# Installation

## Residential/Commercial Generator Sets

Models:

**14/20RESA**

**14/20RESAL**

Controllers:

RDC2

DC2

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

KOHLER® POWER SYSTEMS

TP-6803 12/11

**California Proposition 65**

## ⚠ WARNING

Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

# Product Identification Information

### Generator Set Identification Numbers

Record the product identification numbers from the generator set nameplate(s).

Model Designation _____

Specification Number _____

Serial Number _____

| Accessory Number | Accessory Description |
|---|---|
| | |
| | |
| | |
| | |
| | |

### Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

### Controller Identification

Record the controller description from the generator set operation manual, spec sheet, or sales invoice.

Controller Description _____

# Table of Contents

# Notes

IMPORTANT SAFETY INSTRUCTIONS. Electromechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. SAVE THESE INSTRUCTIONS.

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.

**DANGER**

Danger indicates the presence of a hazard that ***will cause severe personal injury, death***, or ***substantial property damage***.

**WARNING**

Warning indicates the presence of a hazard that ***can cause severe personal injury, death,*** or ***substantial property damage***.

**CAUTION**

Caution indicates the presence of a hazard that ***will*** or ***can cause minor personal injury*** or ***property damage***.

**NOTICE**

Notice communicates installation, operation, or maintenance information that is safety related but not hazard related.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

## Accidental Starting

**WARNING**

**Accidental starting.**
**Can cause severe injury or death.**

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

**Disabling the generator set. Accidental starting can cause severe injury or death.** Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

## Battery

**WARNING**

**Sulfuric acid in batteries.**
**Can cause severe injury or death.**

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

**WARNING**

**Explosion.**
**Can cause severe injury or death.**
**Relays in the battery charger cause arcs or sparks.**

Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.

**Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death.** Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

**Battery acid cleanup. Battery acid can cause severe injury or death.** Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

**Battery gases. Explosion can cause severe injury or death.** Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

**Battery short circuits. Explosion can cause severe injury or death.** Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

## Engine Backfire/Flash Fire

**⚠ WARNING**

**Fire.**
**Can cause severe injury or death.**

Do not smoke or permit flames or sparks near fuels or the fuel system.

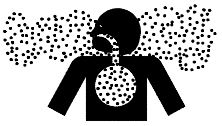
**Servicing the air cleaner. A sudden backfire can cause severe injury or death.** Do not operate the generator set with the air cleaner removed.

**Servicing the fuel system. A flash fire can cause severe injury or death.** Do not smoke or permit flames or sparks near the carburetor, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Catch fuels in an approved container when removing the fuel line or carburetor.

**Combustible materials. A fire can cause severe injury or death.** Generator set engine fuels and fuel vapors are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the compartment or nearby area with a fully charged fire extinguisher. Select a fire extinguisher rated ABC or BC for electrical fires or as recommended by the local fire code or an authorized agency. Train all personnel on fire extinguisher operation and fire prevention procedures.

## Exhaust System

**⚠ WARNING**



**Carbon monoxide.**
**Can cause severe nausea, fainting, or death.**

The exhaust system must be leakproof and routinely inspected.

**Generator set operation. Carbon monoxide can cause severe nausea, fainting, or death.** Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Avoid breathing exhaust fumes when working on or near the generator set. Never operate the generator set inside a building. Never operate the generator set where exhaust gas could seep inside or be drawn into a potentially occupied building through windows, air intake vents, or other openings.

**Carbon monoxide detectors. Carbon monoxide can cause severe nausea, fainting, or death.** Install carbon monoxide detectors on each level of any building adjacent to the generator set. Locate the detectors to adequately warn the building's occupants of the presence of carbon monoxide. Keep the detectors operational at all times. Periodically test and replace the carbon monoxide detectors according to the manufacturer's instructions.

**Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death.** Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning symptoms include but are not limited to the following:

- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles
- Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision
- Stomachache, vomiting, nausea

If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve within minutes of breathing fresh air.

## Fuel System

**⚠ WARNING**

**Explosive fuel vapors.**
**Can cause severe injury or death.**

Use extreme care when handling, storing, and using fuels.

**The fuel system. Explosive fuel vapors can cause severe injury or death.** Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks. Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid fuel line breakage caused by vibration. Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.

**Gas fuel leaks. Explosive fuel vapors can cause severe injury or death.** Fuel leakage can cause an explosion. Check the LP vapor gas or natural gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to 6–8 ounces per square inch (10–14 inches water column). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

## Hazardous Noise

**⚠ CAUTION**

**Hazardous noise.**
**Can cause hearing loss.**

Never operate the generator set without a muffler or with a faulty exhaust system.

**Engine noise. Hazardous noise can cause hearing loss.** Generator sets not equipped with sound enclosures can produce noise levels greater than 105 dBA. Prolonged exposure to noise levels greater than 85 dBA can cause permanent hearing loss. Wear hearing protection when near an operating generator set.

## Hazardous Voltage/ Moving Parts

**⚠ DANGER**

**Hazardous voltage.**
**Will cause severe injury or death.**

This equipment must be installed and serviced by qualified electrical personnel.

**⚠ WARNING**

**Hazardous voltage. Moving parts.**
**Can cause severe injury or death.**

Operate the generator set only when all guards and electrical enclosures are in place.

**⚠ WARNING**

**Hazardous voltage.**
**Backfeed to the utility system can cause property damage, severe injury, or death.**

If the generator set is used for standby power, install an automatic transfer switch to prevent inadvertent interconnection of standby and normal sources of supply.

**⚠ CAUTION**

**Welding the generator set.**
**Can cause severe electrical equipment damage.**

Never weld components of the generator set without first disconnecting the battery, controller wiring harness, and engine electronic control module (ECM).

**Grounding electrical equipment. Hazardous voltage can cause severe injury or death.** Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

**Welding on the generator set. Can cause severe electrical equipment damage.** Before welding on the generator set perform the following steps: (1) Remove the battery cables, negative (–) lead first. (2) Disconnect all engine electronic control module (ECM) connectors. (3) Disconnect all generator set controller and voltage regulator circuit board connectors. (4) Disconnect the engine battery-charging alternator connections. (5) Attach the weld ground connection close to the weld location.

**Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death.** Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

**Short circuits. Hazardous voltage/current can cause severe injury or death.** Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

**Electrical backfeed to the utility. Hazardous backfeed voltage can cause severe injury or death.** Install a transfer switch in standby power installations to prevent the connection of standby and other sources of power. Electrical backfeed into a utility electrical system can cause severe injury or death to utility personnel working on power lines.

## Heavy Equipment

**⚠ WARNING**

**Unbalanced weight.**
**Improper lifting can cause severe injury or death and equipment damage.**

Do not use lifting eyes.
Lift the generator set using lifting bars inserted through the lifting holes on the skid.

## Hot Parts

**⚠ WARNING**

**Hot engine and exhaust system. Can cause severe injury or death.**

Do not work on the generator set until it cools.

**Servicing the exhaust system. Hot parts can cause severe injury or death.** Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

**Servicing the engine heater. Hot parts can cause minor personal injury or property damage.** Install the heater before connecting it to power. Operating the heater before installation can cause burns and component damage. Disconnect power to the heater and allow it to cool before servicing the heater or nearby parts.

## Notice

**NOTICE**

**Canadian installations only**. For standby service connect the output of the generator set to a suitably rated transfer switch in accordance with Canadian Electrical Code, Part 1.

This manual provides installation instructions for Residential/Commercial Model 14/20RESA or 14/20RESAL generator sets. See Figure 1. Refer to TP-6804, Operation Manual, for generator set operation and maintenance instructions.

The generator set is approved for use in stationary applications in locations served by a reliable utility power source.

Have an authorized distributor/dealer install the generator set outdoors according to the instructions in this manual. The generator set installation must comply with the National Electrical Code (NEC) and local code requirements. Do not install this generator set indoors.

Information in this publication represents data available at the time of print. Kohler Co. reserves the right to change this publication and the products represented without notice and without any obligation or liability whatsoever.

Read this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section at the beginning of this manual.

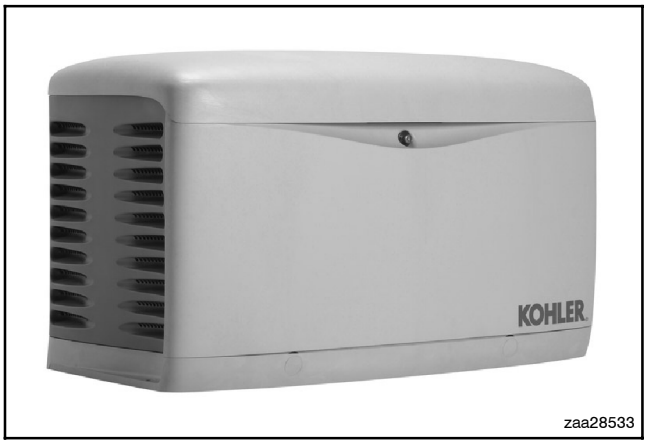



**Figure 1** 14/20RESA/RESAL Generator Set

## List of Related Literature

Figure 2 identifies related literature available for the generator sets covered in this manual. Only trained and qualified personnel should install or service the generator set.

| Literature Type | Part Number |
|---|---|
| OperationManual, 14/20RESA/RESAL Generator Set | TP-6804 |
| Operation/Installation Manual, Model RXT Automatic Transfer Switch | TP-6807 |
| Service Manual, 14/20RESA/RESAL Generator Set | TP-6735 |
| Operation Manual, OnCue Software | TP-6796 |
| Operation/Installation Manual, Model RDT Transfer Switch | TP-6345 |
| Installation Manual, Model RSB Transfer Switch | TP-6486 |
| Operation Manual, Model RSB Transfer Switch | TP-6487 |
| Installation Instructions, Load Control Module (LCM) | TT-1574 |
| Installation Instructions, Programmable Interface Module (PIM) | TT-1584 |

**Figure 2** Related Literature

## Startup and Registration

When the generator set is installed, complete the startup and installation checklists supplied with the startup notification form. Complete and sign the startup notification form and register the unit using the Kohler online Warranty Processing System.

# Service Assistance

For professional advice on generator set power requirements and conscientious service, please contact your nearest Kohler distributor or dealer.

- Consult the Yellow Pages under the heading Generators—Electric.
- Visit the Kohler Power Systems website at KohlerPower.com.
- Look at the labels and stickers on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

**Headquarters Europe, Middle East, Africa (EMEA)**
Kohler Power Systems
3 rue de Brennus
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France
Phone: (33) 1 49 178300
Fax: (33) 1 49 178301

**Asia Pacific**
Power Systems Asia Pacific Regional Office
Singapore, Republic of Singapore
Phone: (65) 6264-6422
Fax: (65) 6264-6455

**China**
North China Regional Office, Beijing
Phone: (86) 10 6518 7950
(86) 10 6518 7951
(86) 10 6518 7952
Fax: (86) 10 6518 7955

East China Regional Office, Shanghai
Phone: (86) 21 6288 0500
Fax: (86) 21 6288 0550

**India, Bangladesh, Sri Lanka**
India Regional Office
Bangalore, India
Phone: (91) 80 3366208
(91) 80 3366231
Fax: (91) 80 3315972

**Japan, Korea**
North Asia Regional Office
Tokyo, Japan
Phone: (813) 3440-4515
Fax: (813) 3440-2727

**Latin America**
Latin America Regional Office
Lakeland, Florida, USA
Phone: (863) 619-7568
Fax: (863) 701-7131

## 1.1 Introduction

**⚠ DANGER**

**Hazardous voltage.**
**Will cause severe injury or death.**

This equipment must be installed and serviced by qualified electrical personnel.

Have the generator set installed by an authorized Kohler distributor/dealer or authorized representative. Install the equipment in compliance with the National Electrical Code (NEC) and local codes. For Canadian installations, refer to the Canadian Electrical Code (CEC).

The generator set must be installed outdoors. The exhaust systems on enclosed units are designed for outdoor installation only.

**Note: DO NOT** install these generator sets inside a building.

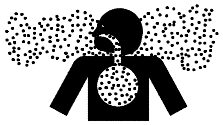
**Note:** Install carbon monoxide (CO) detector(s) on each level of any building adjacent to a generator set. Locate the detectors to adequately warn the building's occupants of the presence of carbon monoxide.

Obtain a building permit and contact your local utility companies to mark the locations of underground pipes and cables.

Read and follow the safety precautions in this manual and observe the decals on the equipment. Refer to the diagrams and drawings in this manual for dimensions and electrical connections during the installation procedure. Read the entire installation procedure and obtain the accessories and tools needed before beginning installation. Perform the steps in the order shown.

To install optional accessories, follow the instructions provided with each kit.

**⚠ WARNING**



**Carbon monoxide.**
**Can cause severe nausea, fainting, or death.**

The exhaust system must be leakproof and routinely inspected.

**Generator set operation. Carbon monoxide can cause severe nausea, fainting, or death.** Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Avoid breathing exhaust fumes when working on or near the generator set. Never operate the generator set inside a building. Never operate the generator set where exhaust gas could seep inside or be drawn into a potentially occupied building through windows, air intake vents, or other openings.

**Carbon monoxide detectors. Carbon monoxide can cause severe nausea, fainting, or death.** Install carbon monoxide detectors on each level of any building adjacent to the generator set. Locate the detectors to adequately warn the building's occupants of the presence of carbon monoxide. Keep the detectors operational at all times. Periodically test and replace the carbon monoxide detectors according to the manufacturer's instructions.

## 1.2 Lifting

**⚠ WARNING**

**Unbalanced weight.**
**Improper lifting can cause severe injury or death and equipment damage.**

Do not use lifting eyes.
Lift the generator set using lifting bars inserted through the lifting holes on the skid.

| Model | Weight, kg (lb.) |
|---|---|
| 14RESA/RESAL | 186 (410) |
| 20RESA/RESAL | 227 (500) |

**Figure 1-1** Approximate Weights

Approximate generator set weights are shown in Figure 1-1. Use lifting bars inserted through the holes in the skid to lift the unit. See the dimension drawings on the following pages for lifting hole locations.

## 1.3 Generator Set Inspection

Complete a thorough inspection of the generator set. Check for the following:

1. Inspect the generator set for loose or damaged parts or wires. Repair or tighten any loose parts before installation.

2. Check the engine oil. Fill, if necessary, with the recommended viscosity and grade of oil. Use synthetic oil, API (American Petroleum Institute) Service Class SG or higher. See TP-6804, Operation Manual, for additional information.

## 1.4 Location and Mounting

Install the generator set outdoors. Choose a location that is at least 0.9 m (3 ft.) from any building or structure and near the incoming gas service. Allow a minimum of 2.4 m (8 ft.) clearance beyond the exhaust end of the generator set. Locate the generator set so that the hot exhaust does not blow on plants or other combustible materials. Do not install the generator set where exhaust gas could accumulate and seep inside or be drawn into a potentially occupied building.

**Notice**

**DO NOT** locate the generator set near patios, decks, play areas, or animal shelters. Keep items such as lawn furniture, toys, sports equipment, and all combustible materials away from the generator set exhaust outlet.

Remind family members, children, and visitors to use caution near the generator set. Generator sets connected to automatic transfer switches start automatically during exercise periods and power outages. Some generator set components become hot when the generator set is running and remain hot for a time after the generator set shuts down.

### 1.4.1 Mounting Area

The generator set is shipped on an engineered composite mounting pad. Prepare a flat, level mounting area covered with a weed barrier and gravel or a concrete mounting pad. Set the composite mounting pad directly on the gravel or concrete.

Do not install the mounting pad directly on grass, wood, or other combustible materials. Clear all combustible materials, including plants and shrubs, building materials, and lawn furniture, from an area at least 2.4 m (8 ft.) beyond the exhaust end of the generator set. See Figure 1-7 in Section 1.5.

### 1.4.2 Exhaust Requirements

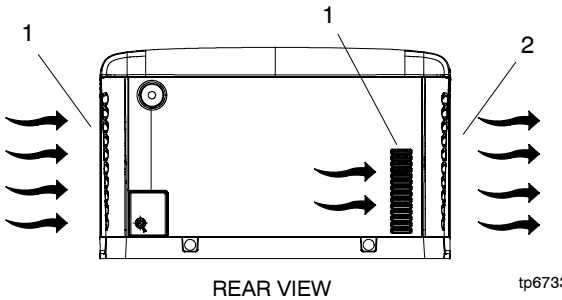
Figure 1-2 gives the exhaust temperature at rated load. The engine exhaust mixes with the generator set cooling air at the exhaust end of the enclosure. Mount the generator set so that the hot exhaust does not blow on plants or other combustible materials. Maintain the clearances shown in Figure 1-7 in Section 1.5.

| Exhaust | Temperature, °C (°F) |
|---|---|
| Exhaust gas exiting the enclosure at rated kW, °C (°F) | 260 (500) |

**Figure 1-2** Exhaust Flow and Temperature

The generator set requires correct air flow for cooling and combustion. The inlet and outlet openings in the sound enclosure provide the cooling and combustion air. Figure 1-3 shows the locations of the cooling air intake and exhaust vents. Inspect the air inlet and outlet openings inside and outside the housing to ensure that the air flow is not blocked.

The generator set is designed to operate with all enclosure panels and internal baffling in place. If during installation, maintenance or repair the unit must be operated without the complete enclosure and baffling as shipped from the factory make sure the exhaust panel is removed as well.




1. Air intake
2. Exhaust outlet

**Figure 1-3** Cooling Air Intake and Exhaust

## 1.5 Dimension Drawings

See the dimension drawings in Figure 1-4 through Figure 1-7 for the generator set dimensions, fuel and electric inlet locations, and recommended clearance.

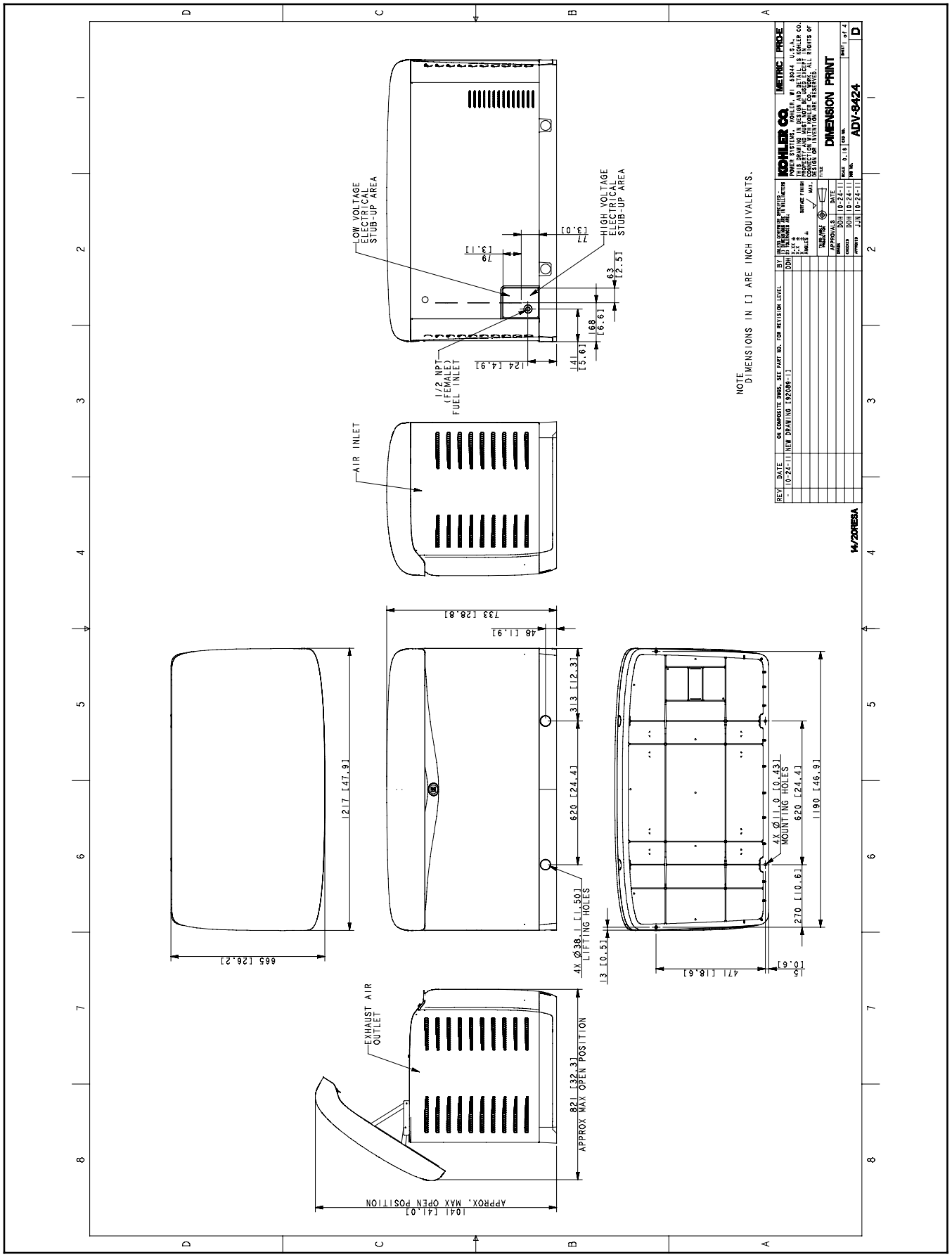



**Figure 1-4** Dimension Drawing ADV-8424, Sheet 1

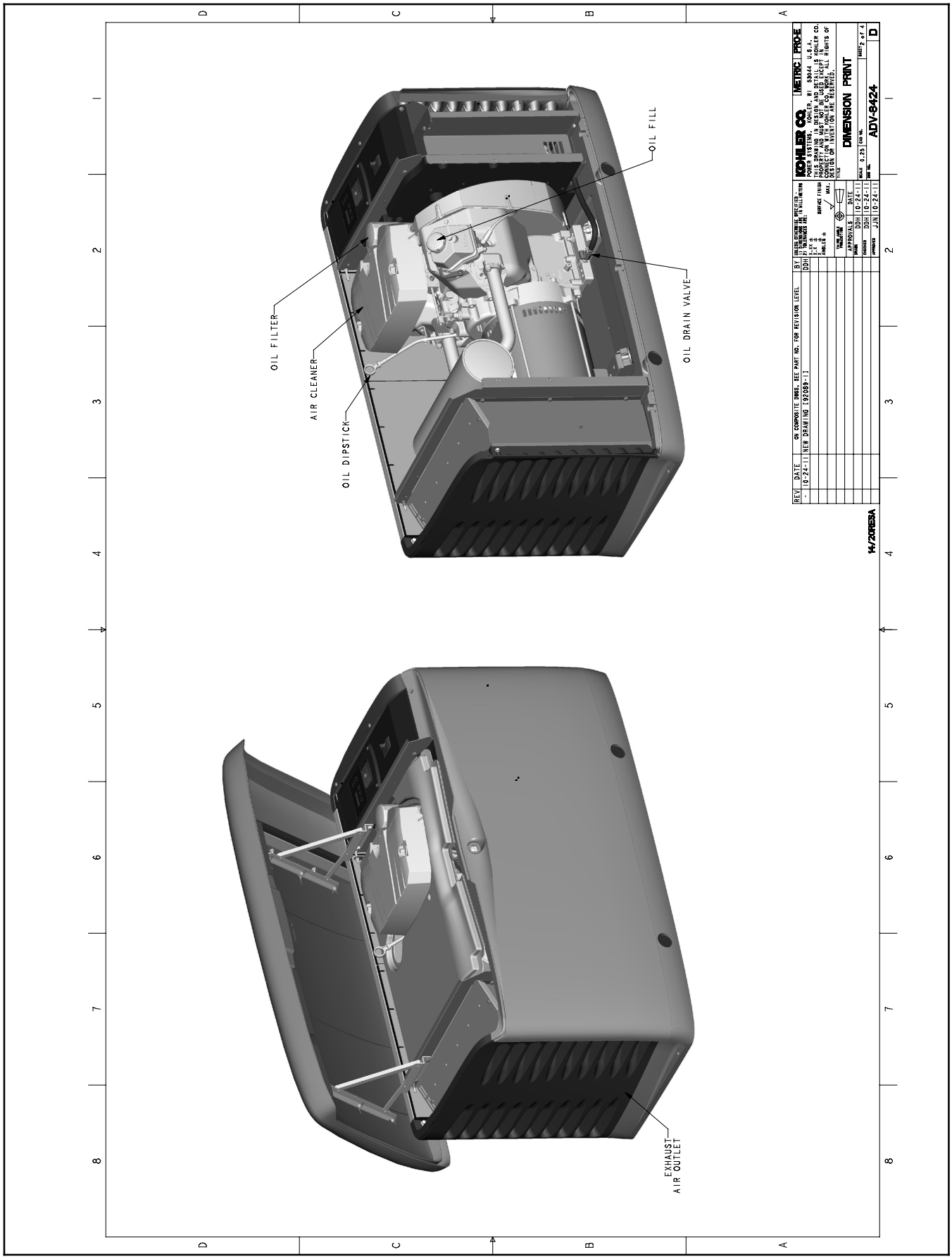



**Figure 1-5** Dimension Drawing ADV-8424, Sheet 2

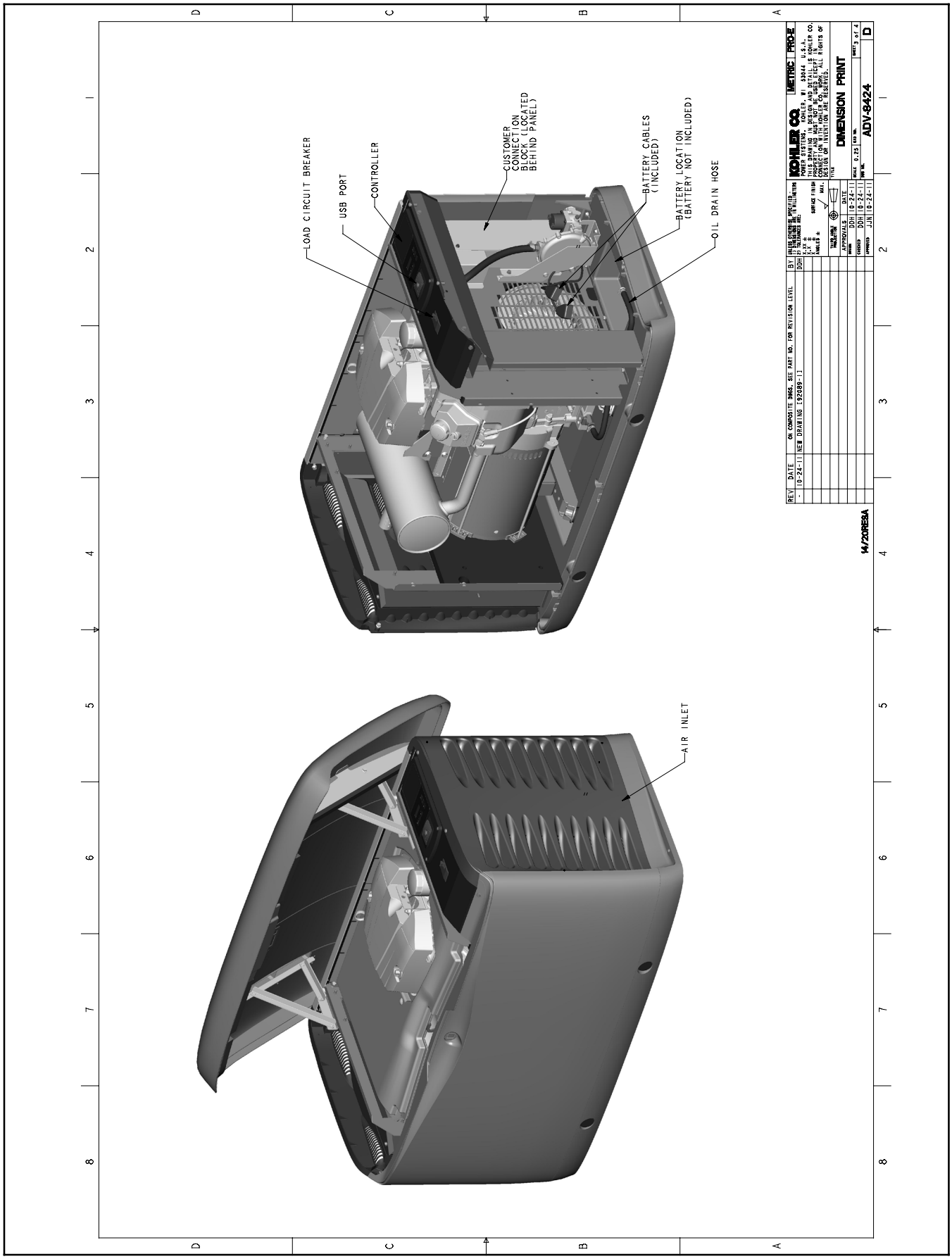



**Figure 1-6** Dimension Drawing ADV-8424, Sheet 3

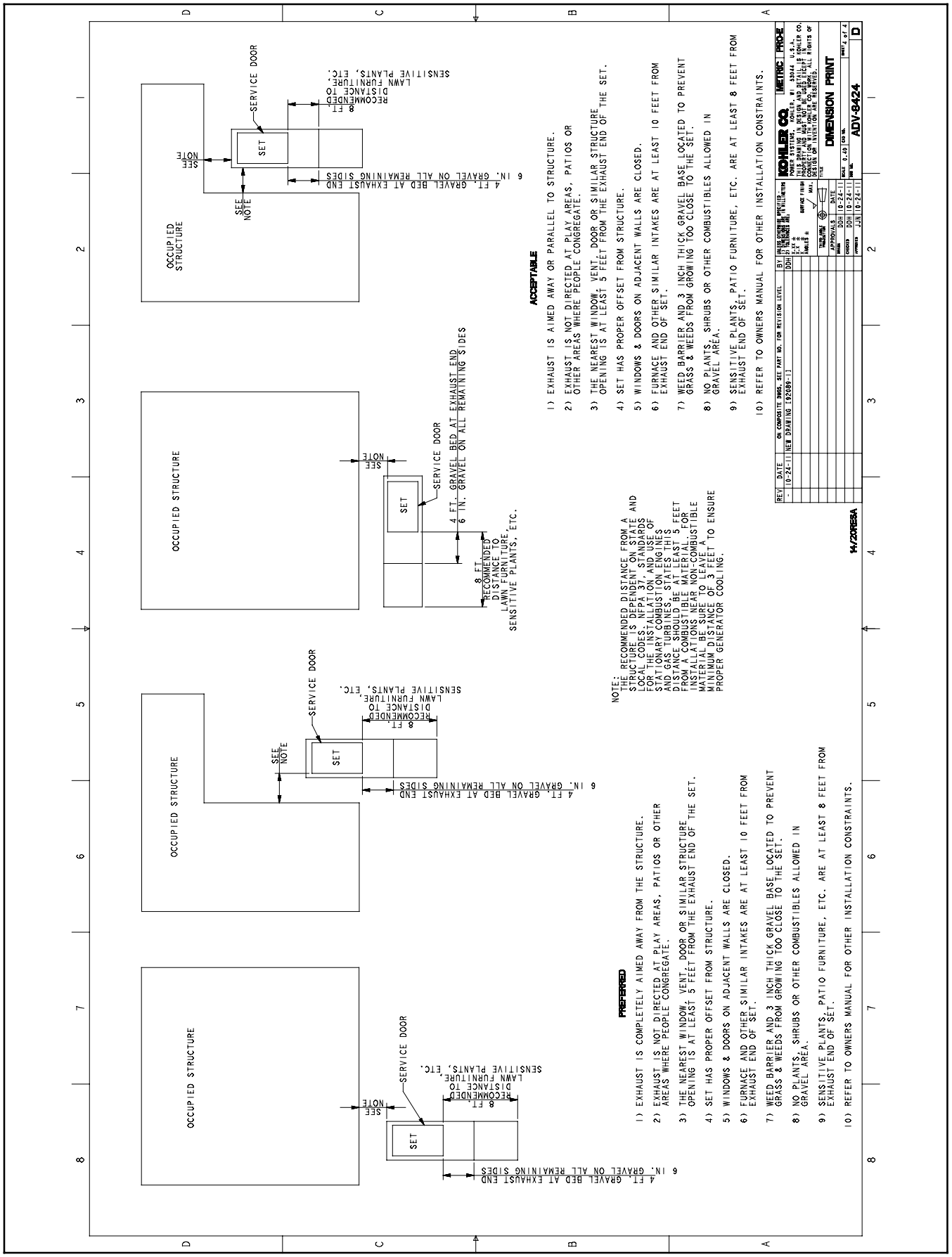



**Figure 1-7** Dimension Drawing ADV-8424, Sheet 4

## 1.6 Fuel Requirements

The generator set operates using natural gas or LP vapor fuel. The generator set is EPA-certified for both natural gas and LP vapor fuels.

The fuel system installation must comply with the NEC and local codes.

### 1.6.1 Fuel Supply

Because of variable climates and geographical considerations, contact the local fuel supplier for fuel system planning and installation. Figure 1-8 lists the recommended fuel ratings and other fuel supply information for natural gas and LP vapor fuels.

| Fuel type | Natural Gas | LP Vapor |
|---|---|---|
| Fuel supply inlet | 1/2 NPT | |
| Fuel supply pressure, kPa (in. $H_2O$) | 1.3–2.7 (5–11) | 1.7–2.7 (7–11) |
| Fuel flow rate, maximum, Btu/hr.: | | |
| 14RESA/RESAL | 193,000 | 203,000 |
| 20RESA/RESAL | 281,000 | 340,000 |
| **Nominal Fuel Rating, Btu/ft.$^3$** | | |
| Natural gas | 1000 | |
| LP vapor | 2500 | |

**Figure 1-8** Fuel Supply

Verify that the output pressure from the primary gas utility pressure regulator is as shown in Figure 1-8 and that the utility gas meter flow rate is sufficient to supply the generator set at rated load plus all other gas-consuming appliances. For LP tanks, verify that the output pressure is as shown in Figure 1-8. See Figure 1-10 for fuel consumption. Contact the fuel supplier for flow rate information or a gas meter upgrade.

The dimension drawing in Section 1.5 shows the location of the fuel inlet connection. Use flexible sections to prevent fuel line breakage caused by vibration. Hold the fuel solenoid valve with a wrench when tightening the fuel connections. Protect all fuel lines from machinery or equipment contact, adverse weather conditions, and environmental damage.

### 1.6.2 Fuel Pipe Size

Ensure that the fuel pipe size and length meet the specifications in Figure 1-9. Measure the pipe length from the primary gas pressure regulator to the pipe connection on the generator set fuel inlet. Add 2.4 m (8 ft.) to the measured length for each 90 degree elbow. Compare the total pipe length with the chart in Figure 1-9 to find the required pipe size.

Contact local LP provider for LP installation information.

| Minimum Gas Pipe Size Recommendation, in. NPT | | | | |
|---|---|---|---|---|
| | 14RESA/RESAL | | 20RESA/RESAL | |
| Pipe Length, m (ft.) | Natural Gas (193,000 Btu/hr.) | LP Vapor (203,000 Btu/hr.) | Natural Gas (281,000 Btu/hr.) | LP Vapor (340,000 Btu/hr.) |
| 8 (25) | 3/4 | 3/4 | 1 | 3/4 |
| 15 (50) | 1 | 3/4 | 1 | 1 |
| 30 (100) | 1 | 1 | 1 1/4 | 1 |
| 46 (150) | 1 1/4 | 1 | 1 1/4 | 1 1/4 |
| 61 (200) | 1 1/4 | 1 | 1 1/4 | 1 1/4 |

**Figure 1-9** Fuel Pipe Size Recommendations

| Fuel Type | % Load | Fuel Consumption, $m^3$/hr. (cfh) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 14RESA/RESAL | | | | 20RESA/RESAL | | | |
| | | 60 Hz | | 50 Hz | | 60 Hz | | 50 Hz | |
| Natural Gas | 100% | 5.4 | (193) | 4.9 | (175) | 8.0 | (281) | 6.4 | (225) |
| | 75% | 4.7 | (163) | 4.2 | (148) | 6.9 | (243) | 5.4 | (189) |
| | 50% | 3.5 | (124) | 3.1 | (108) | 4.6 | (161) | 3.9 | (139) |
| | 25% | 2.6 | (93) | 2.4 | (84) | 3.6 | (127) | 2.9 | (103) |
| LP Vapor | 100% | 2.3 | (81) | 2.1 | (74) | 3.9 | (136) | 2.9 | (102) |
| | 75% | 2.1 | (75) | 1.9 | (68) | 3.1 | (109) | 2.4 | (85) |
| | 50% | 1.8 | (60) | 1.5 | (53) | 2.3 | (82) | 1.8 | (63) |
| | 25% | 1.2 | (45) | 1.1 | (40) | 1.7 | (59) | 1.3 | (47) |

LP vapor conversion factors:
8.58 $ft.^3$ = 1 lb.
0.535 $m^3$ = 1 kg
36.39 $ft.^3$ = 1 gal.

Nominal fuel rating:
Natural gas: 37 $MJ/m^3$ (1000 $Btu/ft.^3$)
LP vapor: 93 $MJ/m^3$ (2500 $Btu/ft.^3$)

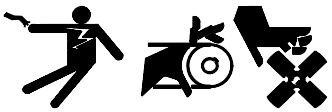
**Figure 1-10** Fuel Consumption

## 1.7 Fuel Conversion

The multi-fuel system allows conversion from natural gas to LP vapor (or vice-versa) in the field while maintaining emissions-standard compliance. A trained technician or an authorized distributor/dealer can convert the fuel system.

Figure 1-11 shows the fuel system components.

**⚠ WARNING**

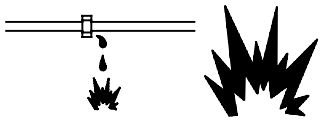


**Accidental starting.**
**Can cause severe injury or death.**

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

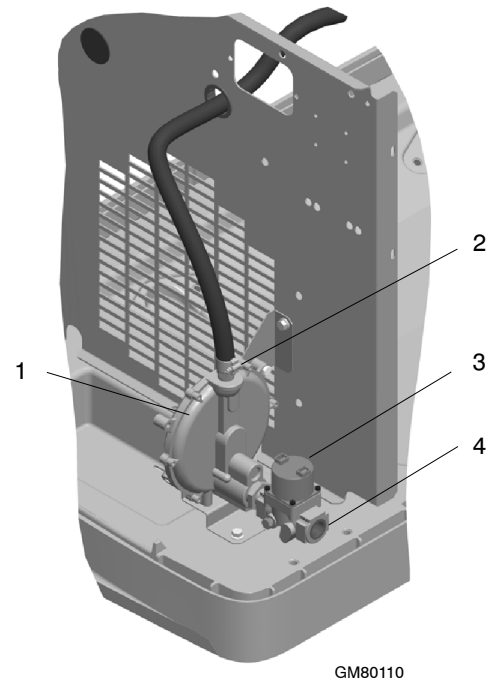
**Disabling the generator set. Accidental starting can cause severe injury or death.** Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

**⚠ WARNING**



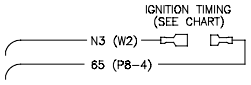
**Explosive fuel vapors.**
**Can cause severe injury or death.**

Use extreme care when handling, storing, and using fuels.




1. Fuel Regulator
2. Fuel block (not shown; see Figure 1-12) or LP orifice location (see Figure 1-15)
3. Fuel solenoid valve and digital spark advance ignition (DSAI) leads
4. Fuel inlet, 1/2 in. NPT female

| IGNITION TIMING | |
|---|---|
| FUEL TYPE | CH980 |
| NATURAL GAS | CONNECT 65 TO N |
| LP GAS | DO NOT CONNECT |




DSAI Lead Connection

**Figure 1-11** Fuel System

### 1.7.1 Fuel Conversion, 14RESA/RESAL

Two fuel connections on the fuel block allow field-conversion between natural gas and LP vapor. The fuel metering valves are factory-set and sealed to comply with applicable emission standards and to provide the best possible hot and cold starting.

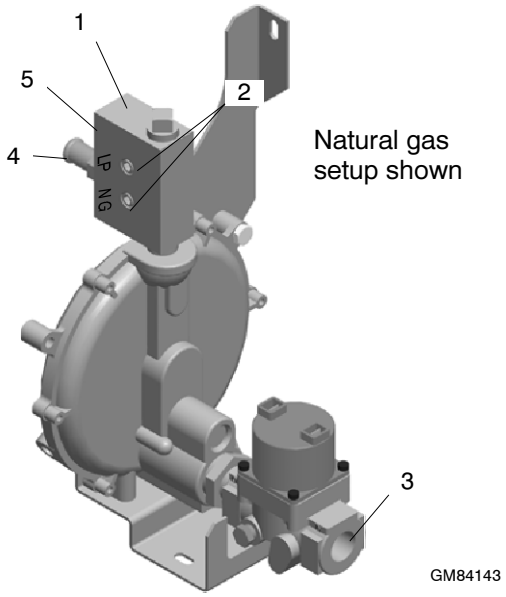
**Note:** Do not adjust the factory-sealed fuel-metering adjustments on the fuel block. Changing the fuel-metering adjustments may violate federal or state laws.

Use the following procedure to convert from natural gas (NG) to LP vapor. The procedure includes moving the fuel connection from the natural gas to the LP port, plugging the natural gas port, and disconnecting the leads for the digital spark advance ignition (DSAI). See Figure 1-11 for the fuel system component locations.

**Procedure to convert from NG to LP, 14RESA/RESAL**

1. Press the OFF button on the generator set controller.
2. Disconnect the power to the battery charger.
3. Disconnect the generator set engine starting battery, negative (-) lead first.
4. Turn off the fuel supply.
5. Remove the hose clamp and fuel hose from the hose fitting in the fuel block. See Figure 1-12.
6. Remove the hose fitting from the natural gas outlet port in the fuel block. See Figure 1-12.
7. Remove the plug from the LP port in the fuel block. See Figure 1-12.
8. Clean the plug with a dry cloth or brush, apply fresh pipe sealant, and install the plug into the natural gas outlet port.
9. Clean the hose fitting with a dry cloth or brush, apply fresh pipe sealant to the threads, and install the fitting into the LP port.

   **Note:** Do not adjust the fuel metering valves.
10. Slide the hose onto the hose fitting and secure it with the clamp.
11. Disconnect the DSAI leads for LP. The DSAI leads are located near the fuel solenoid valve. See Figure 1-11.
12. Connect and turn on the new fuel supply.




1. Fuel block
2. Fuel metering valves—*factory-sealed, do not adjust*
3. Fuel inlet, 1/2 in. NPT
4. Hose fitting
5. Plug

**Figure 1-12** Fuel Block, 14RESA/RESAL

13. Reconnect the generator set engine starting battery leads, negative (-) lead last.
14. Reconnect power to the battery charger.
15. Start the generator set by pressing the RUN button on the generator set controller.
16. Check for leaks using a gas leak detector.
17. Run the generator set and check the operation.
18. Press the OFF button to to shut down the generator set.

**Conversion from LP to Natural Gas**

To convert from LP vapor to natural gas, follow the fuel conversion procedure above, moving the hose fitting to the natural gas port and plugging the LP port. Connect the DSAI leads for natural gas. See Figure 1-13.

| Fuel | DSAI Leads 65 and N |
|---|---|
| Natural Gas | Connect lead 65 to N |
| LP | Disconnect |

**Figure 1-13** DSAI Connection

## 1.7.2 Fuel Conversion, 20RESA/RESAL

For LP vapor fuel, an orifice is used in the fuel line. The unit is typically shipped set up for natural gas, with the loose orifice tied near the fuel solenoid valve. To convert to LP vapor, install the orifice and disconnect the spark advance leads as described below. See Figure 1-15 for the fuel system component locations.

### Procedure to Convert from NG to LP, 20RESA/RESAL

1. Press the OFF button on the generator set controller.
2. Disconnect the power to the battery charger.
3. Disconnect the generator set engine starting battery, negative (-) lead first.
4. Turn off the fuel supply.
5. Remove the hose clamp and fuel hose from the hose fitting. See Figure 1-15.
6. Insert the orifice into the hose fitting. See Figure 1-15.
7. Slide the hose onto the hose fitting and secure it with the clamp.
8. Disconnect digital spark-advance module (DSAI) leads 65 and N5 for LP. The DSAI leads are located near the fuel solenoid valve. See Figure 1-11.
9. Connect and turn on the new fuel supply.
10. Reconnect the generator set engine starting battery leads, negative (-) lead last.
11. Reconnect power to the battery charger.
12. Start the generator set by pressing the RUN button on the generator set controller.
13. Check for leaks using a gas leak detector.
14. Run the generator set and check the operation.
15. Press the OFF button to shut down the generator set.

### Conversion from LP to Natural Gas

To convert from LP vapor to natural gas, remove the fuel orifice and connect the DSAI leads together.

| Fuel | DSAI Leads 65 and N |
|---|---|
| Natural Gas | Connect lead 65 to N |
| LP | Disconnect |

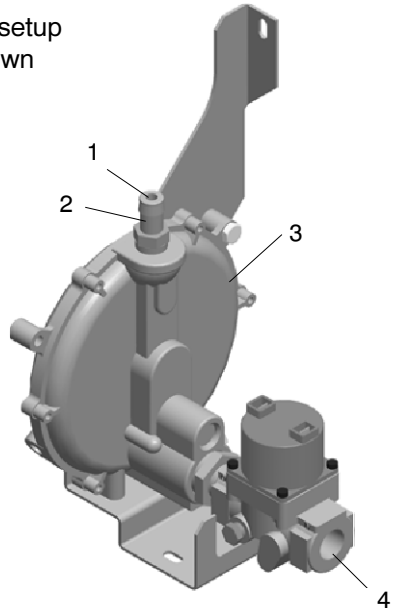
**Figure 1-14** DSAI Connections

### Rating

Converting the fuel will change the generator set rating. See the generator set specification sheet for ratings with natural gas and LP. Order a new nameplate with the updated rating and fuel information from an authorized distributor/dealer, if necessary. Provide the following information from the original nameplate:

- Model Number
- Spec Number
- Serial Number
- Fuel (original and new)
- kW
- kVA
- Amps
- Volts
- Hz

**Note:** LP setup shown




GM84143

1. LP orifice
2. Hose fitting
3. Regulator
4. Fuel inlet, 1/2 in. NPT female

**Figure 1-15** Fuel Regulator and LP Orifice, 20RESA/RESAL

## 1.8 Electrical Connections

**⚠ DANGER**

**Hazardous voltage.**
**Will cause severe injury or death.**

This equipment must be installed and serviced by qualified electrical personnel.

**Grounding electrical equipment. Hazardous voltage can cause severe injury or death.** Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

**Electrical backfeed to the utility. Hazardous backfeed voltage can cause severe injury or death.** Install a transfer switch in standby power installations to prevent the connection of standby and other sources of power. Electrical backfeed into a utility electrical system can cause severe injury or death to utility personnel working on power lines.

**NOTICE**

**Canadian installations only**. For standby service connect the output of the generator set to a suitably rated transfer switch in accordance with Canadian Electrical Code, Part 1.

Have an authorized distributor/dealer or a licensed electrician make the following electrical connections. The electrical installation must comply with the National Electrical Code® (NEC) class 1 wire designation and all applicable local codes. Canadian installations must comply with the Canadian Electrical Code (CEC) and applicable local codes.

### 1.8.1 Grounding

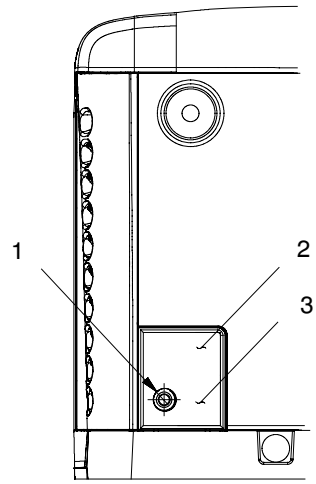
Ground the generator set. The grounding method must comply with NEC and local codes. Connect the grounding strap to the generator set ground lug, terminal GND inside the controller compartment.

Generator sets are shipped with the generator neutral bonded (connected) to the generator ground in the junction box. The requirement for having a bonded (grounded) neutral or ungrounded neutral is determined by the type of installation. At installation, the neutral can be grounded at the generator set or lifted from the ground stud and isolated if the installation requires an ungrounded neutral connection at the generator. The generator set will operate properly with the neutral either bonded to ground or isolated from ground at the generator.

Various regulations and site configurations including the National Electrical Code (NEC), local codes, and the type of transfer switch used in the application determine the grounding of the neutral at the generator. NEC Section 250 is one example that has a very good explanation of the neutral grounding requirements for generators.

### 1.8.2 Electrical Lead Entry

Drill or punch holes in the enclosure for the electrical conduit in the locations shown in Figure 1-16. A full-scale dimensioned template for the hole locations is printed in Appendix B. See page 41.




**Note:** See Appendix B for a full-scale template with dimensions.

1. 1/2 NPT female fuel inlet
2. ATS signal electrical lead entry point
3. Utility voltage electrical lead entry point

**Figure 1-16** Electrical Lead Entry Locations

### 1.8.3 Field-Connection Terminal Block

The generator set is equipped with a field-connection terminal block located in the air inlet area near the junction box. Leads have been factory-installed from the junction box to the terminal block for easy field wiring.

See the dimension drawing in Section 1.5 for the terminal block location. See Figure 1-17 for terminal block details. Refer to the terminal block decal for connections and cable sizes. Also see Section 2, Wiring Diagrams.

The National Electrical Code® is a registered trademark of the National Fire Protection Association, Inc.

Route AC leads through flexible conduit. Ensure that the leads and conduit do not interfere with the operation of the generator set or obstruct the service areas. Route low-voltage communication leads through separate conduit.

**Procedure**

1. Drill holes for the conduit fittings. See Figure 1-16 and Appendix B for the recommended electrical inlet locations. Feed the cables through the openings.

2. Connect the leads from the transfer switch emergency source lugs to the L1 and L2 connections on the generator set terminal block.

3. Connect the neutral (L0) and ground (GRD) leads from the ATS and the main panel to the corresponding connection points on the terminal block. See Section 1.8.1, Grounding.

4. Connect utility power leads to the terminal block connections labelled Utility. Connect to a circuit that is supplied by the utility source and backed up by the generator. The power source must be GFCI protected. See Section 1.8.4 for more information about the utility power requirement.

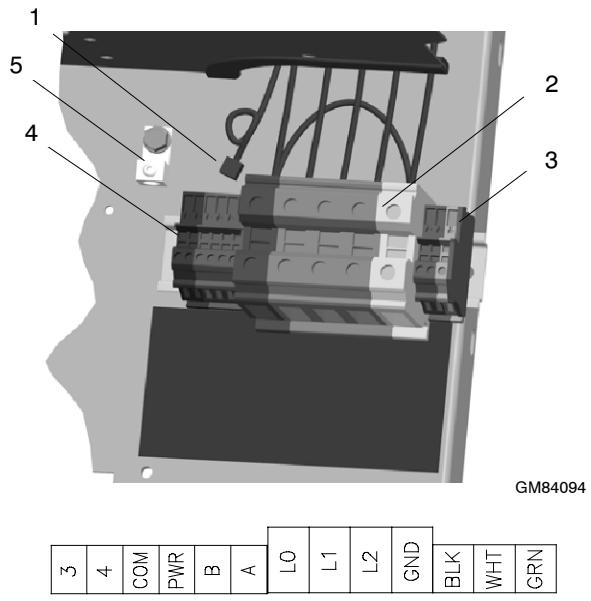
5. For connection of optional transfer switches, the programmable interface module (PIM), and/or a load control module (LCM), see Section 1.8.5.

6. If the OnCue Home Generator Management System will be used with the generator set, run category 5E network cable from the generator set to the customer's router or modem.

   **Note:** Installation of the network cable at the time of generator set installation is highly recommended. Installing the Ethernet cable now will make connection much easier if you choose to add OnCue later.

   a. Route the network cable with other low-voltage signal wiring (for example, the RBUS communication leads or engine start leads to the transfer switch), in separate conduit from the AC load leads. If the network cable is longer than 100 meters (328 ft.), use a repeater or switch.

   b. Use an RJ45 inline coupler to connect the Ethernet cable to the cable in the customer connection box. See Figure 1-17. The inline coupler is included with the OnCue kit.




1. Ethernet cable for optional OnCue connection
2. AC load connections
3. 120VAC utility power connections
4. Low voltage communication and engine start connections
5. Ground connection for communication cable shield.

**Figure 1-17** Electrical Connections

## 1.8.4 Power Supply

120 VAC, 60 Hz power must be supplied to the generator set location for the battery charger (integral to the RDC2 and DC2 controllers) and the optional accessories shown in Figure 1-18. The power source must be GFCI protected. The power to the accessories must be available at all times, i.e. the circuit must be powered by the utility source and backed up by the generator.

Be sure to disconnect power at the distribution panel before making the connections. Connect power leads to the utility power connection points on the terminal block. See Section 1.8.3 and the wiring diagrams in Section 2 for connection details.

| | Power Requirement, Max. | | |
|---|---|---|---|
| **Equipment** | **Watts** | **Amps** | **Volts** |
| Battery charger (standard, integral to RDC2 controller) | 120 | 1 | 120 |
| Carburetor heater (optional) | 37 | 0.33 | 120 |
| Battery heater (optional) | 110 | 0.92 | |
| Fuel regulator heater (20RESA/RESAL only) | 60 | 0.50 | 120 |

**Figure 1-18** Power Requirements

## 1.8.5 Transfer Switch Connection

Connect the ATS or remote start/stop switch. Connect the load leads from the generator set to the Emergency source lugs on the ATS. Route low-voltage communication leads through separate conduit. All connections must comply with applicable state and local codes.

**Note:** Do not use the Kohler® Model RRT transfer switch with the 14/20RESA or 14/20RESAL generator set.

**Communication connections for a Kohler® Model RXT transfer switch:**

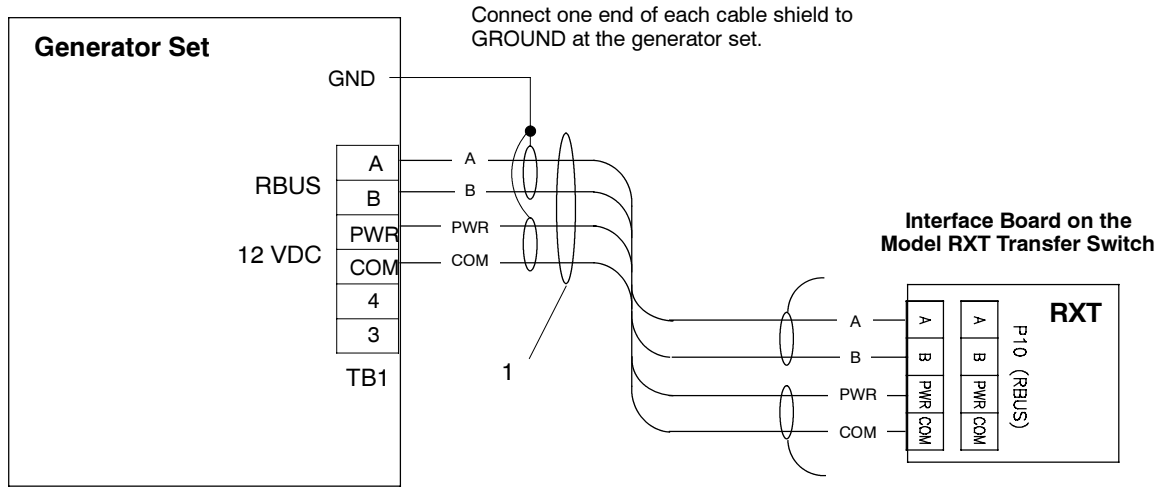
See Figure 1-19. Use Belden #9402 or equivalent 20 AWG shielded, twisted-pair cable to connect P10-1 through P10-4 on the transfer switch interface module to the generator set terminal block TB1 connections A, B, PWR, and COM.

See Section 1.8.6 for the maximum cable length.

**Note:** Connections 3 and 4 on the generator set are not used with the Model RXT transfer switch.

**Engine start connection for other transfer switches or a remote start/stop switch:**

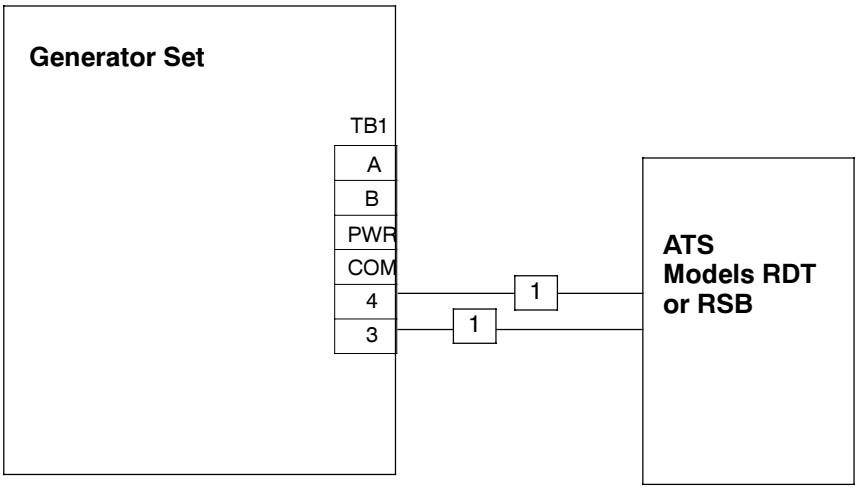
Connect the engine start leads from the transfer switch or remote start switch to terminals 3 and 4 on the terminal block. See Figure 1-20. Route the engine start leads through separate conduit from the AC power and load leads.




**Note:** Generator set terminal block (TB1) connections 3 and 4 are NOT USED with the Model RXT ATS.

1. Communication cable Belden #9402 or equivalent 20 AWG shielded, twisted-pair cable

**Figure 1-19** Model RXT Transfer Switch Communication Connection to Generator Set Terminal Block




Generator Set Terminal Block TB1.
See Figure 1-6 for location. Check the decal on the generator set for terminal block connections.

tp6809

1. Engine start leads 3 and 4. See the ATS manual for cable size specifications.

**Figure 1-20** Engine Start Connections with Transfer Switch Models RDT or RSB

## 1.8.6 System Connections with Accessory Modules

See Figure 1-22 through Figure 1-26 for connection options with up to three accessory modules. Accessory modules can include one Model RXT transfer switch, one programmable interface module (PIM), and/or one load control module (LCM).

See Figure 1-21 for the maximum total cable length with 1, 2, or 3 accessory modules per cable run.

- Use Belden #9402 (4-conductor) or equivalent 20 AWG shielded, twisted-pair cable. Note the shield connections shown in Figure 1-22.
- Belden #8723 (2-conductor) shielded twisted-pair cable can be used for connections A and B, and #12–14 AWG wire can be used for the COM and PWR connections. The maximum total cable length is the value shown for #12 or #14 AWG wire in Figure 1-21.

| Cable (TB1–PWR and COM) | Maximum length per run, meters (ft.) Number of Modules (ATS, PIM, and LCM) per Run | | |
|---|---|---|---|
| | 1 Module | 2 Modules | 3 Modules |
| Belden #9402 or equivalent 20AWG | 61 (200) | 31 (100) | 21 (67) |
| 14 AWG | 152 (500) | 152 (500) | 122 (400) |
| 12 AWG | 152 (500) | 152 (500) | 152 (500) |

**Figure 1-21** Total Cable Lengths with Accessory Modules Connected in Series (daisy-chain)

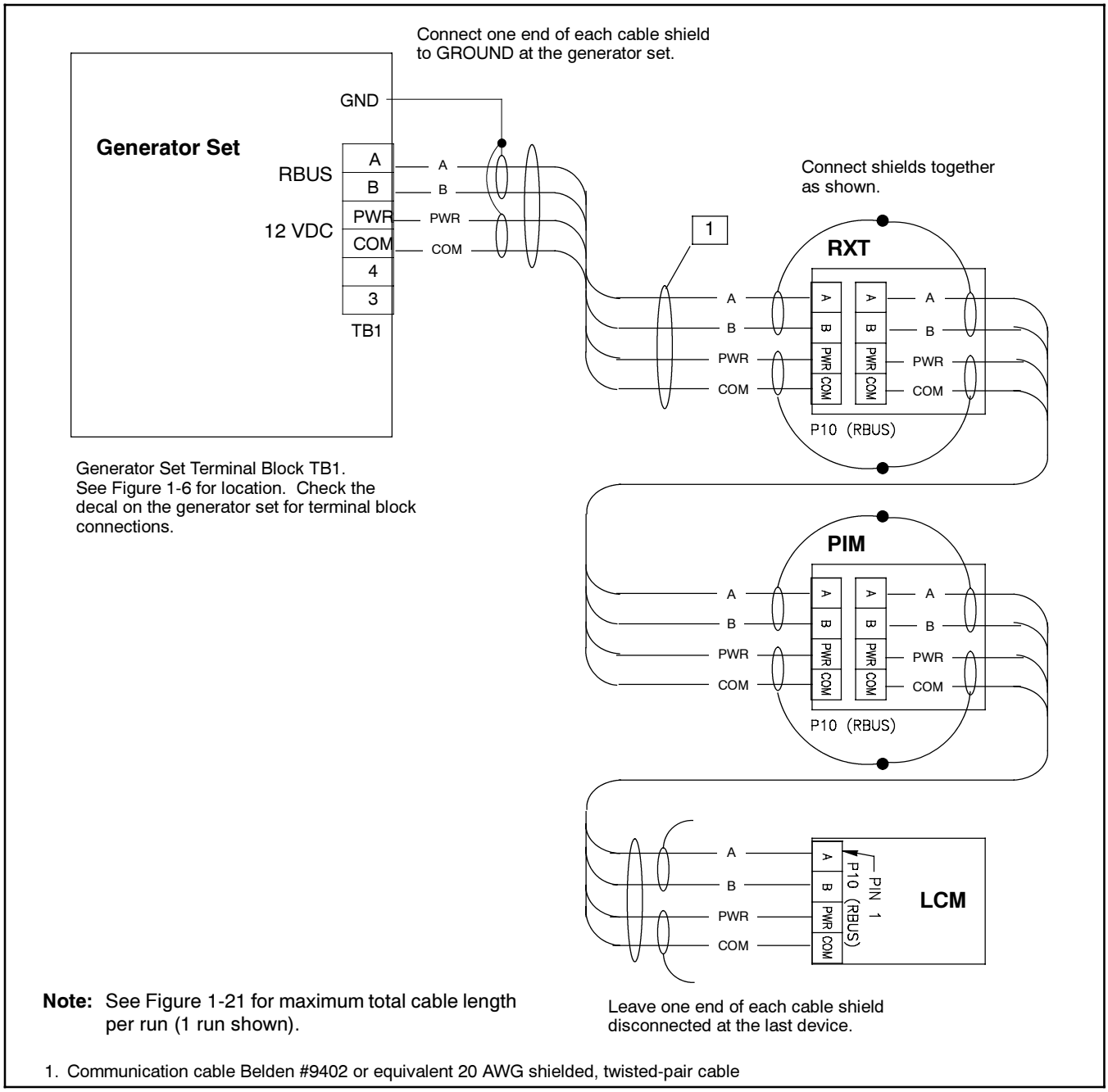
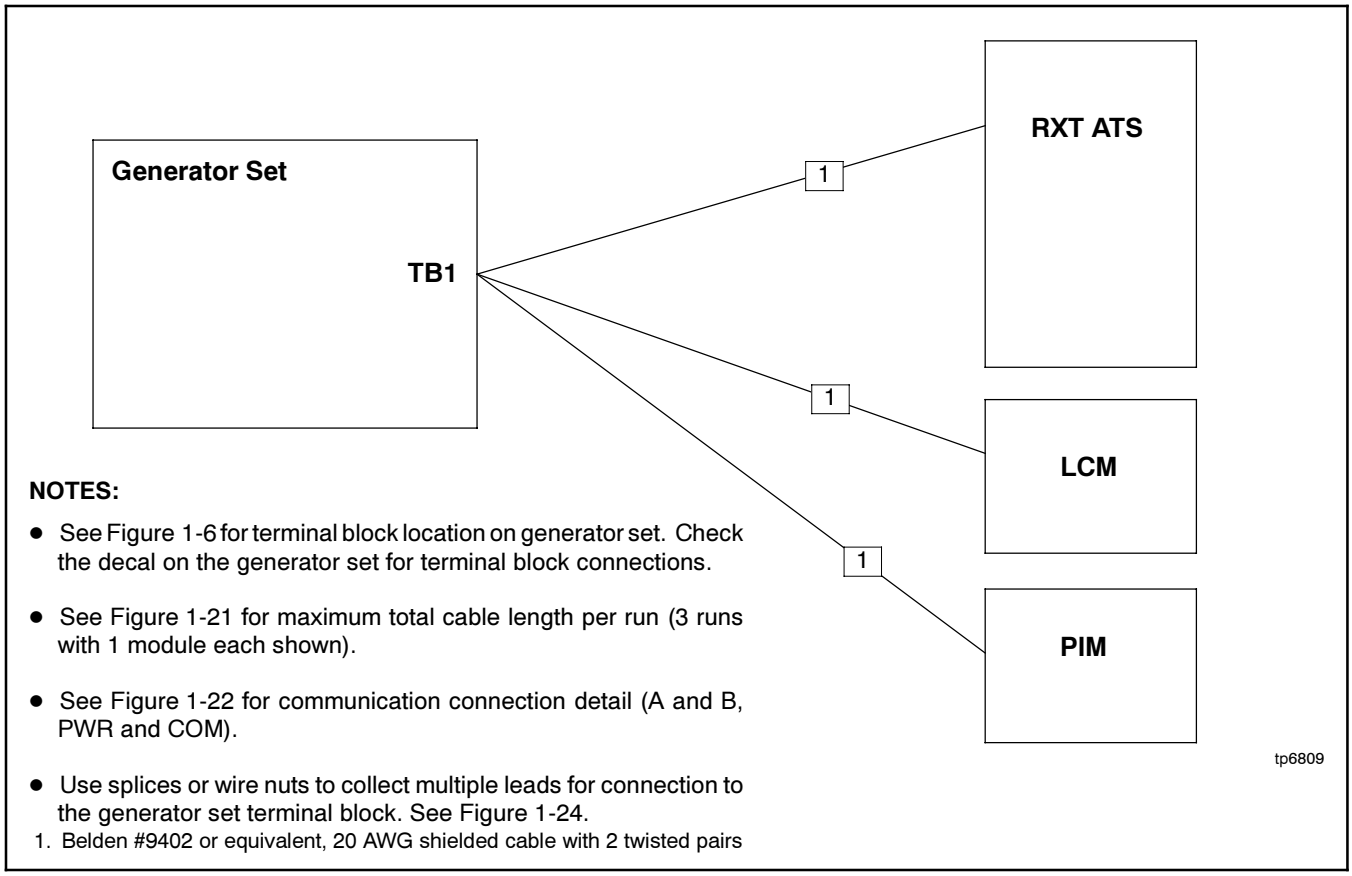



**Figure 1-22** Accessory Module Communication Connection Details




**NOTES:**

- See Figure 1-6 for terminal block location on generator set. Check the decal on the generator set for terminal block connections.
- See Figure 1-21 for maximum total cable length per run (3 runs with 1 module each shown).
- See Figure 1-22 for communication connection detail (A and B, PWR and COM).
- Use splices or wire nuts to collect multiple leads for connection to the generator set terminal block. See Figure 1-24.

1. Belden #9402 or equivalent, 20 AWG shielded cable with 2 twisted pairs

**Figure 1-23** Accessory Module Connections (three cable runs with one module each)

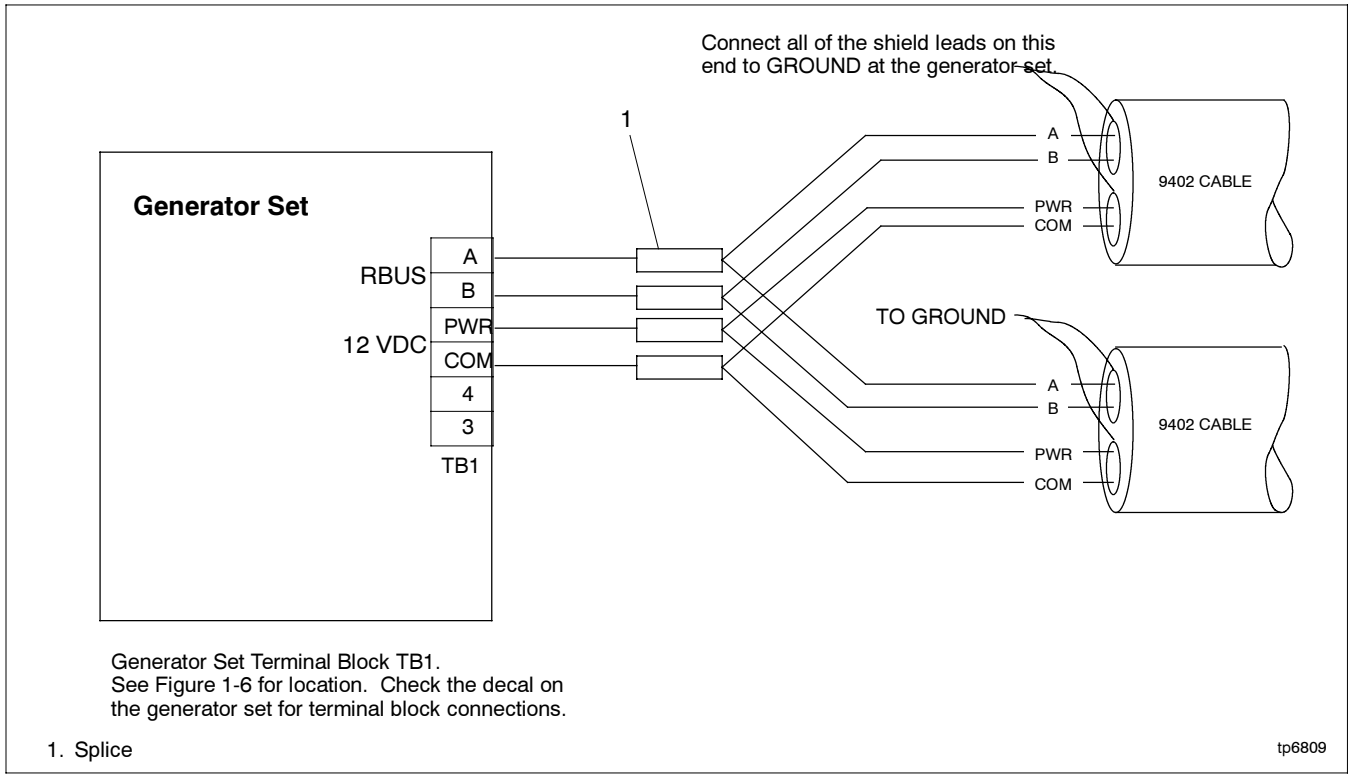



**Figure 1-24** Multiple Connections to the Generator Set

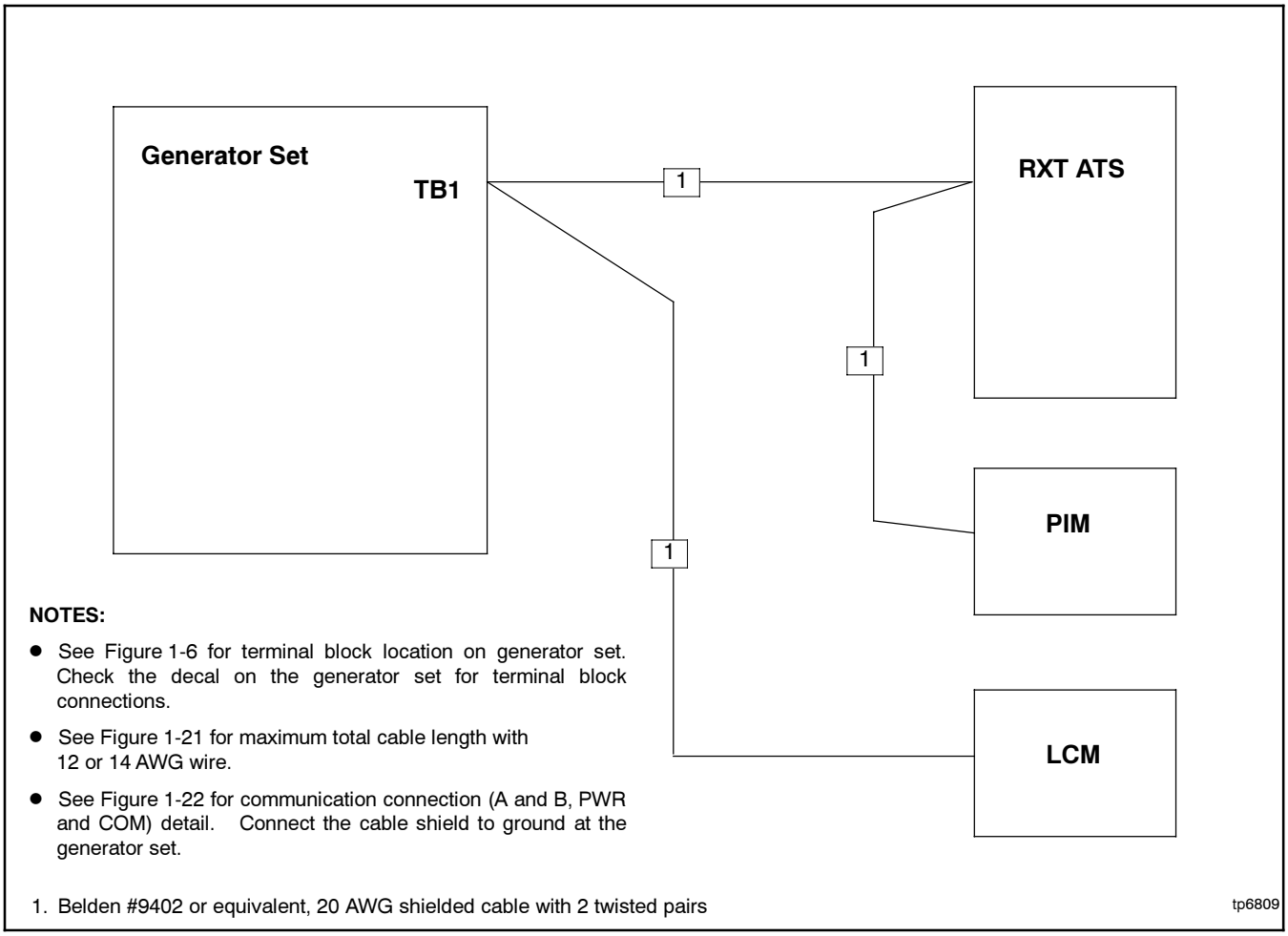



**Figure 1-25** Accessory Module Connections (two cable runs with one and two modules shown)

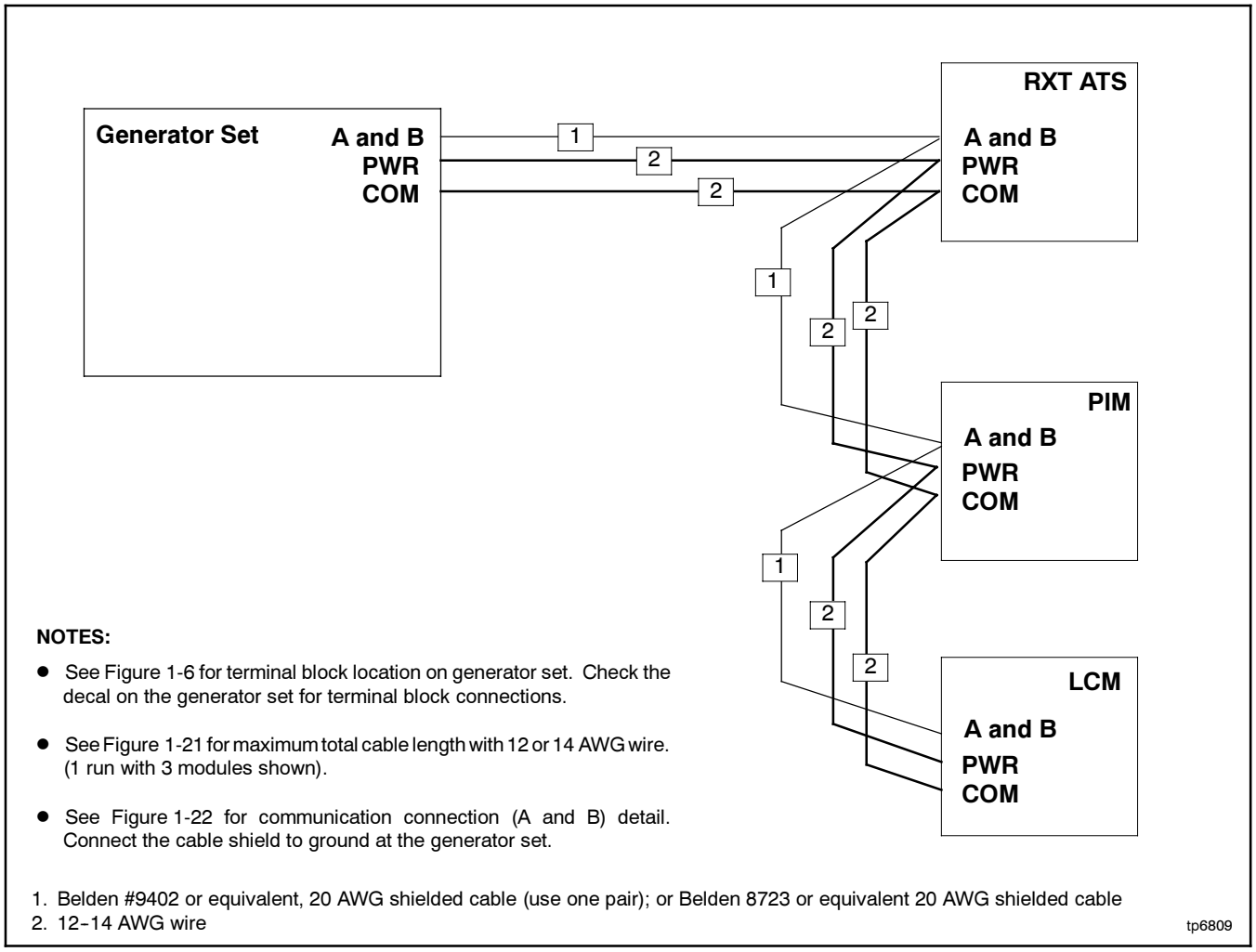
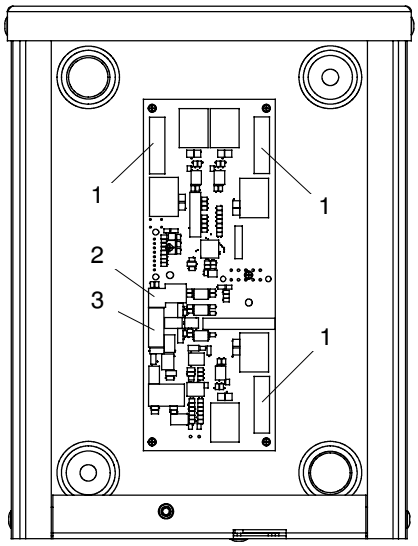



**Figure 1-26** Accessory Module Connections with 12–14 AWG Power Leads (one cable run with three modules shown)

### 1.8.7 Connect Optional Programmable Interface Module (PIM)

The optional programmable interface module (PIM) provides two programmable inputs and six dry contact outputs, four of which are programmable. See TT-1584 for PIM installation and connection instructions.




1. Output connections (3 terminal blocks, 6 outputs)
2. Input connections (2 inputs)
3. Rbus communication connection to generator set terminal block TB1

**Figure 1-27** Optional PIM

The default settings for the inputs and outputs are shown in Figure 1-28. To change the input and output settings, use a personal computer running Kohler® SiteTech software. See TP-6701, SiteTech Software Operation Manual, for instructions.

A personal computer running Kohler® OnCue™ software can be used to actively control PIM outputs. See the OnCue Software Operation Manual for instructions.

| PIM Connection | Factory Default Setting |
|---|---|
| Input 1 | None |
| Input 2 | None |
| Output 1 (Relay 1) | Run |
| Output 2 (Relay 2) | Common Fault |
| Output 3 (Relay 3) | Low Battery Voltage (Programmable) |
| Output 4 (Relay 4) | Not in Auto (Programmable) |
| Output 5 (Relay 5) | Cooldown (Programmable) |
| Output 6 (Relay 6) | Normal Source Failure (Programmable) |

**Figure 1-28** PIM Inputs and Outputs

### 1.8.8 Connect Optional Load Control Module (LCM)

The optional load control module (LCM) provides an automatic load management system to comply with Section 702.5 of NEC 2008. Refer to TT-1574, provided with the LCM, for installation and connection instructions. The installer is responsible for ensuring that the power system installation complies with all applicable state and local codes.

The load control module automatically manages up to six residential loads. Four power relays are provided for management of non-essential secondary loads, and two relays are available to control two independent air conditioner loads.

Two kits are available with either a prewired harness for load relay connection, or a terminal block. The prewired harness requires installation of the LCM within 2 feet of the distribution panel.


**Figure 1-29** Optional Load Control Module (LCM) (shown with optional pre-wired harness)

## 1.9 Battery

**⚠ WARNING**

**Sulfuric acid in batteries.**
**Can cause severe injury or death.**

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

**⚠ WARNING**

**Explosion.**
**Can cause severe injury or death.**
**Relays in the battery charger cause arcs or sparks.**

Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.

**Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death.** Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

**Battery acid cleanup. Battery acid can cause severe injury or death.** Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

**Battery gases. Explosion can cause severe injury or death.** Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

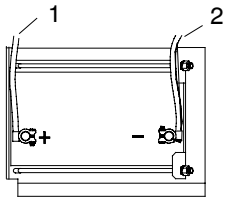
**Battery short circuits. Explosion can cause severe injury or death.** Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

**Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death.** Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Use a 12-volt group 51 battery with a minimum rating of 500 cold cranking amps at 0°F. The generator set uses a negative ground with a 12-volt engine electrical system. See Figure 1-30 for battery connections. Make sure that the battery is correctly connected and the terminals are tight.

**Note:** The generator set will not start and circuit board damage may occur if the battery is connected in reverse.

See the dimension drawing in Section 1.5 for the engine starting battery location on the air intake side of the generator set. Standard battery cables provide easy connection to the battery.




EZ-273000-J

1. To positive (+) terminal on starter solenoid.
2. To ground (-) terminal on or near starter motor.

**Figure 1-30** Typical Battery Connection

Use the following procedure to install and connect the battery.

**Battery Installation Procedure**

1. Ensure that the starting battery is fully charged before placing the battery in service.
2. Clean the battery posts and/or adapters if necessary.
3. Install the battery post adapters, if needed.
4. Place the battery in the housing.
5. Connect the positive (+) lead to the engine starting battery.
6. Connect the negative (–) lead to the engine starting battery.

Refer to the generator set operation manual and the battery manufacturer's instructions for battery maintenance instructions.

When power is applied to the RDC2/DC2 controller (that is, when the battery is connected), you will be prompted to set the date and time, and then to set the exerciser. See Section 1.12 and the generator set operation manual for instructions.

If the battery is disconnected for service or replacement, the exercise settings on the RDC2/DC2 controller are lost. Set the exerciser after installing and connecting the battery. See Section 1.12, Set Exerciser.

## 1.10 Generator Set Accessories

Have accessories installed by an authorized distributor/dealer or a licensed electrician. Follow the installation instructions provided with each kit. Use separate conduit for AC and DC leads to reduce the possibility of electrical interference. Verify that the leads and conduit do not interfere with the operation of the generator set or obstruct the service areas. Verify that the electrical installation complies with the National Electrical Code (NEC) and all applicable local codes. See Section 2, Wiring Diagrams, for more information regarding generator set electrical connections.

### 1.10.1 Regulator Heater

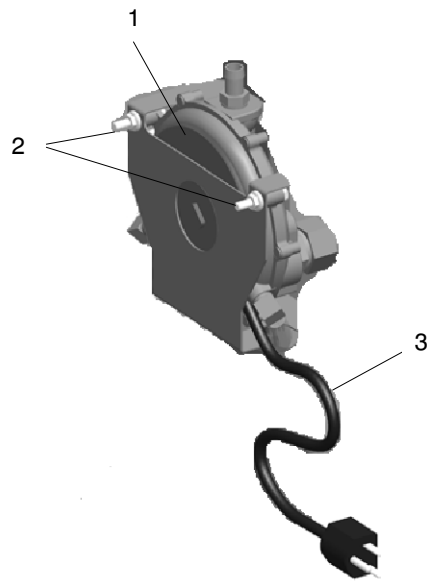
The regulator heater kit is designed for Model 20RESA and 20RESAL generator sets. The regulator heater kit is recommended in addition to the carburetor heater for reliable engine starting in temperatures below –18°C (0°F). See Figure 1-31 for heater specifications.

| Regulator Heater | |
|---|---|
| Heater rating | 120 VAC, 60 W |
| Thermostat | 4°C/13°C (40°F/55°F) Snap action |
| Pad diameter | 127 mm (5 in.) |
| Cord length | 610 mm (24 in.) |

**Figure 1-31** Regulator Heater Specifications

The regulator heater requires a source of 120 VAC power. The generator set is equipped with one 120 VAC receptacle. The kit includes an outlet splitter for powering the regulator heater and an optional carburetor heater. The circuit should be ground fault protected.

To install the regulator heater kit, follow the instructions in TT-1569, provided with the kit. Figure 1-32 shows the installed regulator heater kit.




1. Regulator heater pad GM79142
2. Regulator mounting screws M933-06035-60, qty. 2 (re-use existing nuts)
3. Heater power cord

**Figure 1-32** Installed Regulator Heater Kit (for 20RESA/RESAL)

## 1.10.2 Carburetor Heater

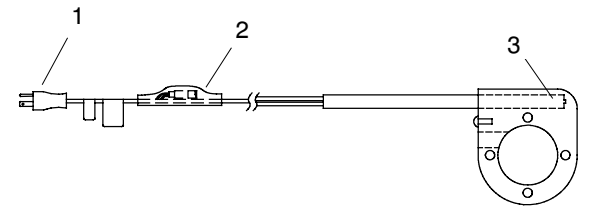
An optional carburetor heater is recommended for improved cold starting in locations where the ambient temperature drops below 0°C (32°F). The carburetor heater prevents condensation and carburetor icing. The heater turns on when the temperature at the thermostat falls below approximately 4°C (40°F) and turns off when the temperature rises above approximately 16°C (60°F). The carburetor heaters are shown in Figure 1-33.

To install the carburetor heater, follow the instructions provided with the kit. Figure 1-34 shows the installed carburetor heater kit installed for a 14 kW generator set. Figure 1-35 shows the location for the carburetor heater kit on a 20 kW generator set.

The heater thermostat is installed in the cord. Figure 1-33 shows the location of the thermostat on the power cord. The heater power cord and thermostat are located in the generator set housing air intake area/ battery compartment.

**Note:** Do not place the heater thermostat inside the generator set engine compartment. The thermostat must be exposed to the ambient air.

The heater requires a continuous source of power. Plug the carburetor heater into the 120 VAC receptacle provided.




**14RESA/RESAL Carburetor Heater**

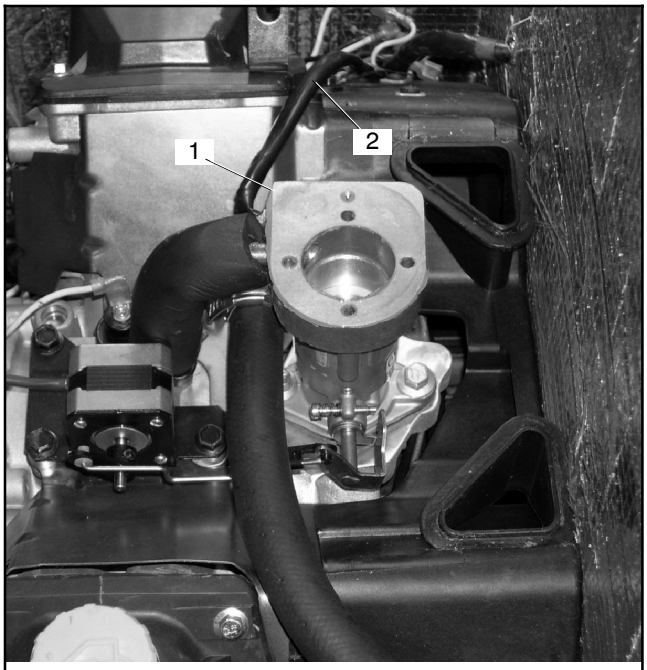
GM19463


**20RESA/RESAL Carburetor Heater**

GM57968

1. Power plug
2. Thermostat
3. Heater

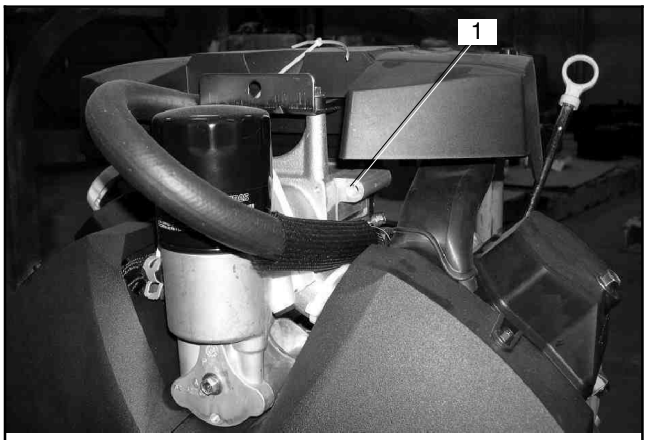
**Figure 1-33** Carburetor Heaters




tp6195

1. Carburetor heater (air cleaner removed to show heater)
2. Carburetor heater power cord

**Figure 1-34** 14RESA/RESAL Carburetor Heater




tp6514

1. Carburetor heater location

**Figure 1-35** 20RESA/RESAL Carburetor Heater Location on Engine (bulkhead removed to show heater location)

### 1.10.3 OnCue Home Generator Management System

The OnCue® Home Generator Management System allows monitoring and control of your generator set from a personal computer located in your home or at other remote locations. OnCue can also be configured to send email or text message notifications in the event of a generator set fault. See TP-6796, OnCue Software Operation Manual, for software instructions.

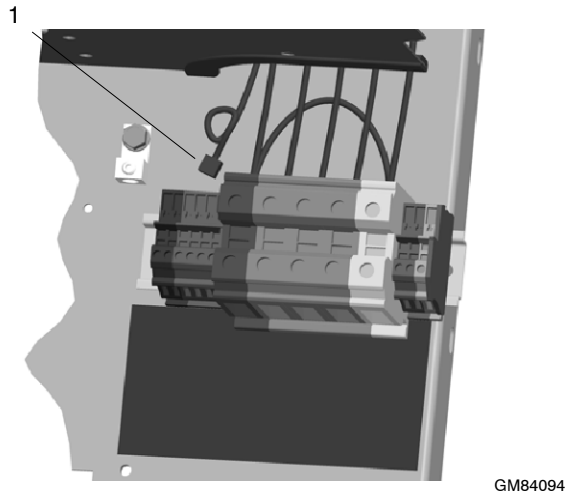
The OnCue system is available separately as a loose kit. Use category 5E network cable to connect the RDC2 controller to the customer-supplied Ethernet router and cable or DSL modem. Route the cable with other low-voltage signal wiring (for example, the RBUS communication leads or engine start leads to the transfer switch), in separate conduit from the AC load leads. If the network cable is longer than 100 meters (328 ft.), use a repeater or switch.

**Recommended:** Use a laptop computer to verify the network connection before connecting to the generator set.

#### Checking the network connection

1. Check for and turn OFF any wireless connections to the laptop.
2. Connect the network cable to the laptop. Connect the other end of the network cable to the customer's router or modem.
3. Verify the Internet connection by opening your web browser and going to www.kohlerpower.com or another website.
4. After verifying the connection through the network cable, disconnect the network cable from the laptop and turn the laptop wireless connections back on.

Connect to the Ethernet cable in the customer connection area of the generator set. See Figure 1-36. Use an RJ45 inline coupler, provided with the OnCue kit, to connect the customer's Ethernet cable to the cable in the customer connection box.




1. Ethernet cable for optional OnCue connection

**Figure 1-36** Network Connection for OnCue

## 1.11 Prestart Installation Check

Review the entire installation section. Inspect all wiring and connections to verify that the generator set is ready for operation. Check all items in the following Prestart Checklist.

**Prestart Checklist**

**Air Cleaner.** Check that a clean air cleaner element is installed to prevent unfiltered air from entering the engine. See the generator set operation manual for instructions.

**Air Inlets.** Check for clean and unobstructed air inlets.

**Battery.** Check for tight battery connections. Consult the battery manufacturer's instructions regarding battery care and maintenance.

**Enclosure.** Check that all enclosure panels and internal baffling are in place.

**Exhaust System.** Check for exhaust leaks and blockages. Check the muffler condition.

- Inspect the exhaust system components for cracks, leaks, and corrosion. Check for tight exhaust system connections.
- Check for corroded or broken metal parts and replace them as needed.
- Check that the exhaust outlet is unobstructed.

**Oil Level.** Maintain the oil level at or near, not over, the full mark on the dipstick.

**Operating Area.** Check for obstructions that could block the flow of cooling air. Keep the air intake area clean. Do not leave rags, tools, or debris on or near the generator set.

## 1.12 Set the Exerciser

Set the exerciser to automatically run the generator set on the desired day and time every week or every two weeks. See the generator set Operation Manual for detailed descriptions of the unloaded and loaded exercise operation.

### 1.12.1 RDC2 Controller

When power is applied to the RDC2 controller (when the battery or the utility power for the battery charger is connected), you will be prompted to set the date and time, and then to set the exerciser.

The first setting will flash. Press the Up and Down arrow buttons to change the setting. Press Select to save the setting and move on to the next. Repeat until the date, time, and exercise are set and the controller display shows the main menu. See the generator set Operation Manual for more detailed instructions to set the date and time and set the exerciser.

Press AUTO to place the generator set controller into automatic mode.

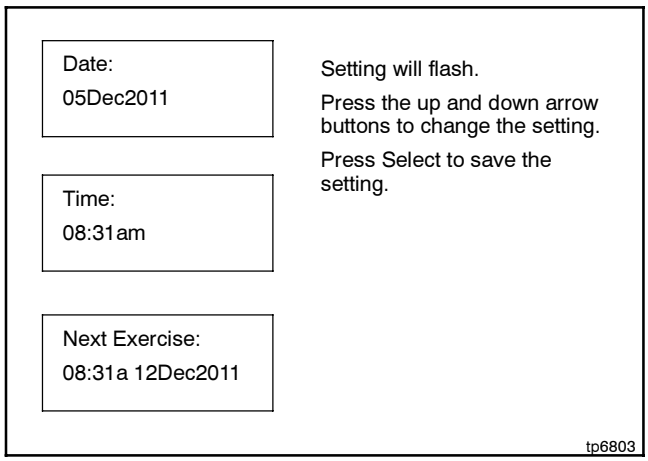



**Figure 1-37** Set Time, Date, and Exercise (RDC2)

### 1.12.2 DC2 Controller

To set the exerciser on the DC2 controller, first press AUTO to place the controller into automatic (standby) mode. Then press and hold the Exercise button. The generator set will start and run a 20-minute unloaded cycle exercise. The generator set will run automatically for 20 minutes at the same time every 7 days. See the generator set Operation Manual for more information.

### 1.12.3 Loaded Exercise

In order to set a loaded exercise using the RDC2 or DC2 controller, a Kohler® Model RXT transfer switch must be connected. See the generator set operation manual for instructions to set a loaded exercise.

To set a loaded exercise on a generator set connected to a transfer switch other than a Model RXT, use the transfer switch controller to set the exercise. Refer to the transfer switch operation manual for instructions.

# Section 2 Wiring Diagrams

Figure 2-1 lists the wiring diagram numbers and page numbers.

| Wiring Diagram Description | Drawing Number | Page |
|---|---|---|
| Schematic Diagram | ADV-8164 | 36 |
| Point-to-Point Wiring Diagram | GM81217 | 37 |

**Figure 2-1** Wiring Diagrams and Schematics

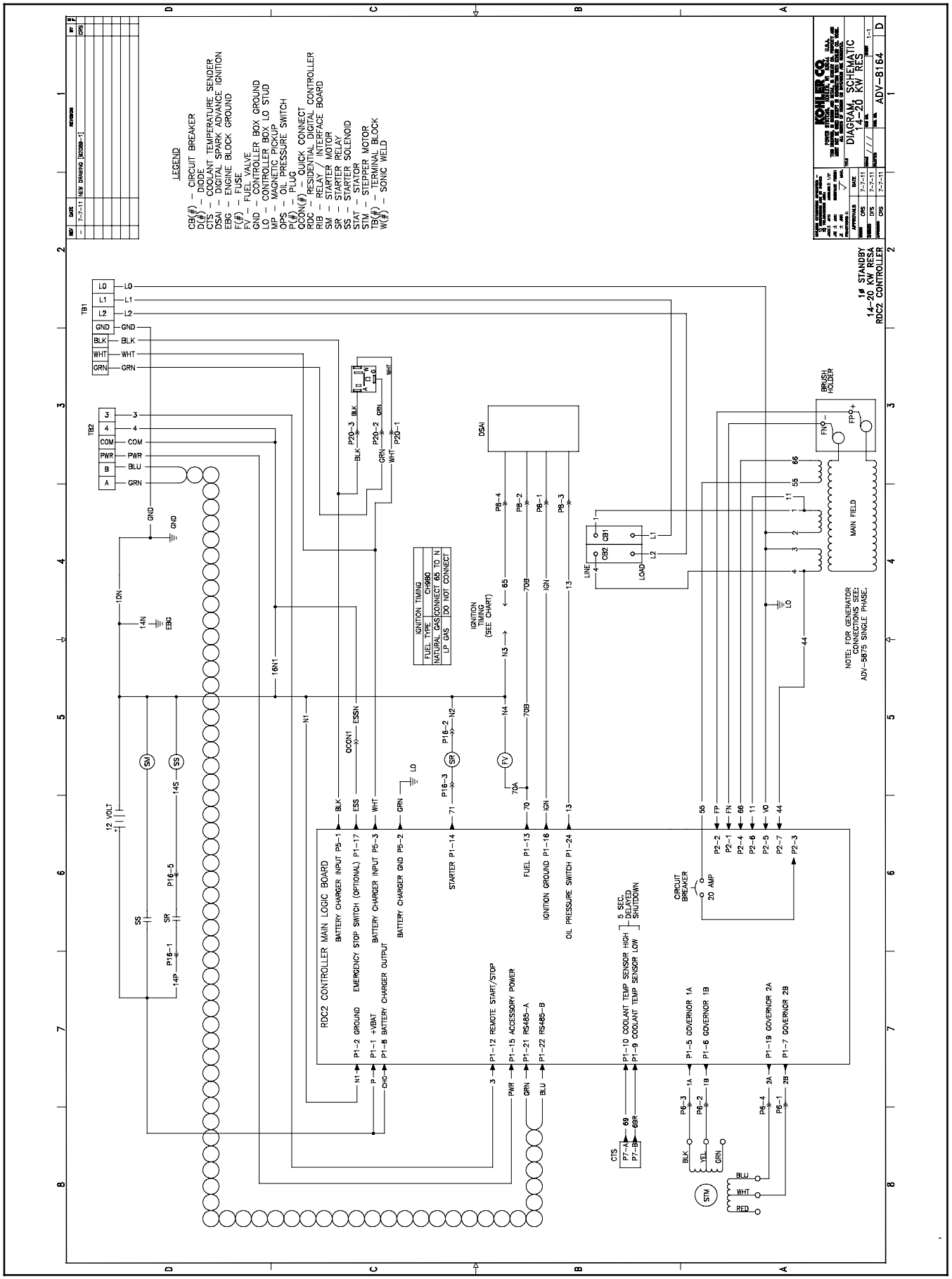



**Figure 2-2** Schematic Diagram, ADV-8164

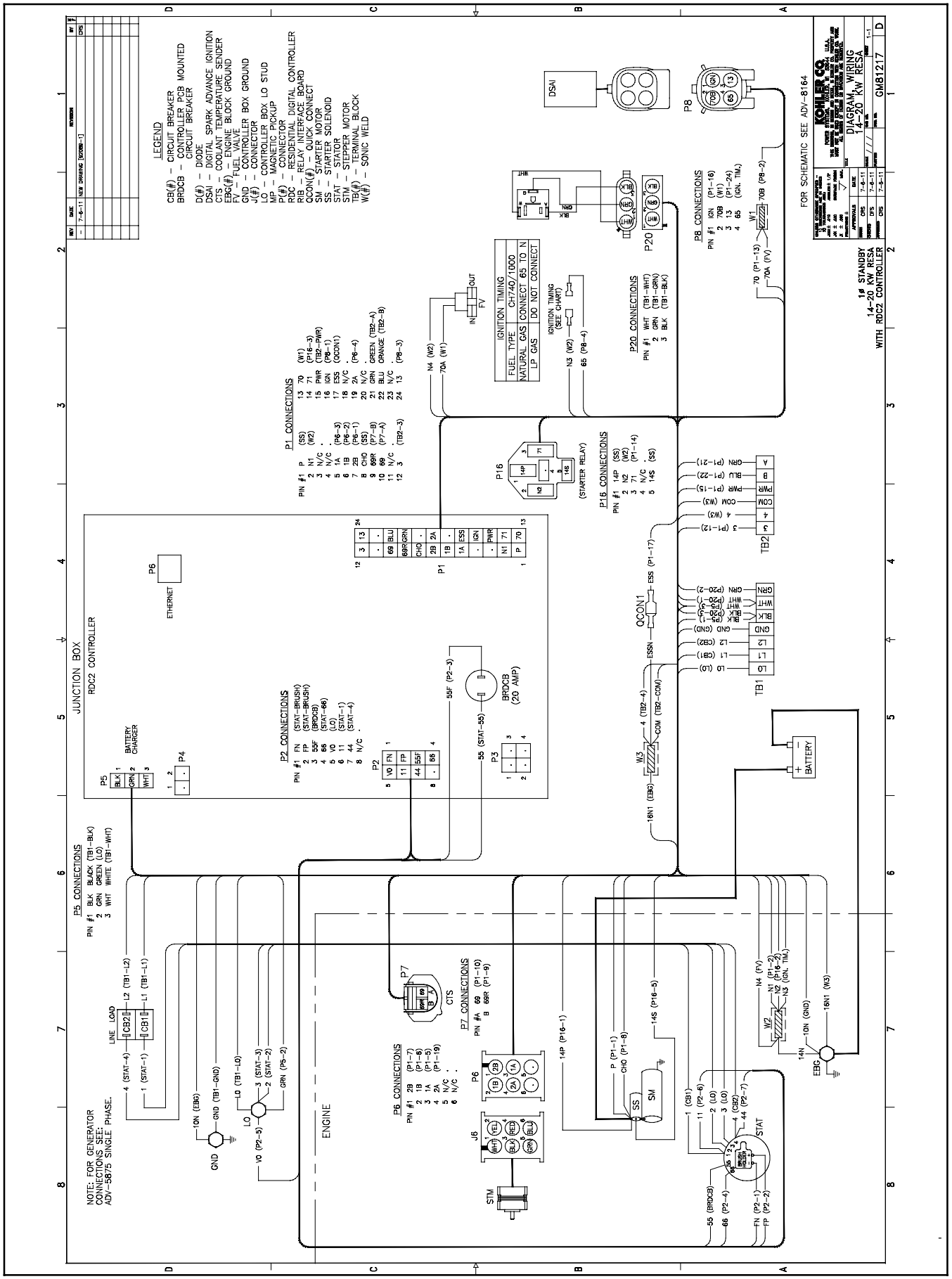



**Figure 2-3** Point-to-Point Wiring Diagram, GM81217

# Notes

# Appendix A Abbreviations

The following list contains abbreviations that may appear in this publication.

| | |
|---|---|
| A, amp | ampere |
| ABDC | after bottom dead center |
| AC | alternating current |
| A/D | analog to digital |
| ADC | advanced digital control; analog to digital converter |
| adj. | adjust, adjustment |
| ADV | advertising dimensional drawing |
| Ah | amp-hour |
| AHWT | anticipatory high water temperature |
| AISI | American Iron and Steel Institute |
| ALOP | anticipatory low oil pressure |
| alt. | alternator |
| Al | aluminum |
| ANSI | American National Standards Institute (formerly American Standards Association, ASA) |
| AO | anticipatory only |
| APDC | Air Pollution Control District |
| API | American Petroleum Institute |
| approx. | approximate, approximately |
| APU | Auxiliary Power Unit |
| AQMD | Air Quality Management District |
| AR | as required, as requested |
| AS | as supplied, as stated, as suggested |
| ASE | American Society of Engineers |
| ASME | American Society of Mechanical Engineers |
| assy. | assembly |
| ASTM | American Society for Testing Materials |
| ATDC | after top dead center |
| ATS | automatic transfer switch |
| auto. | automatic |
| aux. | auxiliary |
| avg. | average |
| AVR | automatic voltage regulator |
| AWG | American Wire Gauge |
| AWM | appliance wiring material |
| bat. | battery |
| BBDC | before bottom dead center |
| BC | battery charger, battery charging |
| BCA | battery charging alternator |
| BCI | Battery Council International |
| BDC | before dead center |
| BHP | brake horsepower |
| blk. | black (paint color), block (engine) |
| blk. htr. | block heater |
| BMEP | brake mean effective pressure |
| bps | bits per second |
| br. | brass |
| BTDC | before top dead center |
| Btu | British thermal unit |
| Btu/min. | British thermal units per minute |
| C | Celsius, centigrade |
| cal. | calorie |
| CAN | controller area network |
| CARB | California Air Resources Board |
| CAT5 | Category 5 (network cable) |
| CB | circuit breaker |
| CC | crank cycle |
| cc | cubic centimeter |
| CCA | cold cranking amps |
| ccw. | counterclockwise |
| CEC | Canadian Electrical Code |
| cert. | certificate, certification, certified |
| cfh | cubic feet per hour |
| cfm | cubic feet per minute |
| CG | center of gravity |
| CID | cubic inch displacement |
| CL | centerline |
| cm | centimeter |
| CMOS | complementary metal oxide substrate (semiconductor) |
| com | communications (port) |
| coml | commercial |
| Coml/Rec | Commercial/Recreational |
| conn. | connection |
| cont. | continued |
| CPVC | chlorinated polyvinyl chloride |
| crit. | critical |
| CSA | Canadian Standards Association |
| CT | current transformer |
| Cu | copper |
| cUL | Canadian Underwriter's Laboratories |
| CUL | Canadian Underwriter's Laboratories |
| cu. in. | cubic inch |
| cw. | clockwise |
| CWC | city water-cooled |
| cyl. | cylinder |
| D/A | digital to analog |
| DAC | digital to analog converter |
| dB | decibel |
| dB(A) | decibel (A weighted) |
| DC | direct current |
| DCR | direct current resistance |
| deg., ° | degree |
| dept. | department |
| dia. | diameter |
| DI/EO | dual inlet/end outlet |
| DIN | Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss) |
| DIP | dual inline package |
| DPDT | double-pole, double-throw |
| DPST | double-pole, single-throw |
| DS | disconnect switch |
| DVR | digital voltage regulator |
| $E^2$PROM, EEPROM | electrically-erasable programmable read-only memory |
| E, emer. | emergency (power source) |
| ECM | electronic control module, engine control module |
| EDI | electronic data interchange |
| EFR | emergency frequency relay |
| e.g. | for example *(exempli gratia)* |
| EG | electronic governor |
| EGSA | Electrical Generating Systems Association |
| EIA | Electronic Industries Association |
| EI/EO | end inlet/end outlet |
| EMI | electromagnetic interference |
| emiss. | emission |
| eng. | engine |
| EPA | Environmental Protection Agency |
| EPS | emergency power system |
| ER | emergency relay |
| ES | engineering special, engineered special |
| ESD | electrostatic discharge |
| est. | estimated |
| E-Stop | emergency stop |
| etc. | et cetera (and so forth) |
| exh. | exhaust |
| ext. | external |
| F | Fahrenheit, female |
| FHM | flat head machine (screw) |
| fl. oz. | fluid ounce |
| flex. | flexible |
| freq. | frequency |
| FS | full scale |
| ft. | foot, feet |
| ft. lb. | foot pounds (torque) |
| ft./min. | feet per minute |
| ftp | file transfer protocol |
| g | gram |
| ga. | gauge (meters, wire size) |
| gal. | gallon |
| gen. | generator |
| genset | generator set |
| GFI | ground fault interrupter |
| GND, ⏚ | ground |
| gov. | governor |
| gph | gallons per hour |
| gpm | gallons per minute |
| gr. | grade, gross |
| GRD | equipment ground |
| gr. wt. | gross weight |
| H x W x D | height by width by depth |
| HC | hex cap |
| HCHT | high cylinder head temperature |
| HD | heavy duty |
| HET | high exhaust temp., high engine temp. |
| hex | hexagon |
| Hg | mercury (element) |
| HH | hex head |
| HHC | hex head cap |
| HP | horsepower |
| hr. | hour |
| HS | heat shrink |
| hsg. | housing |
| HVAC | heating, ventilation, and air conditioning |
| HWT | high water temperature |
| Hz | hertz (cycles per second) |
| IBC | International Building Code |
| IC | integrated circuit |
| ID | inside diameter, identification |
| IEC | International Electrotechnical Commission |
| IEEE | Institute of Electrical and Electronics Engineers |
| IMS | improved motor starting |
| in. | inch |
| in. $H_2O$ | inches of water |
| in. Hg | inches of mercury |
| in. lb. | inch pounds |
| Inc. | incorporated |
| ind. | industrial |
| int. | internal |
| int./ext. | internal/external |
| I/O | input/output |
| IP | internet protocol |
| ISO | International Organization for Standardization |
| J | joule |
| JIS | Japanese Industry Standard |
| k | kilo (1000) |
| K | kelvin |
| kA | kiloampere |
| KB | kilobyte ($2^{10}$ bytes) |
| KBus | Kohler communication protocol |
| kg | kilogram |

| | |
|---|---|
| $kg/cm^2$ | kilograms per square centimeter |
| kgm | kilogram-meter |
| $kg/m^3$ | kilograms per cubic meter |
| kHz | kilohertz |
| kJ | kilojoule |
| km | kilometer |
| kOhm, kΩ | kilo-ohm |
| kPa | kilopascal |
| kph | kilometers per hour |
| kV | kilovolt |
| kVA | kilovolt ampere |
| kVAR | kilovolt ampere reactive |
| kW | kilowatt |
| kWh | kilowatt-hour |
| kWm | kilowatt mechanical |
| kWth | kilowatt-thermal |
| L | liter |
| LAN | local area network |
| L x W x H | length by width by height |
| lb. | pound, pounds |
| $lbm/ft^3$ | pounds mass per cubic feet |
| LCB | line circuit breaker |
| LCD | liquid crystal display |
| LED | light emitting diode |
| Lph | liters per hour |
| Lpm | liters per minute |
| LOP | low oil pressure |
| LP | liquefied petroleum |
| LPG | liquefied petroleum gas |
| LS | left side |
| $L_{wa}$ | sound power level, A weighted |
| LWL | low water level |
| LWT | low water temperature |
| m | meter, milli (1/1000) |
| M | mega ($10^6$ when used with SI units), male |
| $m^3$ | cubic meter |
| $m^3/hr.$ | cubic meters per hour |
| $m^3/min.$ | cubic meters per minute |
| mA | milliampere |
| man. | manual |
| max. | maximum |
| MB | megabyte ($2^{20}$ bytes) |
| MCCB | molded-case circuit breaker |
| MCM | one thousand circular mils |
| meggar | megohmmeter |
| MHz | megahertz |
| mi. | mile |
| mil | one one-thousandth of an inch |
| min. | minimum, minute |
| misc. | miscellaneous |
| MJ | megajoule |
| mJ | millijoule |
| mm | millimeter |
| mOhm, mΩ | milliohm |
| MOhm, MΩ | megohm |
| MOV | metal oxide varistor |
| MPa | megapascal |
| mpg | miles per gallon |
| mph | miles per hour |
| MS | military standard |
| ms | millisecond |
| m/sec. | meters per second |
| mtg. | mounting |
| MTU | Motoren-und Turbinen-Union |
| MW | megawatt |
| mW | milliwatt |
| μF | microfarad |
| N, norm. | normal (power source) |
| NA | not available, not applicable |
| nat. gas | natural gas |
| NBS | National Bureau of Standards |
| NC | normally closed |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturers Association |
| NFPA | National Fire Protection Association |
| Nm | newton meter |
| NO | normally open |
| no., nos. | number, numbers |
| NPS | National Pipe, Straight |
| NPSC | National Pipe, Straight-coupling |
| NPT | National Standard taper pipe thread per general use |
| NPTF | National Pipe, Taper-Fine |
| NR | not required, normal relay |
| ns | nanosecond |
| OC | overcrank |
| OD | outside diameter |
| OEM | original equipment manufacturer |
| OF | overfrequency |
| opt. | option, optional |
| OS | oversize, overspeed |
| OSHA | Occupational Safety and Health Administration |
| OV | overvoltage |
| oz. | ounce |
| p., pp. | page, pages |
| PC | personal computer |
| PCB | printed circuit board |
| pF | picofarad |
| PF | power factor |
| ph., ∅ | phase |
| PHC | Phillips® head Crimptite® (screw) |
| PHH | Phillips® hex head (screw) |
| PHM | pan head machine (screw) |
| PLC | programmable logic control |
| PMG | permanent magnet generator |
| pot | potentiometer, potential |
| ppm | parts per million |
| PROM | programmable read-only memory |
| psi | pounds per square inch |
| psig | pounds per square inch gauge |
| pt. | pint |
| PTC | positive temperature coefficient |
| PTO | power takeoff |
| PVC | polyvinyl chloride |
| qt. | quart, quarts |
| qty. | quantity |
| R | replacement (emergency) power source |
| rad. | radiator, radius |
| RAM | random access memory |
| RBUS | RS-485 proprietary communications |
| RDO | relay driver output |
| ref. | reference |
| rem. | remote |
| Res/Coml | Residential/Commercial |
| RFI | radio frequency interference |
| RH | round head |
| RHM | round head machine (screw) |
| rly. | relay |
| rms | root mean square |
| rnd. | round |
| RO | read only |
| ROM | read only memory |
| rot. | rotate, rotating |
| rpm | revolutions per minute |
| RS | right side |
| RTDs | Resistance Temperature Detectors |
| RTU | remote terminal unit |
| RTV | room temperature vulcanization |
| RW | read/write |
| SAE | Society of Automotive Engineers |
| scfm | standard cubic feet per minute |
| SCR | silicon controlled rectifier |
| s, sec. | second |
| SI | *Systeme international d'unites,* International System of Units |
| SI/EO | side in/end out |
| sil. | silencer |
| SMTP | simple mail transfer protocol |
| SN | serial number |
| SNMP | simple network management protocol |
| SPDT | single-pole, double-throw |
| SPST | single-pole, single-throw |
| spec | specification |
| specs | specification(s) |
| sq. | square |
| sq. cm | square centimeter |
| sq. in. | square inch |
| SMS | short message service |
| SS | stainless steel |
| std. | standard |
| stl. | steel |
| tach. | tachometer |
| TB | terminal block |
| TCP | transmission control protocol |
| TD | time delay |
| TDC | top dead center |
| TDEC | time delay engine cooldown |
| TDEN | time delay emergency to normal |
| TDES | time delay engine start |
| TDNE | time delay normal to emergency |
| TDOE | time delay off to emergency |
| TDON | time delay off to normal |
| temp. | temperature |
| term. | terminal |
| THD | total harmonic distortion |
| TIF | telephone influence factor |
| tol. | tolerance |
| turbo. | turbocharger |
| typ. | typical (same in multiple locations) |
| UF | underfrequency |
| UHF | ultrahigh frequency |
| UIF | user interface |
| UL | Underwriter's Laboratories, Inc. |
| UNC | unified coarse thread (was NC) |
| UNF | unified fine thread (was NF) |
| univ. | universal |
| URL | uniform resource locator (web address) |
| US | undersize, underspeed |
| UV | ultraviolet, undervoltage |
| V | volt |
| VAC | volts alternating current |
| VAR | voltampere reactive |
| VDC | volts direct current |
| VFD | vacuum fluorescent display |
| VGA | video graphics adapter |
| VHF | very high frequency |
| W | watt |
| WCR | withstand and closing rating |
| w/ | with |
| WO | write only |
| w/o | without |
| wt. | weight |
| xfmr | transformer |

# Appendix B Electrical Lead Entry Template

Use the full-scale drawing in Figure 3 to mark the openings for the electrical conduit, if desired. See Section 1.8.2 for more information.

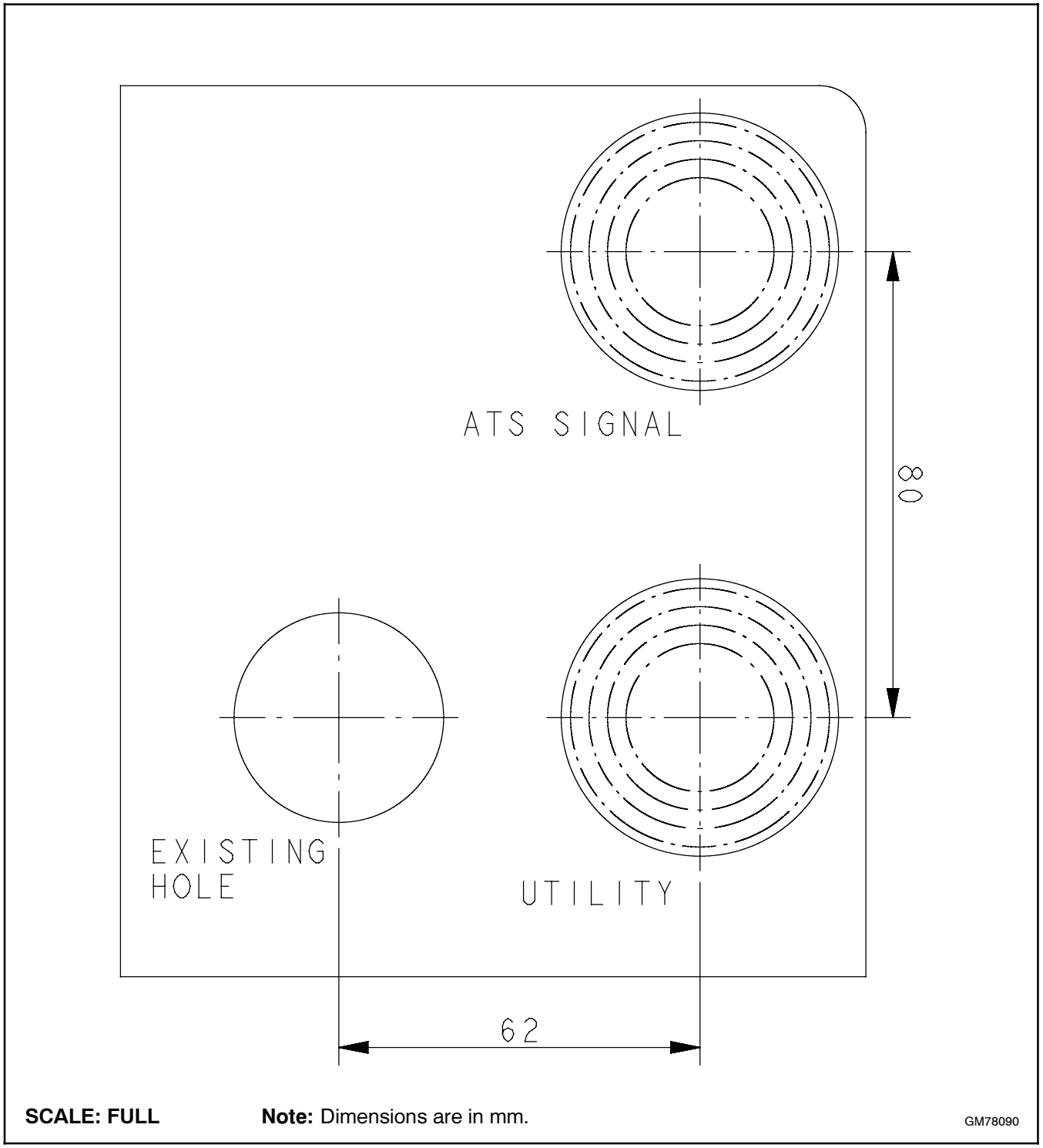



**Figure 3** Template, Electrical

# Notes

KOHLER®
POWER SYSTEMS

KOHLER CO. Kohler, Wisconsin 53044
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales/service outlet in the
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