severe personal injury or death. Therefore, run the battery cables and fuel lines as far apart as possible or separate them by physical barriers. If they must be run through the same opening, separate them physically by running them through separate pieces of tubing or conduit. Do not tie them together.*

Connect the cable from the positive (+) terminal of the battery to the starter solenoid terminal, and the cable from the negative (-) terminal of the battery to the ground terminal on the generator housing. See Figure 6.

**TABLE 1. BATTERY CABLE SIZES FOR AMBIENT TEMPERATURES DOWN TO -20° F (-29° C)**

TOTAL CABLE LENGTH, FEET (METRES)	CABLE SIZE, AWG
0 to 10 (0 to 3)	2*
11 to 15 (3 to 4.5)	0
16 to 20 (4.5 to 6)	000
* - No. 2 cable can be used for total cable lengths of up to 20 feet (6 metres) in warmer climates.	



**FIGURE 6. BATTERY CABLE CONNECTIONS**

# Installation Review and Startup

---

## INSTALLATION REVIEW

Before starting the genset inspect the installation and check off (✓) each of the following questions if it can be answered "YES". If a question cannot be checked off, review the appropriate section in the manual.

- [ ] Is there access to the control switch for starting and stopping the genset?
- [ ] Is there access to the line circuit breakers and control fuses for resetting or replacement?
- [ ] Is there access to the engine oil drain for draining engine oil?
- [ ] Is there access to the air filter for replacing the filter element?
- [ ] Is there access to the spark plugs (two) for replacement?
- [ ] Is the housing large enough to provide at least the minimum required clearances to the genset all the way around?
- [ ] Is the genset securely bolted in place?
- [ ] Are the cooling air inlet and outlet openings free of obstructions?
- [ ] Have the AC output connections been made properly?
- [ ] Has an approved transfer switch been installed to prevent the interconnection of the genset and the utility?
- [ ] Have properly sized batteries and battery cables been installed?
- [ ] Are all fuel connections tight?
- [ ] Is fuel supply pressure correct?
- [ ] Are electrical and fuel lines properly separated?
- [ ] Is the genset mounted inside a weather-protective housing?
- [ ] Is noise acceptable?
- [ ] Does engine exhaust disperse away from buildings?

## STARTUP

When all installation requirements have been met, connect the battery cables to the battery, positive (+) cable first.

**⚠WARNING** *Batteries give off explosive gases that can cause severe personal injury. Do not smoke near batteries. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other ignition sources well away.*

**Do not disconnect the battery cables while the genset is cranking or running: the arcing can ignite the explosive battery gases.**

Read through the Operator's Manual and perform the maintenance and pre-start checks instructed. The genset is shipped from the factory with the proper level of engine oil, which should nevertheless be checked before the genset is started. Start and operate the genset, following all the instructions and precautions in the Operator's Manual.

**⚠WARNING** **EXHAUST GAS IS DEADLY! Do not operate the genset indoors unless there is ample fresh air ventilation.**

Check for fuel and exhaust leaks and unusual noises while the genset is running under full and intermediate loads. To calculate electrical loads see POWERING EQUIPMENT under *Operation* in the Operator's Manual. Do not place the genset in service until all leaks have been fixed and operation is satisfactory.

Before leaving the site, if the genset is ready to be placed in service, push the control switch to the **Auto** position to provide automatic standby power.

# Specifications

<b>GENERATOR:</b> 4-Pole Revolving Field, Self-Excited, 1-Phase, Microcontroller Regulated			
Frequency / Speed	60 Hertz / 1800 RPM		50 Hertz / 1500 RPM
Fuel	Natural Gas	LPG	LPG
Rated Power	5.6 kW	6.0 kW	5.0 kW
Voltage	120/240 or 120 volts		230 volts
Circuit Breaker Rating	2-Pole, 25 amps		
<b>FUEL CONSUMPTION:</b>	Natural Gas	LPG	LPG
No-load	55 ft <sup>3</sup> /h (1.6 m <sup>3</sup> /h)	2.2 lb/h (1.0 Kg/h)	2.0 lb/h (0.9 Kg/h)
Half-load	73 ft <sup>3</sup> /h (2.1 m <sup>3</sup> /h)	3.5 lb/h (1.6 Kg/h)	3.2 lb/h (1.4 Kg/h)
Full-load	120 ft <sup>3</sup> /h (3.4 m <sup>3</sup> /h)	5.5 lb/h (2.5 Kg/h)	5.0 lb/h (2.3 Kg/h)
<b>ENGINE:</b> Opposed 2-Cylinder, 4-Cycle Spark-Ignited, Side-Valve, Air Cooled, Microcontroller Governed			
Bore	3.653 inch (90 mm)		
Stroke	3.000 inch (76 mm)		
Displacement	60 inch <sup>3</sup> (980 cc)		
Compression Ratio	7.0 : 1		
Min Crankcase Vacuum	10 inch (254 mm) WC (water column)		
Min Cylinder Compression Test Pressure	75 psi (517 kPa)		
Oil Capacity (with filter)*	3.5 quart (3.3 liter)		
Intake Valve Clearance (Cold)	0.005 inch (0.13 mm)		
Exhaust Valve Clearance (Cold)	0.013 inch (0.33 mm)		
Spark Plug Gap	0.025 inch (0.64 mm)		
Spark Plug Tightening Torque	8 lb-for (10 N-m)		
Ignition Timing (electronic ignition)	15° BTDC (non-adjustable)		
Natural Gas Supply Pressure	6-13 inch (152-330 mm) WC (water column)		
LPG Supply Pressure (vapor)	9-13 inch (229-330 mm) WC (water column)		
Gas Supply Connection	3/8 inch NPT		
<b>CONTROL AND CRANKING SYSTEM:</b>			
Nominal Battery Voltage	12 volts		
Battery Cranking Capacity	450 amps down to 0° F (-17° C) 650 amps down to -20° F (-29° C)		
Battery Charging Output	10 amps		
Fuse F1 (control B+ input)	7.5 amps		
Fuse F2 (starter solenoid)	7.5 amps		
Fuse F3 (carburetor de-icer)	25 amps		
* See <i>Periodic Maintenance</i> for oil filling instructions.			



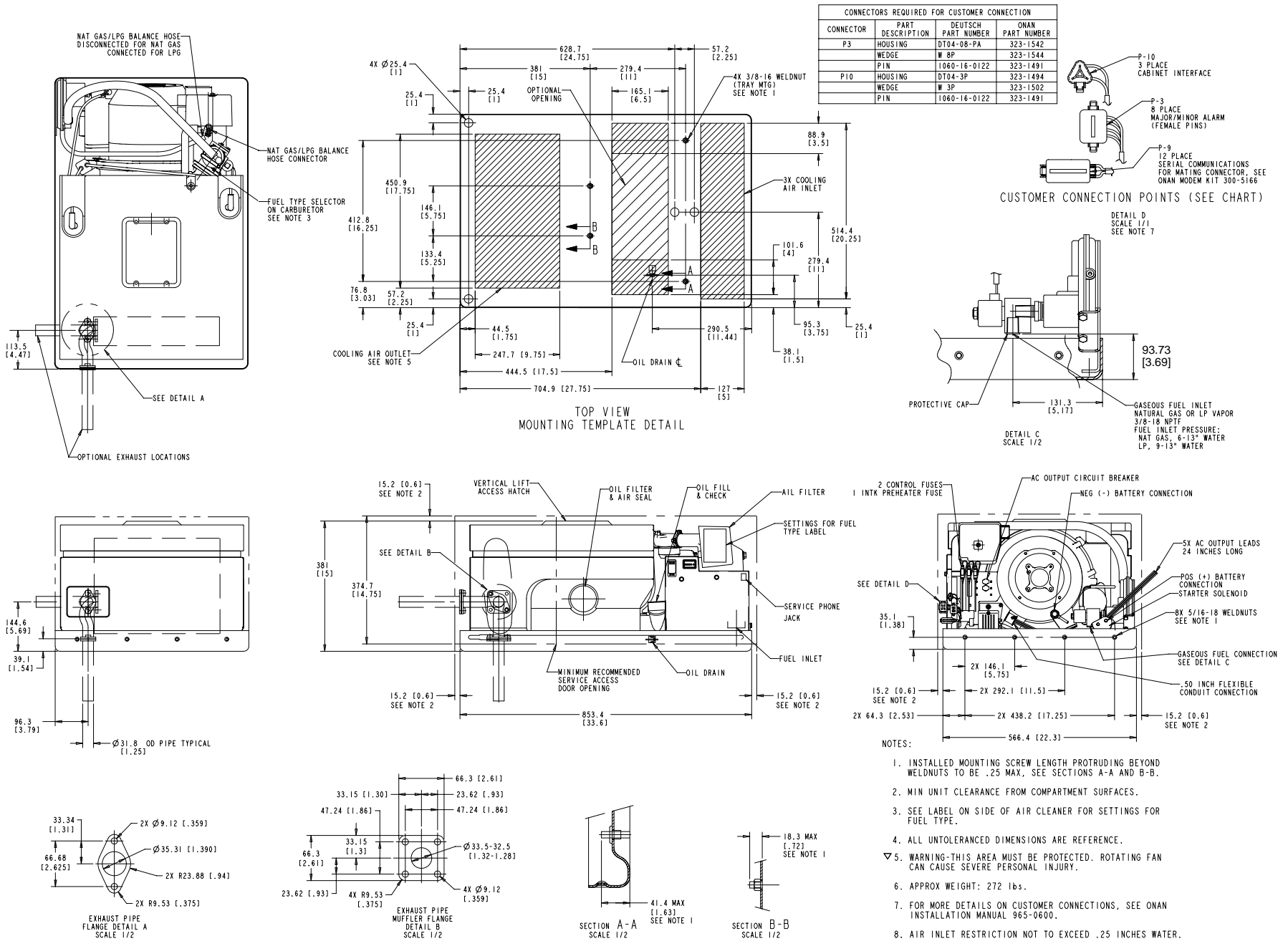
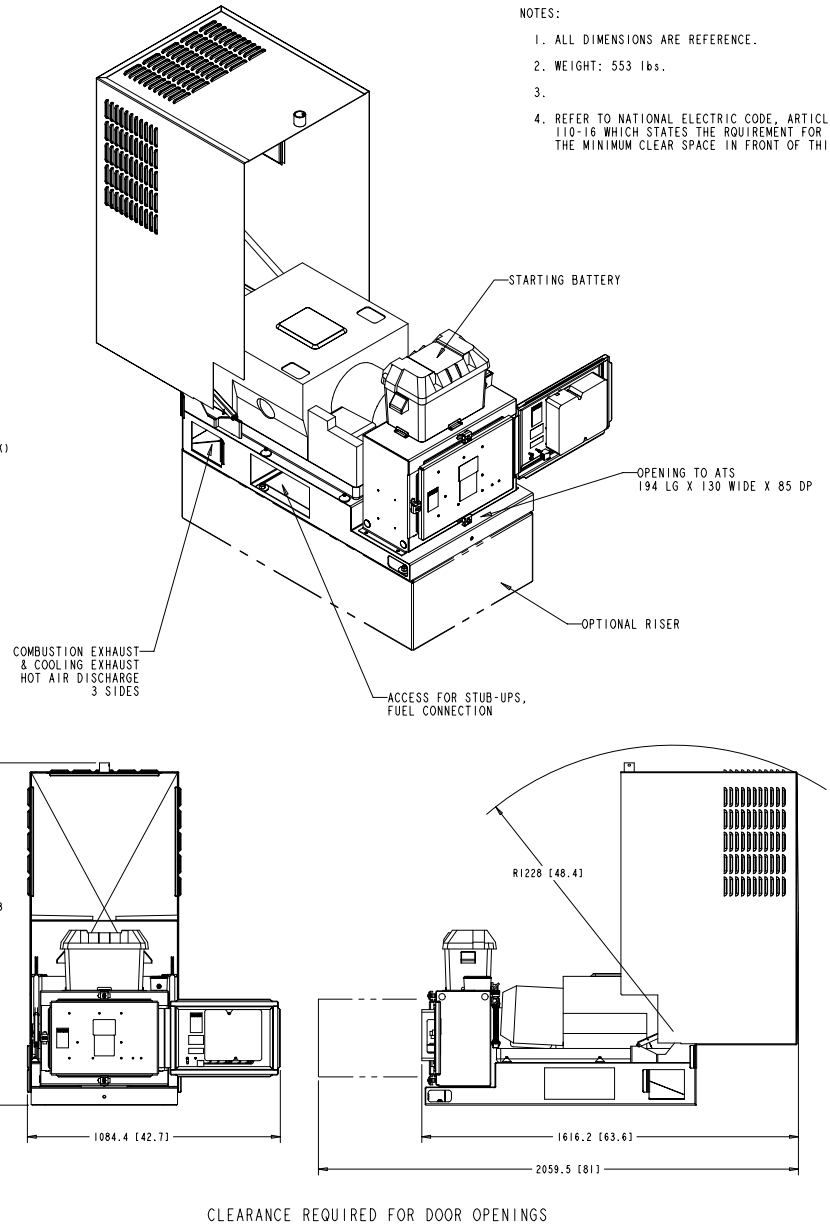
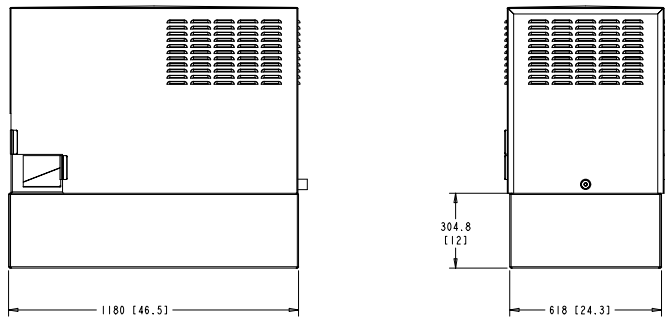
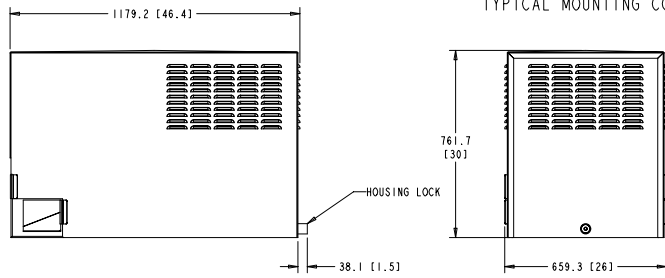
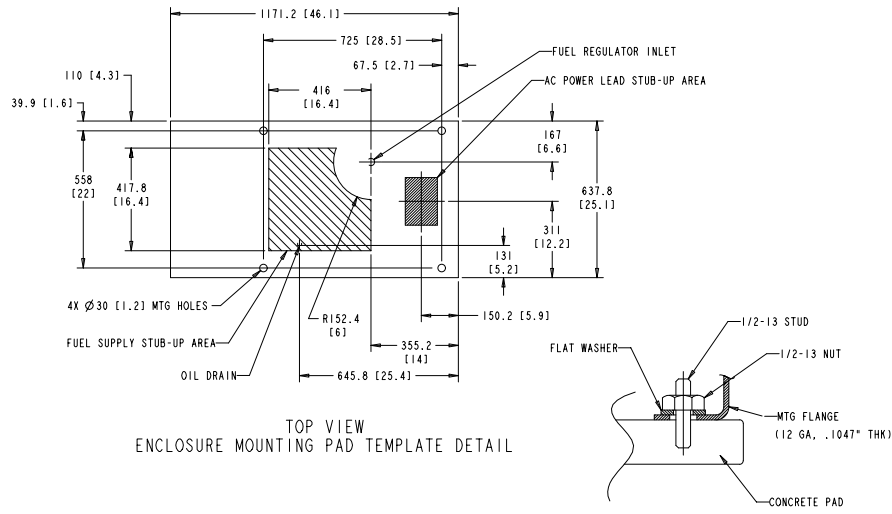


FIGURE 7. TYPICAL GENSET OUTLINE

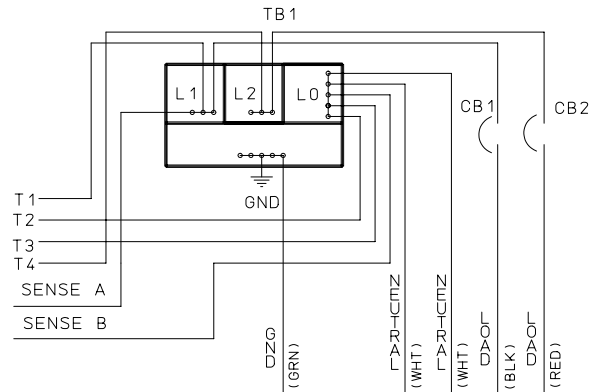


- NOTES:
1. ALL DIMENSIONS ARE REFERENCE.
  2. WEIGHT: 553 lbs.
  - 3.
  4. REFER TO NATIONAL ELECTRIC CODE, ARTICLE 110-16 WHICH STATES THE REQUIREMENT FOR THE MINIMUM CLEAR SPACE IN FRONT OF THIS UNIT.

**FIGURE 8. TYPICAL GENSET OUTLINE WITH ENCLOSURE**

1 PHASE 60Hz 3 WIRE  
R104 120/240V

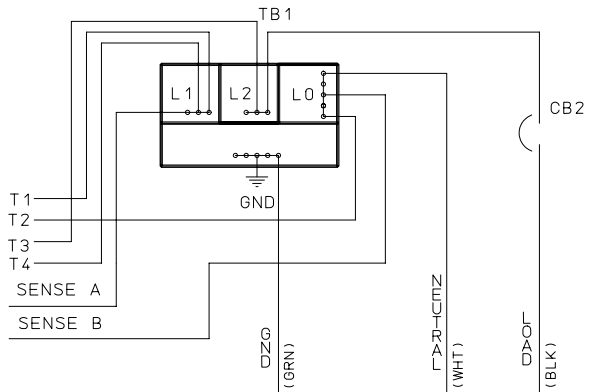
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CUSTOMER CONNECTION WIRES

1 PHASE 50Hz 2 WIRE  
R117 230V

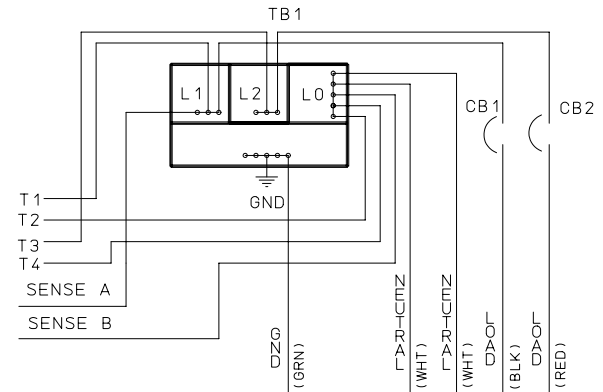
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CUSTOMER CONNECTION WIRES

1 PHASE 60Hz 2 WIRE  
R086 120V

0611-1247-03



CUSTOMER CONNECTION WIRES

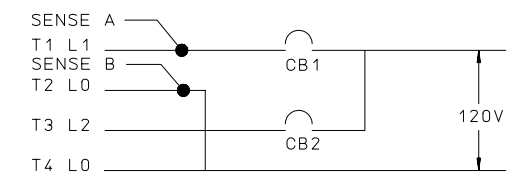
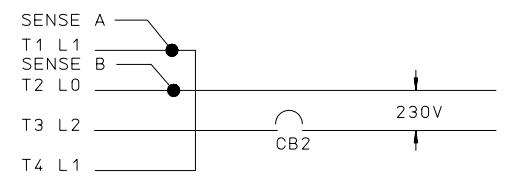
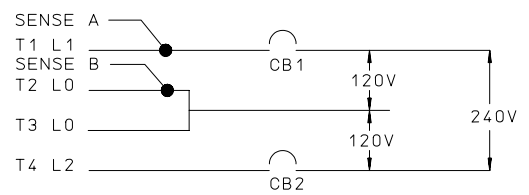


FIGURE 9. GENERATOR RECONNECTION DIAGRAMS

NOTES:

1. ALL COMPONENTS ARE SHOWN DE-ENERGIZED.
2. 120/240, 3 WIRE - CONNECT POWER CABLES TO A AND B  
120 L-N, 2 WIRE - CONNECT POWER CABLES TO A AND NEUTRAL

LEGEND

- K1(CC) NORMAL CLOSING COIL
- K1(TC) NORMAL TRIP COIL
- K2(CC) EMERGENCY CLOSING COIL
- K2(TC) EMERGENCY TRIP COIL

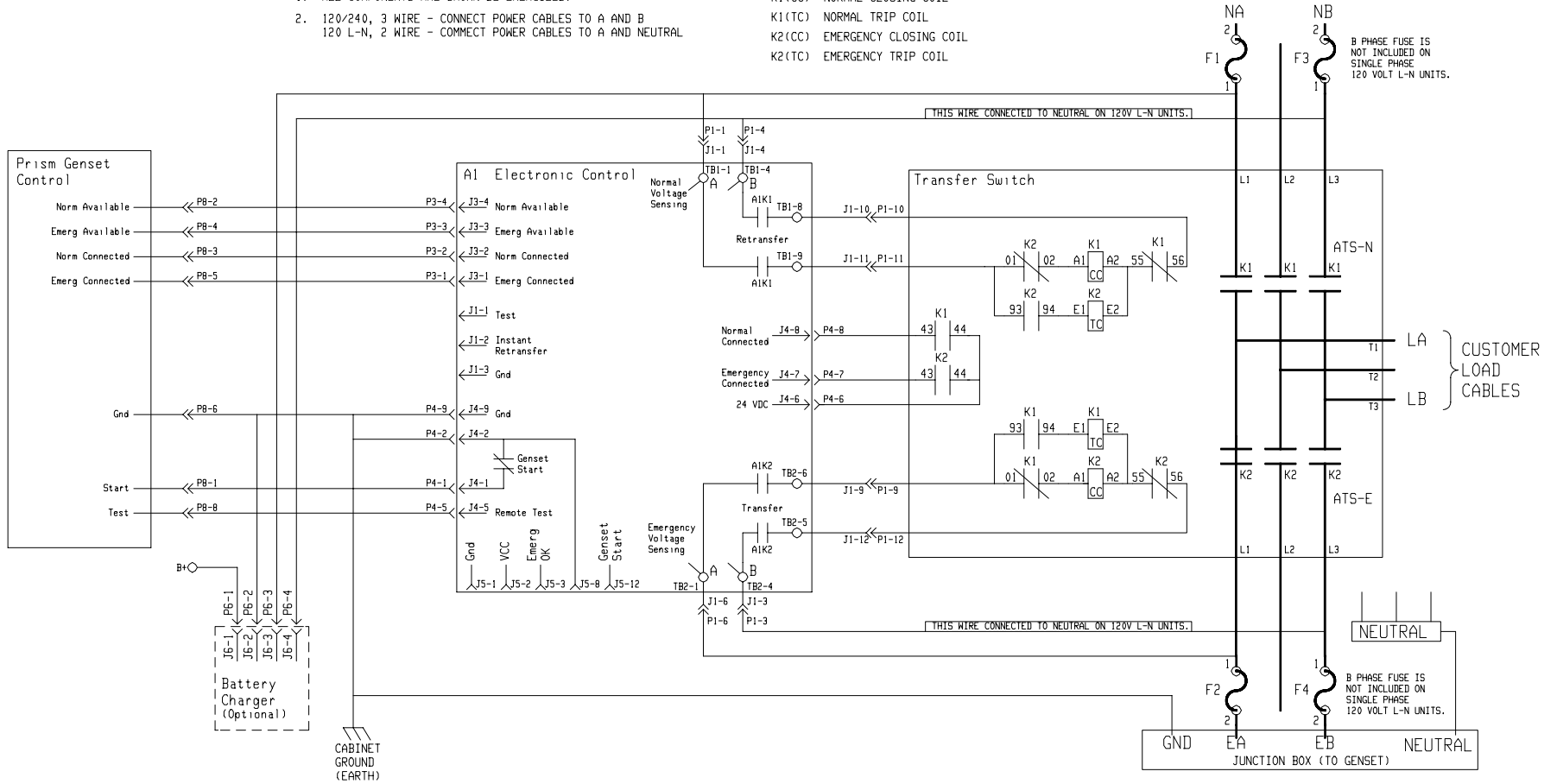


FIGURE 10. TYPICAL AUTOMATIC TRANSFER SWITCH (ATS) CONNECTIONS



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