Installation

Residential/Commercial Generator Sets

Models:

14/20RES

14/20RESL

Controller:

RDC Residential Digital Controller
DC Digital Controller

ISO 9001
KOHLER POWER SYSTEMS
NATIONALLY REGISTERED

KOHLER®
POWER SYSTEMS

TP-6733 8/11a

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

Product Identification Information **2**

Safety Precautions and Instructions **5**

Introduction **9**

Startup and Registration 9

Service Assistance **10**

Section 1 Installation **11**

1.1 General 11
1.2 Lifting 11
1.3 Generator Set Inspection 11
1.4 Location and Mounting 11
1.4.1 Exhaust Requirements 11
1.4.2 Mounting Area 12
1.5 Dimension Drawings 12
1.6 Fuel Requirements 17
1.6.1 Fuel Supply 17
1.6.2 Fuel Pipe Size 17
1.7 Fuel Conversion 18
1.7.1 Fuel Conversion, 14RES/RESL 20
1.7.2 Fuel Conversion, 20RES/RESL 21
1.8 Electrical Connections 22
1.8.1 Electrical Lead Entry 22
1.8.2 Power Supply 22
1.8.3 Field-Connection Terminal Block 23
1.8.4 Grounding 25
1.8.5 Battery Charger 25
1.9 Controller Fuse F3 25
1.10 Battery 26
1.11 Accessories 28
1.11.1 Regulator Heater 28
1.11.2 Carburetor Heater 29
1.12 Prestart Installation Check 30
1.13 Set Exerciser 30
1.14 Controller Configuration 31
1.14.1 Firmware Version Number 31
1.14.2 System Parameters 31
1.14.3 RDC Controller Configuration 32
1.15 Voltage and Frequency Adjustments, RDC Controller 32
1.15.1 Voltage Adjustment 34
1.15.2 Frequency Adjustment 34

Section 2 Wiring Diagrams **35**

Appendix A Abbreviations 41

Appendix B Electrical Lead Entry Template 43

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 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.

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.

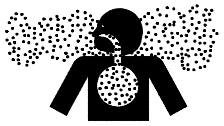
Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner removed.

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.

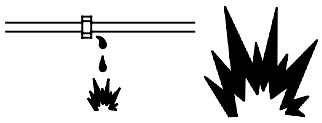
Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning 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

⚠ 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 14/20RES or 14/20RESL generator sets. See Figure 1. Refer to TP-6734, 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.

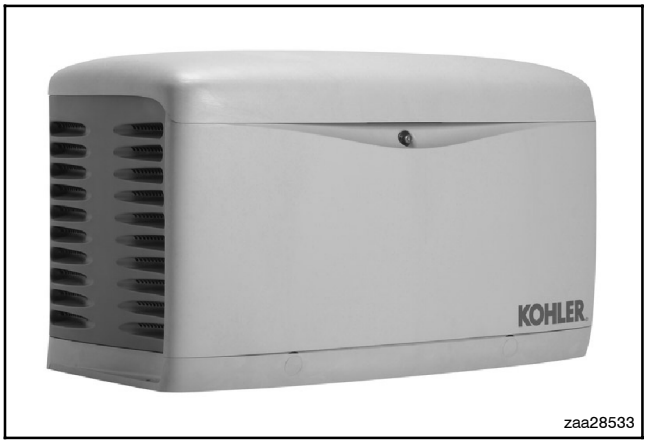


Figure 1 14/20RES/RESL Generator Set

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.

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India Regional Office
Bangalore, India
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Japan, Korea
North Asia Regional Office
Tokyo, Japan
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Fax: (813) 3440-2727

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

1.1 General

Have an authorized distributor/dealer install the generator set outdoors according to the instructions in this manual. Do not install this generator set indoors.

Use the specifications provided here only in the initial planning. Use the generator set and transfer switch dimension drawings and wiring diagrams for installation.

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.)
14RES/RESL	186 (410)
20RES/RESL	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-6734, Operation Manual, for additional information.

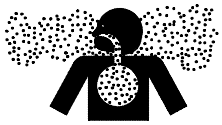
1.4 Location and Mounting

See the dimension drawings on the following pages for the generator set dimensions and fuel and electric inlet locations. The drawing dimensions are shown in millimeters, with inches in brackets.

Install the generator set outdoors. Provide the minimum clearance around the generator set shown in the clearance drawings on the following pages. 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.

1.4.1 Exhaust Requirements

⚠ 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.

The exhaust system is complete for generator sets installed outdoors. Do not install this generator set indoors.

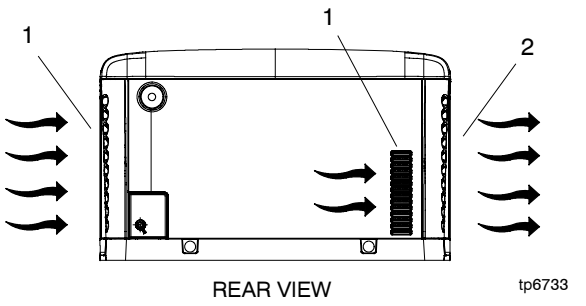
Figure 1-2 gives the exhaust temperature at rated load. The engine exhaust mixes with the generator set cooling air at the exhaust end of the enclosure. Mount the generator set so that the hot exhaust does not blow on plants or other combustible materials. Maintain the clearances shown in Figure 1-7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

1.4.2 Mounting Area

The generator set is shipped on a plastic mounting pad. Prepare a flat, level mounting area covered with a weed barrier and gravel or a concrete mounting pad. Set the plastic mounting pad directly on the gravel or concrete. Do not install the mounting pad directly on grass, wood, or other combustible materials. See Figure 1-7 in Section 1.5.

1.5 Dimension Drawings

The generator set dimension drawings are shown on the following pages.

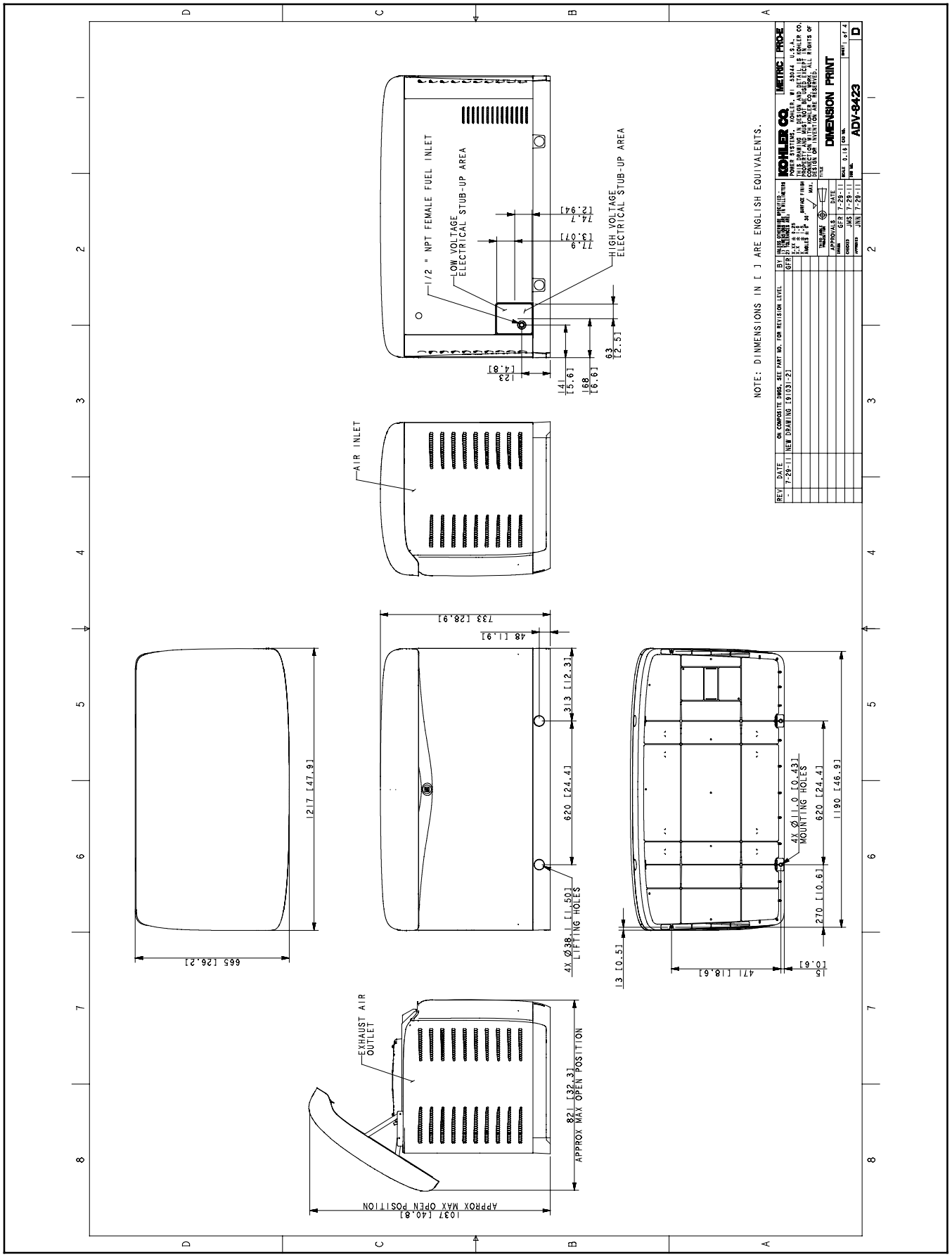


Figure 1-4 Dimension Drawing ADV-8423, Sheet 1

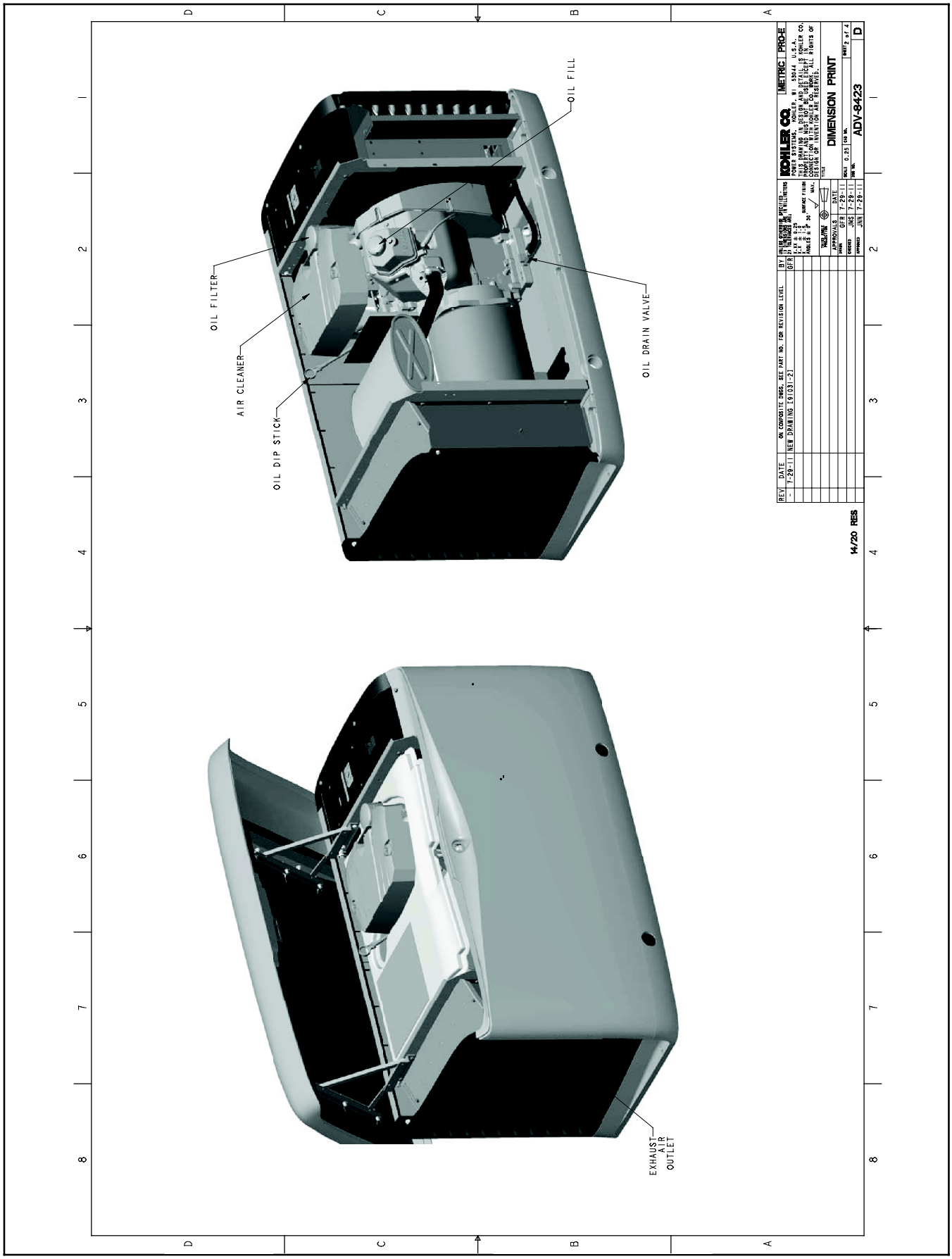


Figure 1-5 Dimension Drawing ADV-8423, Sheet 2

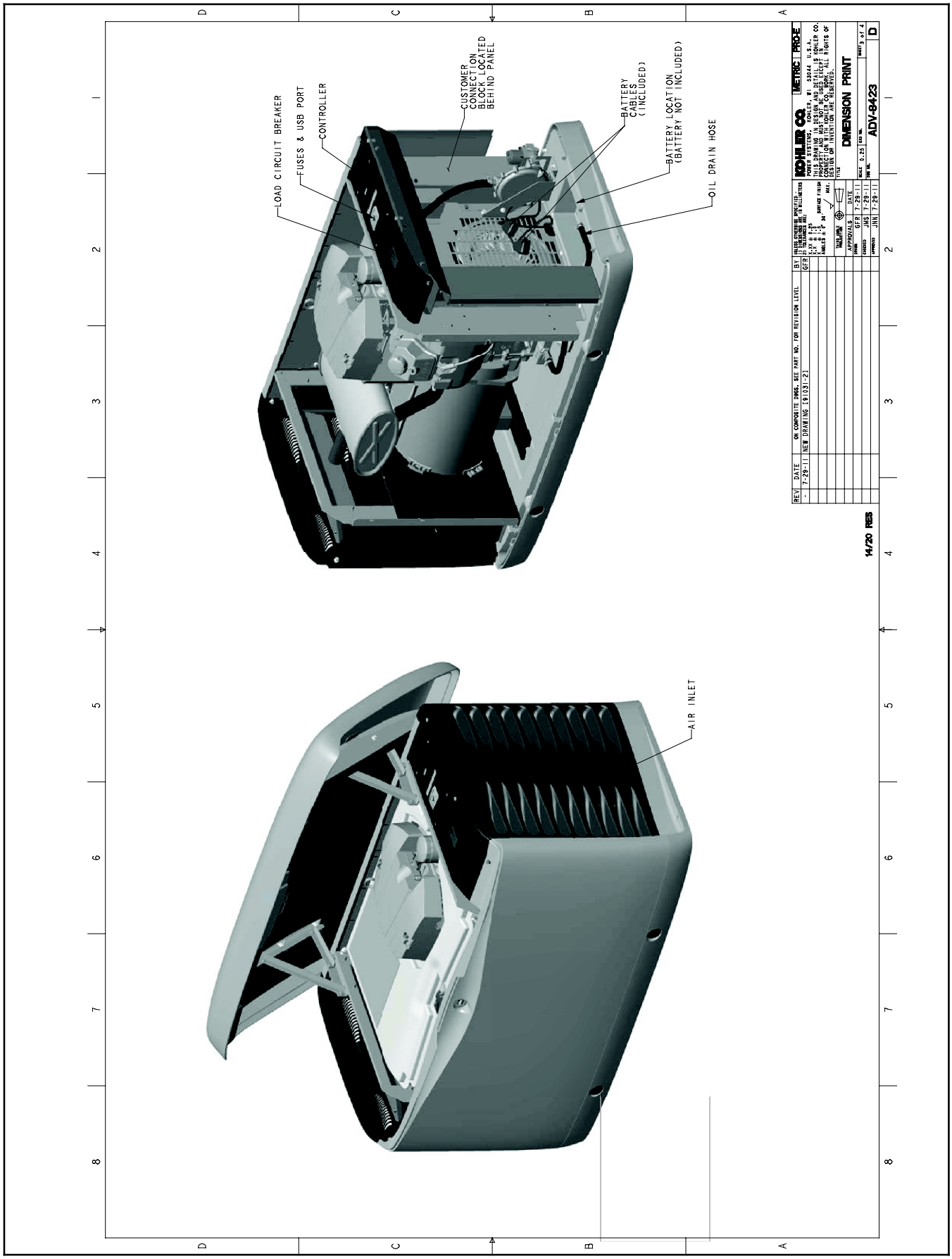


Figure 1-6 Dimension Drawing ADV-8423, Sheet 3

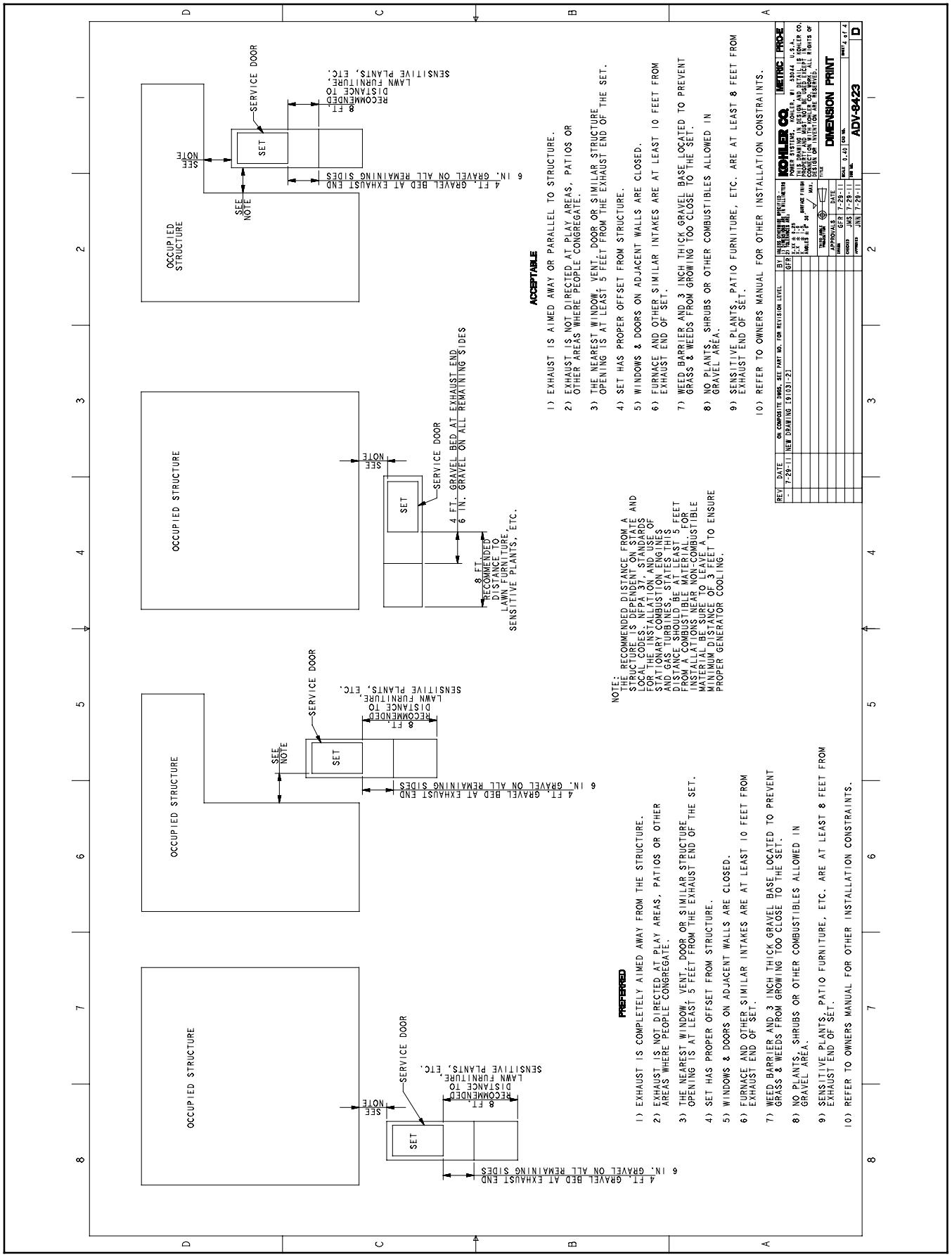


Figure 1-7 Dimension Drawing ADV-8423, Sheet 4

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.:		
14RES/RESL	193,000	203,000
20RES/RESL	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 (or LP tank) pressure regulator is 1.7–2.7 kPa (7–11 in. water column) and that the utility gas meter flow rate is sufficient to supply the generator set at rated load plus all other gas-consuming appliances. 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				
Pipe Length, m (ft.)	14RES/RESL		20RES/RESL	
	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)							
		14RES/RESL				20RES/RESL			
		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. Figure 1-12 shows the revised fuel system.

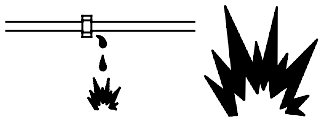
⚠ WARNING

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.

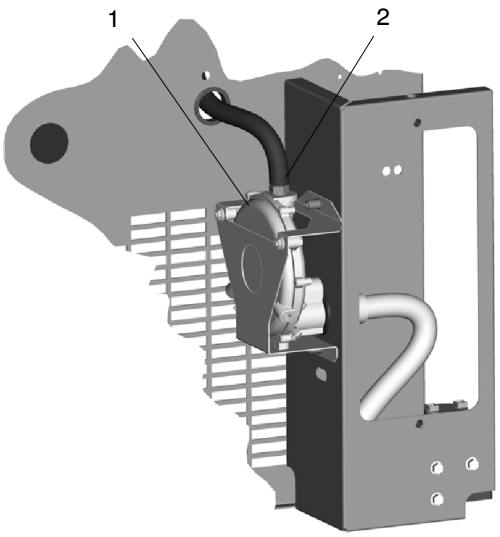
Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove 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

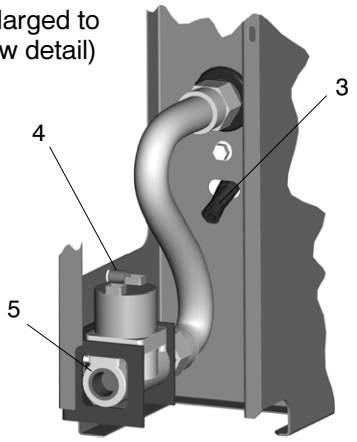


Explosive fuel vapors.
Can cause severe injury or death.

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

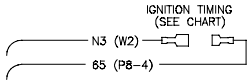


(Enlarged to show detail)



GM66563

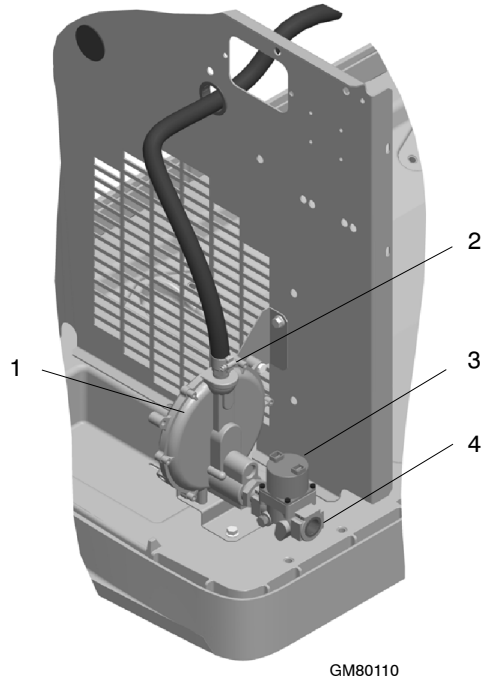
IGNITION TIMING	
FUEL TYPE	CH980
NATURAL GAS	CONNECT 65 TO N
LP GAS	DO NOT CONNECT



DSAI Lead Connection

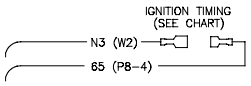
1. Regulator
2. Fuel block (not shown; see Figure 1-13) or LP orifice location (see Figure 1-15)
3. Regulator vent hose (20RES/RESL only)
4. Fuel solenoid valve and digital spark advance ignition (DSAI) leads
5. Fuel inlet, 1/2 in. NPT female

Figure 1-11 Original Fuel System



GM80110

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



DSAI Lead Connection

1. Regulator
2. Fuel block (not shown; see Figure 1-13) 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

Figure 1-12 Revised Fuel System

1.7.1 Fuel Conversion, 14RES/RESL

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.

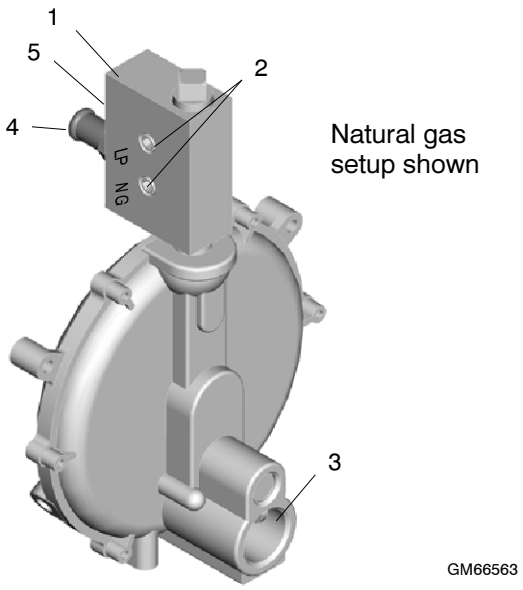
Note: Do not adjust the factory-sealed fuel-metering adjustments on the fuel block. Changing the fuel-metering adjustments may violate federal or state laws.

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 or Figure 1-12 for the fuel system component locations.

Procedure to convert from NG to LP, 14RES/RESL

1. Press the OFF button on the generator set controller and remove the F3 fuse (located in the service access area).
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 1-13.
6. Remove the hose fitting from the natural gas outlet port in the fuel block. See Figure 1-13.
7. Remove the plug from the LP port in the fuel block. See Figure 1-13.
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 or Figure 1-12.
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 1-13 Fuel Block, 14RES/RESL

13. Reconnect the generator set engine starting battery leads, negative (-) lead last.
14. Reconnect power to the battery charger.
15. Install the F3 fuse and 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. Use the controller to adjust the output and stability if necessary. See Section 1.15 for instructions.
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 1-14.

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

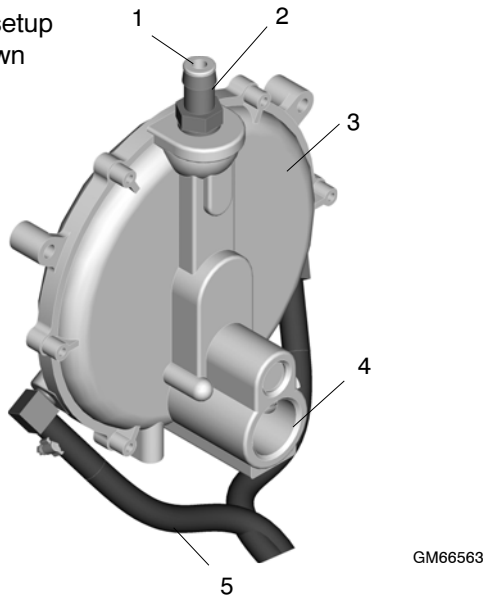
Figure 1-14 DSAI Connection

1.7.2 Fuel Conversion, 20RES/RESL

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, 20RES/RESL

1. Press the OFF button on the generator set controller and remove the F3 fuse (located in the service access area).
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 or Figure 1-12.
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. Reinstall fuse F3 and start the generator set by pressing the RUN button on the generator set controller.



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

Figure 1-15 Fuel Regulator and LP Orifice, 20RES/RESL

13. Check for leaks using a gas leak detector.
14. Run the generator set and check the operation. Use the controller to adjust the output and stability if necessary. See Section 1.15 for instructions.
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 1-16 DSAI Connections

1.8 Electrical Connections

⚠ 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.

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

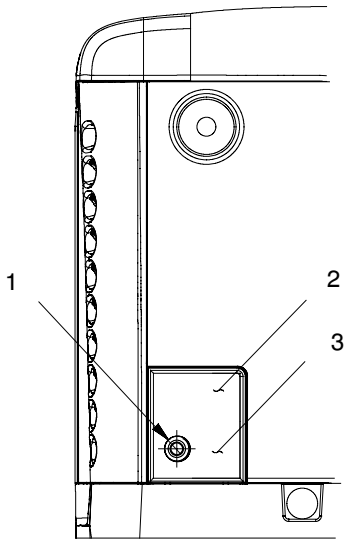
Canadian installations only. For standby service connect the output of the generator set to a suitably rated transfer switch in accordance with Canadian Electrical Code, Part 1.

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.

Ground the generator set from the GRD terminal inside controller compartment according to applicable codes.

1.8.1 Electrical Lead Entry

Drill or punch holes in the enclosure for the electrical conduit in the locations shown in Figure 1-17. A full-scale dimensioned template for the hole locations is printed in Appendix B. See page 43.



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 1-17 Electrical Lead Entry Locations

1.8.2 Power Supply

Power must be supplied to the generator set location for the battery charger 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.

Connect power 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. See Figure 1-18 for the power requirements for the battery charger and accessories.

Equipment	Power Requirement, Max.		
	Watts	Amps	Volts
Battery charger (standard)	192	1.6	120
Carburetor heater (optional)	37	0.33	
Battery heater (optional)	110	0.92	

Figure 1-18 Power Requirements

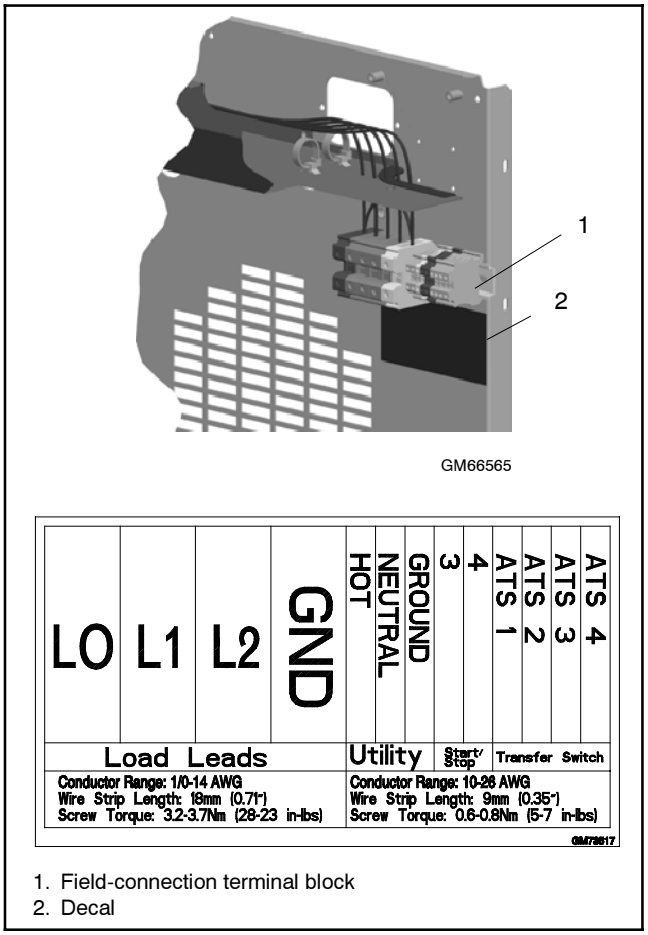
1.8.3 Field-Connection Terminal Block

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 1-19 or Figure 1-20 for terminal block details. Refer to the terminal block decal for connections and cable sizes. Also see Section 2, Wiring Diagrams.

Note: The connections on the revised terminal block are arranged in a different order than the original. Be sure to follow the connections shown on the decal on the generator set.

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.



1. Field-connection terminal block
2. Decal

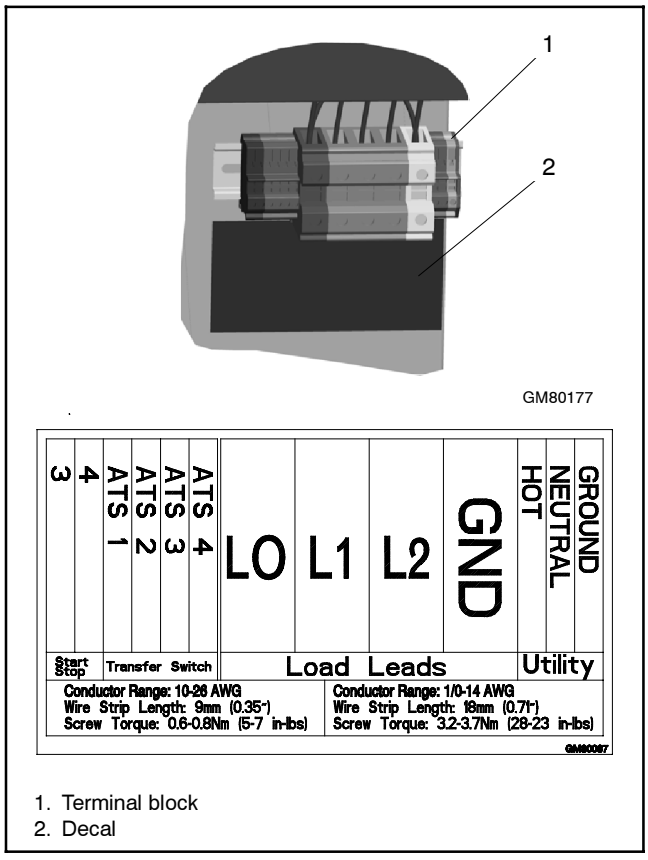
Figure 1-19 Original Field-Connection Terminal Block

Procedure

1. Drill holes for the conduit fittings. See the Figure 1-17 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 1.8.4, Grounding.



1. Terminal block
2. Decal

Figure 1-20 Revised Terminal Block

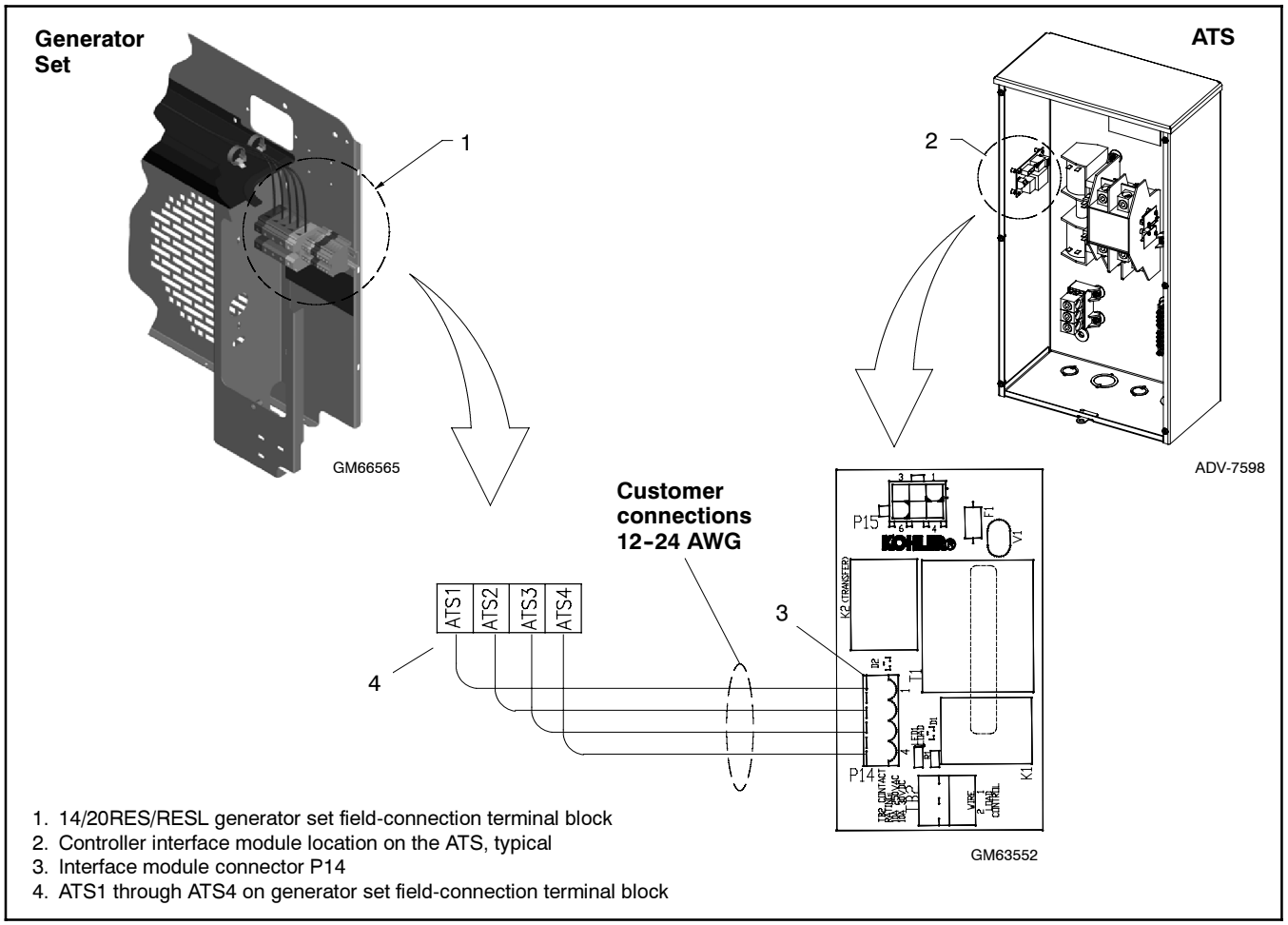
4. Connect the ATS or remote start/stop switch. Route low-voltage communication leads through separate conduit.

   a. **For a Model RRT transfer switch:** Connect the Model RRT transfer switch interface panel to connections ATS1–ATS4. See Figure 1-21.

   Note: To ensure that the controller recognizes the Model RRT transfer switch, connect leads ATS1 through ATS4 to the terminal block before connecting the engine starting battery.

   b. **For a remote start/stop switch or Model RDT or RSB transfer switch:** Connect the engine start leads from the transfer switch or remote start switch to terminals 3 and 4 on the terminal block. Route the engine start leads through separate conduit from the AC power and load leads.

5. Connect utility power 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 1.8.2 for more information about the utility power requirement.



1. 14/20RES/RESL generator set field-connection terminal block
2. Controller interface module location on the ATS, typical
3. Interface module connector P14
4. ATS1 through ATS4 on generator set field-connection terminal block

Figure 1-21 Model RRT Transfer Switch Connection to Generator Set Terminal Block

1.8.4 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.

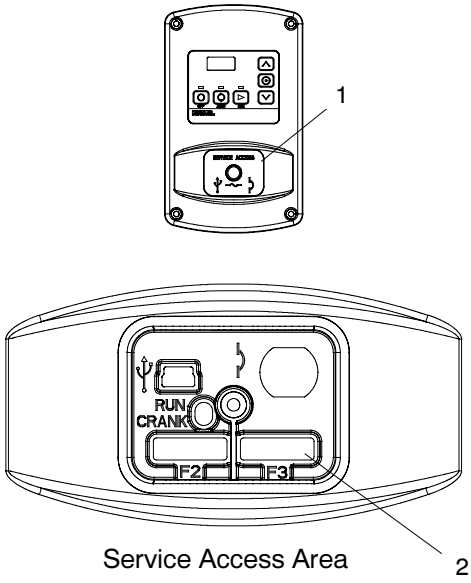
1.8.5 Battery Charger

A battery charger is factory-installed in the battery compartment to keep the starting battery fully charged. The battery charger's DC leads are factory-connected to the battery. Supply power to the generator set for the battery charger and carburetor heater as described in Sections 1.8.2 and 1.8.3. Plug the battery charger's power cord into the receptacle on the bottom of the controller junction box.

Refer to the generator set operation manual for battery charger operation information.

1.9 Controller Fuse F3

To prevent controller reset during installation, remove controller fuse F3 before connecting or disconnecting the battery cables. See Figure 1-22 for the F3 fuse location in the controller's service access area.



1. Controller's service access area (remove cover)
2. Controller fuse F3

Figure 1-22 F3 Fuse Location

1.10 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.

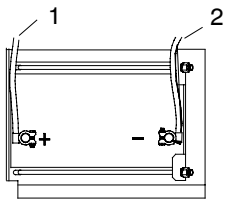
Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, 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 1-23 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.



EZ-273000-J

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

Figure 1-23 Typical Battery Connection

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.

To prevent controller reset during installation, remove controller fuse F3 before connecting or disconnecting the battery cables. See Figure 1-22 in Section 1.9 for the F3 fuse location in the controller's service access area.

Use the following procedure to install and connect the battery.

Battery Installation Procedure

1. Remove controller fuse F3. The fuse is located in the controller service access area. See Figure 1-22.
2. Ensure that the starting battery is fully charged before placing the battery in service.
3. Clean the battery posts and/or adapters if necessary.
4. Install the battery post adapters, if needed.
5. Place the battery in the housing.
6. Connect the positive (+) lead to the engine starting battery.
7. Connect the negative (–) lead to the engine starting battery.
8. Install controller fuse F3.

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

If the battery is disconnected for service or replacement, the exercise settings on the RDC/DC controller are lost. Set the exerciser after installing and connecting the battery. See Section 1.13, Set Exerciser.

1.11 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.

1.11.1 Regulator Heater

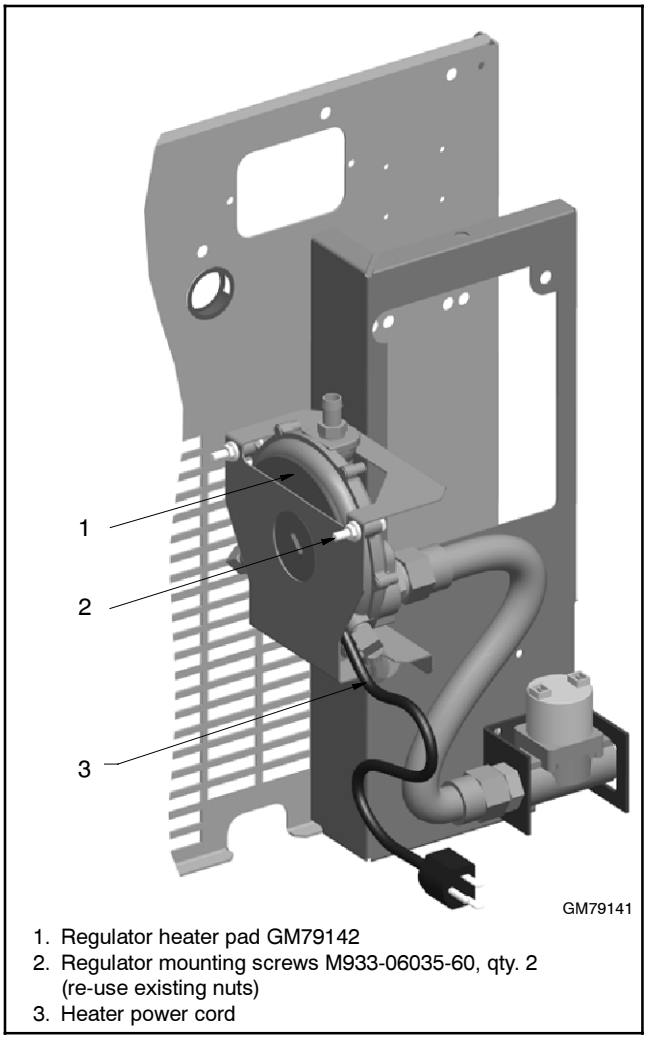
The regulator heater kit is designed for Model 20RES and 20RESL generator sets. The regulator heater kit is recommended in addition to the carburetor heater for reliable engine starting in temperatures below -18°C (0°F). See Figure 1-24 for heater specifications.

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 1-24 Regulator Heater Specifications

The regulator heater requires a source of 120 VAC power. The generator set is equipped with two 120 VAC receptacles, one of which is used for the battery charger. If another accessory such as the carburetor heater or battery heater is also used, the installer will need to provide another receptacle for the regulator 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 1-25 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 1-25 Installed Regulator Heater Kit, shown with original fuel system (for 20RES/RESL)

1.11.2 Carburetor Heater

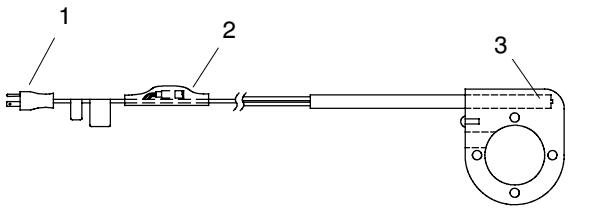
An optional carburetor heater is recommended for improved cold starting in locations where the ambient temperature drops below 0°C (32°F). The carburetor heater prevents condensation and carburetor icing. The heater turns on when the temperature at the thermostat falls below approximately 4°C (40°F) and turns off when the temperature rises above approximately 16°C (60°F). The carburetor heaters are shown in Figure 1-26.

To install the carburetor heater, follow the instructions provided with the kit. Figure 1-27 shows the installed carburetor heater kit installed for a 14 kW generator set. Figure 1-28 shows the location for the carburetor heater kit on a 20 kW generator set.

The heater thermostat is installed in the cord. Figure 1-26 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 one of the 120 VAC receptacles provided.



14RES/RESL Carburetor Heater

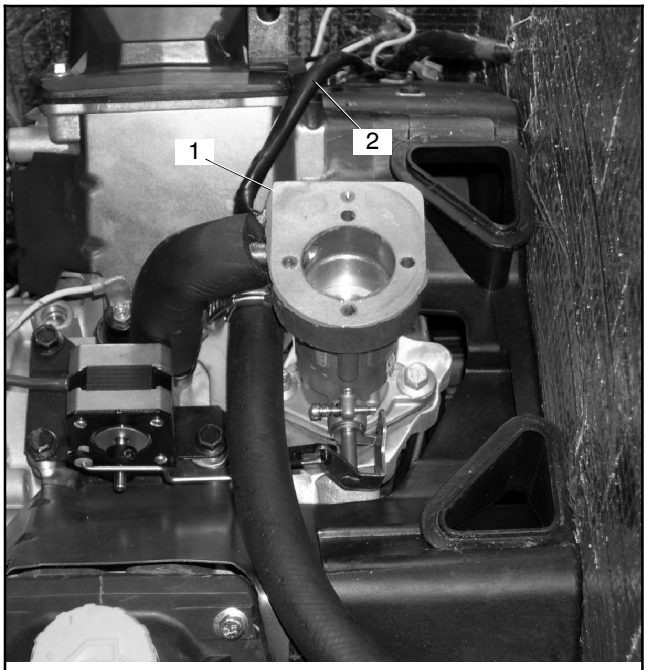
GM19463

20RES/RESL Carburetor Heater

GM57968

1. Power plug
2. Thermostat
3. Heater

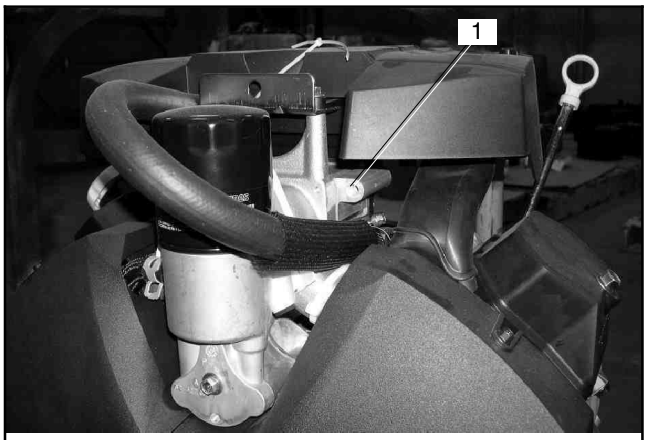
Figure 1-26 Carburetor Heaters



tp6195

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

Figure 1-27 14RES/RESL Carburetor Heater



tp6514

1. Carburetor heater location

Figure 1-28 20RES/RESL Carburetor Heater Location on Engine (bulkhead removed to show heater location)

1.12 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.

1.13 Set Exerciser

Set the exerciser to automatically run the generator set on the desired day and time every week. See TP-6734, Operation Manual, for detailed descriptions of the unloaded and loaded exercise operation.

Procedure to Set the Exerciser

1. Press the AUTO button on the controller.
2. Press the down arrow button (RDC) or the exercise button (DC) to start an unloaded exercise. The engine starts and runs a 20-minute unloaded variable-speed exercise with system diagnostics. **EnLd i**s displayed.
3. If the generator set is connected to a Kohler® Model RRT transfer switch, the exercise can be changed to a loaded exercise by pressing the down arrow button (RDC) or the exercise button (DC) again after the engine has started. **E Ld** is displayed.
4. After 20 minutes, verify that the exercise ends and the engine shuts down automatically. After a loaded exercise, the engine runs for 5 minutes or until cool, and then shuts down.

The exercise will run every seven days at the same time that the exercise was started.

Other transfer switches: For a loaded exercise with a transfer switch other than a Kohler® Model RRT, refer to the transfer switch operation manual for instructions.

1.14 Controller Configuration

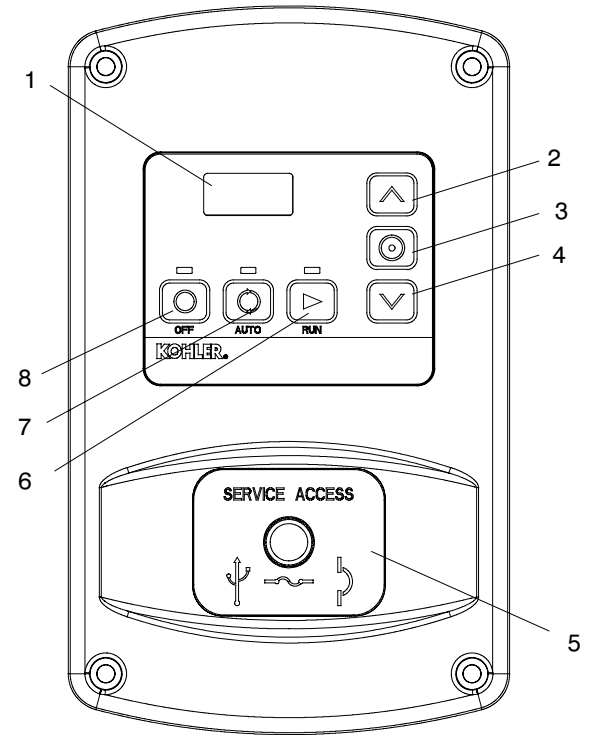
The controller configuration for each generator model is set at the factory and should not normally require changes.

An authorized Kohler distributor/dealer can adjust the RDC controller configuration and generator set performance using the RDC controller keypad. Use the select and arrow buttons to change settings or adjust performance as described in the following sections.

Note: The DC controller cannot be adjusted from the controller keypad.

An authorized Kohler distributor/dealer can adjust the controller configuration and generator set performance on both the RDC and DC controllers using Kohler® SiteTech™ software and a personal computer. Contact an authorized Kohler distributor/dealer for service.

Adjust the controller configuration with the generator set off. Adjust the generator set performance with the generator set running.



1. LED display
2. Up button
3. Select button
4. Down/Exercise button
5. Service access
6. RUN button and LED
7. AUTO button and LED
8. OFF button and LED

Figure 1-29 RDC Residential Digital Control

1.14.1 Firmware Version Number

To check the firmware version number on the RDC controller, hold the select button and the up arrow button for about 5 seconds, until the firmware version number appears on the display. See Figure 1-31. On the DC controller, the firmware version number is displayed during the first 2 seconds of the engine start cycle.

The manufacturer may release new versions of controller firmware. An authorized Kohler® distributor or dealer can update the controller firmware in the field. Kohler® SiteTech™ software and a personal computer are required. See TP-6701, SiteTech Software Operation maunal, for instructions.

1.14.2 System Parameters

The controller configuration for each generator model is set at the factory and should not normally require changes. The controller will display fault code NoEC (no engine configuration setting) if the configuration is not set.

The controller's configuration mode allows adjustment of the system parameters listed in this section. Use the instructions in this section to check the configuration after installation and change it to match the settings shown in Figure 1-30 for your application, if necessary.

An authorized distributor or dealer can use a personal computer running Kohler® SiteTech™ software to set the system parameters, if desired. The controller will display Uu-- if the voltage and frequency are not set to one of the standard combinations shown in Figure 1-30.

Parameter	Setting	Definition		
		Phases	Hz	VAC
System voltage and frequency *	Uu01	1	60	120/240
	Uu06	1	50	115/230
	Uu07	DO NOT USE		
	Uu11	DO NOT USE		
	Uu15	DO NOT USE		
	Uu16	DO NOT USE		
	Uu19	DO NOT USE		
	Uu21	DO NOT USE		
	Uu22	DO NOT USE		
Engine Configuration *	Ec13	14RES/RESL		
	Ec14	20RES/RESL		
* Factory-set for each model.				

Figure 1-30 Controller Configuration Parameters

1.14.3 RDC Controller Configuration

In order to prevent inadvertent changes, a code is required to enter configuration mode. With the controller in OFF, hold the select button and press the up arrow button for 5 seconds. The controller display will show the software version. Press the arrow buttons in the following order to enter configuration mode: down, up, down, up, down, up.

Follow the instructions in Figure 1-31 to enter the configuration mode while the engine is not running and then step through the following parameters. Use the up (∧) and down (∨) arrow buttons to select the appropriate settings for the application.

If no buttons are pressed for one minute, the controller will automatically exit the configuration mode without saving any changes. Start the configuration procedure over again from the beginning if the controller exits the configuration mode before the settings have been saved.

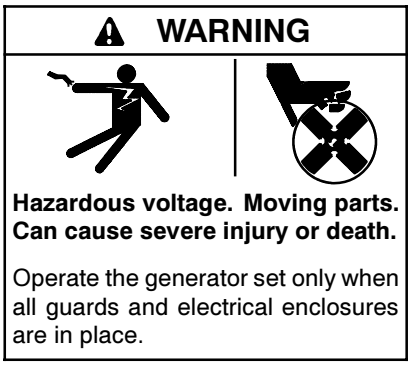
Note: Be sure to save your settings before exiting the configuration mode. The controller reverts to the last saved settings when the OFF button is pressed.

System voltage/frequency setting (Uu). Select the system voltage and frequency from the table in Figure 1-30.

Note: The Uu parameter sets the system's rated voltage and frequency. To adjust the output (measured) voltage and frequency, see Section 1.15, Voltage and Frequency Adjustments.

Engine configuration (Ec). The engine configuration must match the generator set engine type. See Figure 1-30.

1.15 Voltage and Frequency Adjustments, RDC Controller



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.

The generator output voltage and frequency can be adjusted, if necessary. Have adjustments performed by an authorized distributor/ dealer or service technician. The generator set must be running during performance adjustments.

Note: A digital multimeter that measures voltage and frequency is required for these adjustments.

Use a digital multimeter to check the output voltage and frequency. If output voltage or frequency is not within specifications, use the controller keypad to adjust the output voltage and engine speed (frequency) while the generator set is running. See Figure 1-29. The flowchart in Figure 1-31 outlines the adjustment procedures.

Note: Be sure to save your changes as instructed in Figure 1-31 before exiting configuration mode.

Changes in voltage and speed adjustments are lost if not saved before the generator set shuts down. The generator set continues to run with the new settings until it shuts down but then reverts to the previous settings at the next startup if the changes have not been saved.

Note: The DC controller cannot be adjusted from the controller keypad.

An authorized Kohler distributor/dealer can adjust the voltage and frequency on both the RDC and DC controllers using Kohler® SiteTech™ software and a personal computer. Contact an authorized Kohler distributor/dealer for service.

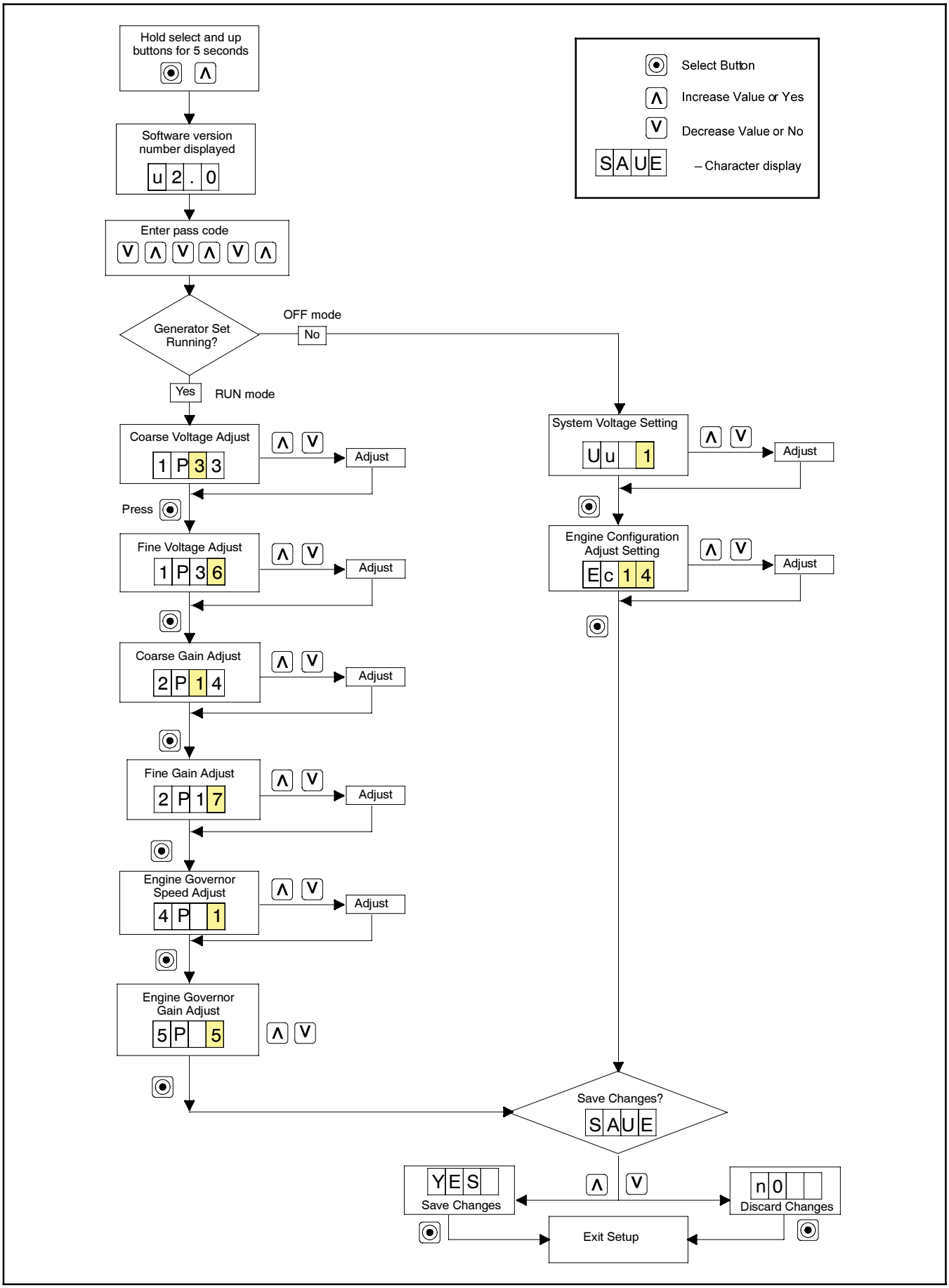


Figure 1-31 Controller Configuration and Performance Adjustments, RDC controller

1.15.1 Voltage Adjustment

Note: Refer to the flowchart in Figure 1-31 during the following procedure.

Voltage Adjustment Procedure

1. With the generator set off, connect a digital multimeter to the output leads or an electrical outlet on the load side of the generator set. Set the meter to measure AC voltage.
2. Start the generator set by pressing the RUN button on the RDC controller.
3. Use the RDC controller to adjust the voltage (parameter 1P) until the output voltage reaches the desired value. Refer to the flowchart in Figure 1-31 for instructions to adjust the output voltage. See Figure 1-32 for the approximate change in voltage per step.

Measured Voltage, VAC	ADC Display	Voltage Change per Step, VAC	
		Coarse	Fine
85–180	1P00–99	5	0.5
180–360	1P00–99	7	0.7

Figure 1-32 Voltage Adjustment (approximate)

4. Adjust the voltage stability (gain, parameter 2P) to minimize light flicker.
5. Readjust the voltage, if necessary.
6. Save settings. See Figure 1-31.
7. Stop the generator set.

Note: Volts-per-hertz parameter 3P can be adjusted only by a Kohler® authorized distributor/dealer using a personal computer and Kohler® SiteTech™ software.

1.15.2 Frequency Adjustment

The engine speed determines the generator output frequency; 60 Hz units operate at 3600 rpm and 50 Hz units run at 3000 rpm. Adjust the engine governor speed and gain to set the output frequency and stability using the following procedure.

Note: Refer to the flowchart in Figure 1-31 during the following procedure.

Frequency Adjustment Procedure

Note: Refer to the flowchart in Figure 1-31 during the following procedure.

1. Attach a frequency meter to the AC output leads or an electrical outlet on the load side of the generator set.
2. Start and run the generator set until it reaches normal operating temperature (at least 10 minutes).
3. Adjust engine governor speed (parameter 4P) to obtain a frequency reading of 60 Hz (or 50 Hz if appropriate). See Figure 1-33.
4. Check stability with the generator set running and with no load applied. If the generator set speed is unstable, hunts, or surges, adjust the engine governor gain, parameter 5P, until the generator set becomes stable with no hunting or surging. (Increasing the gain slows the governor response.)
5. Check the frequency reading. Repeat steps 3 and 4 if necessary to obtain the rated frequency and stable operation.
6. Save settings. See Figure 1-31.

4P Setting	60 Hz		50 Hz	
	RPM	Frequency	RPM	Frequency
00	3420	57	2850	47.5
50	3600	60	3000	50
99	3776	63	3150	52.5

Figure 1-33 Engine Speed Settings

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

Note: The revised design uses the revised fuel system and the revised field-connection terminal block layout shown in Figure 1-20.

Wiring Diagram Description	Original Design (see Figure 1-19)		Revised Design (see Figure 1-20)	
	Drawing Number	Page	Drawing Number	Page
Schematic Diagram	ADV-7697	36	ADV-8033	37
Point-to-Point Wiring Diagram	GM69754	38	GM79591	39

Figure 2-1 Wiring Diagrams and Schematics

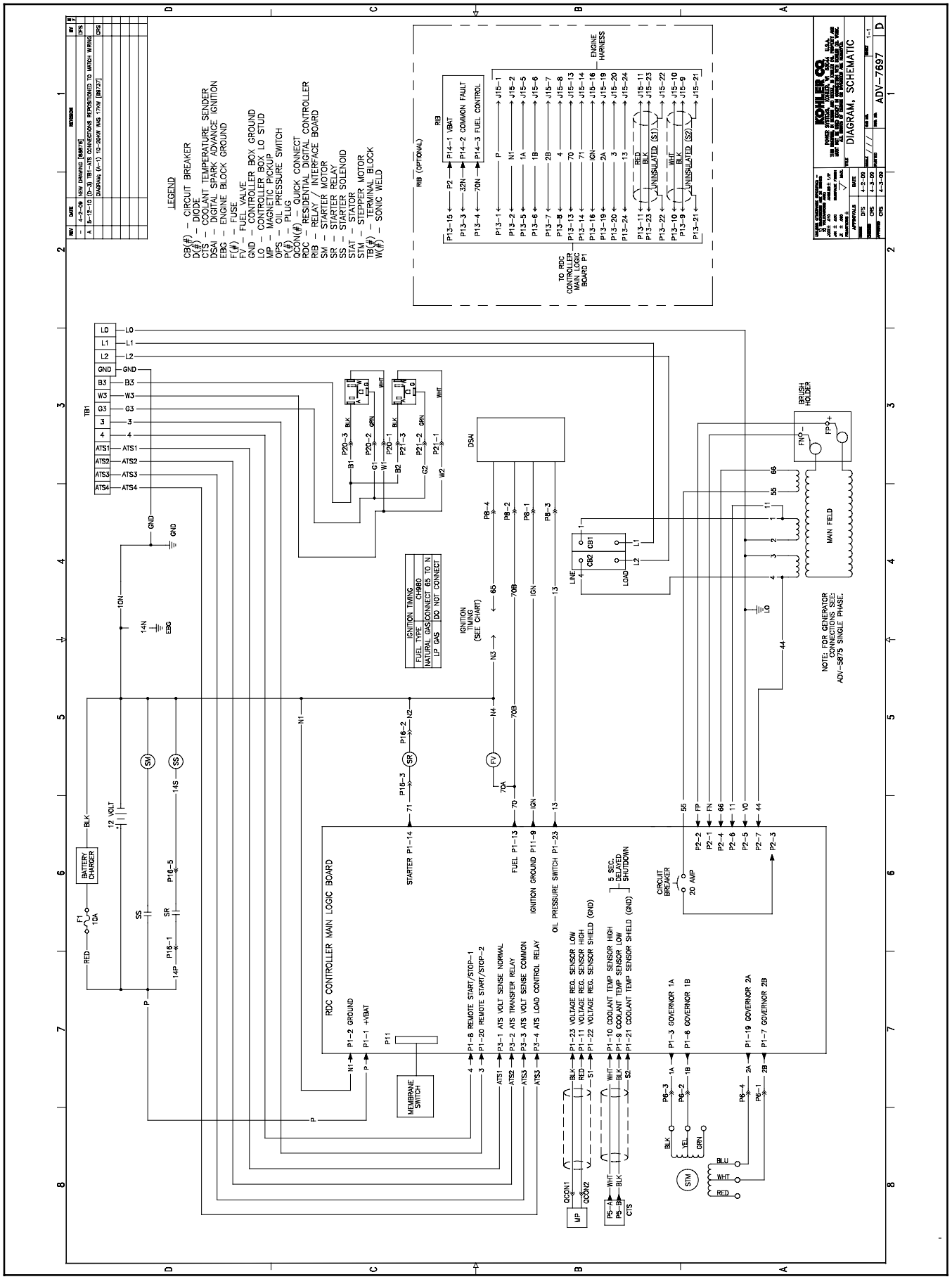


Figure 2-2 Schematic Diagram, ADV-7697 (original)

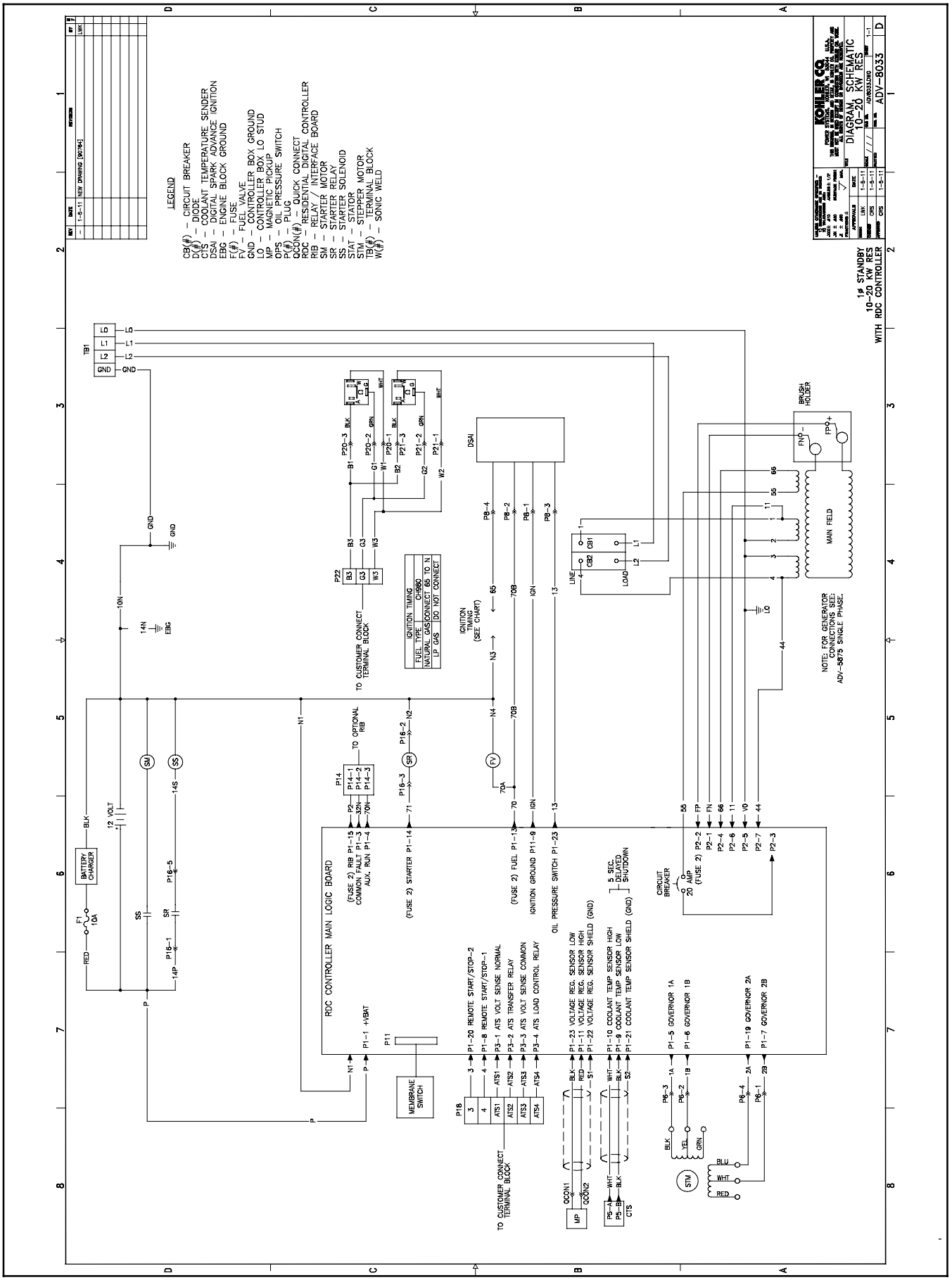


Figure 2-3 Schematic Diagram, ADV-8033 (revised)

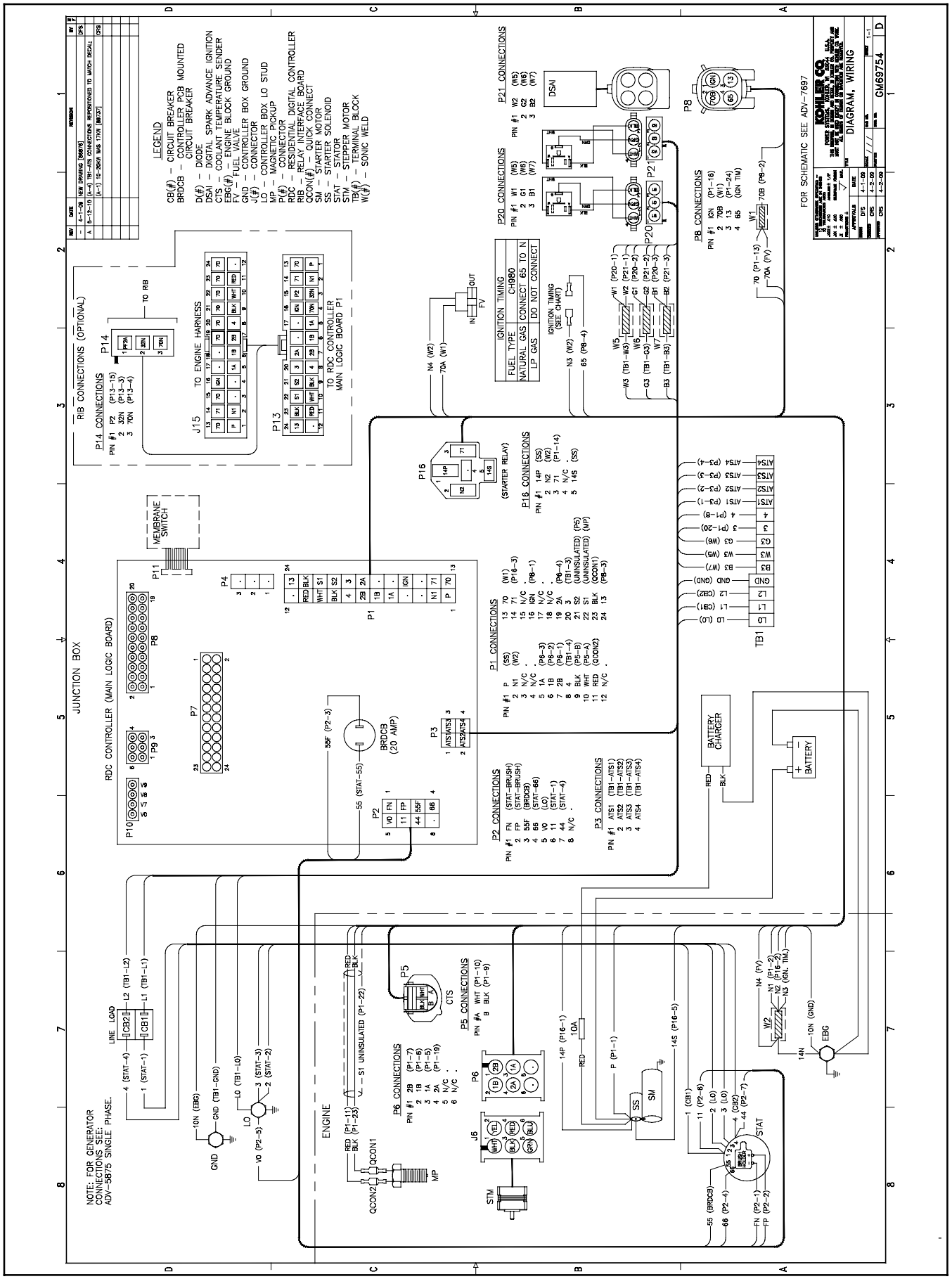


Figure 2-4 Point-to-Point Wiring Diagram, GM69754 (original)

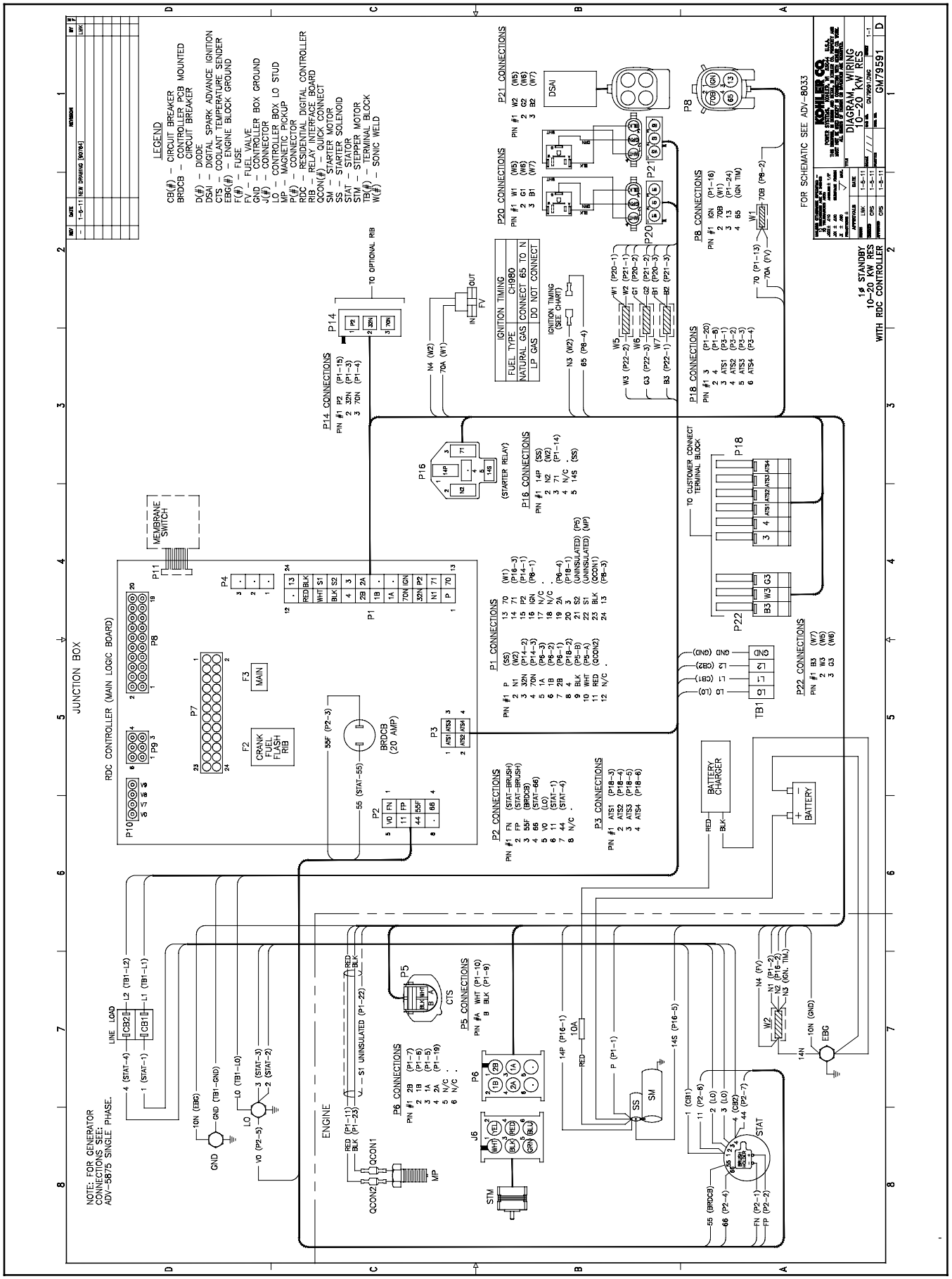


Figure 2-5 Point-to-Point Wiring Diagram, GM79591 (revised)

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^2PROM, 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
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

Use the full-scale drawing in Figure 2 to mark the openings for the electrical conduit, if desired. See Section 1.8.1 for more information.

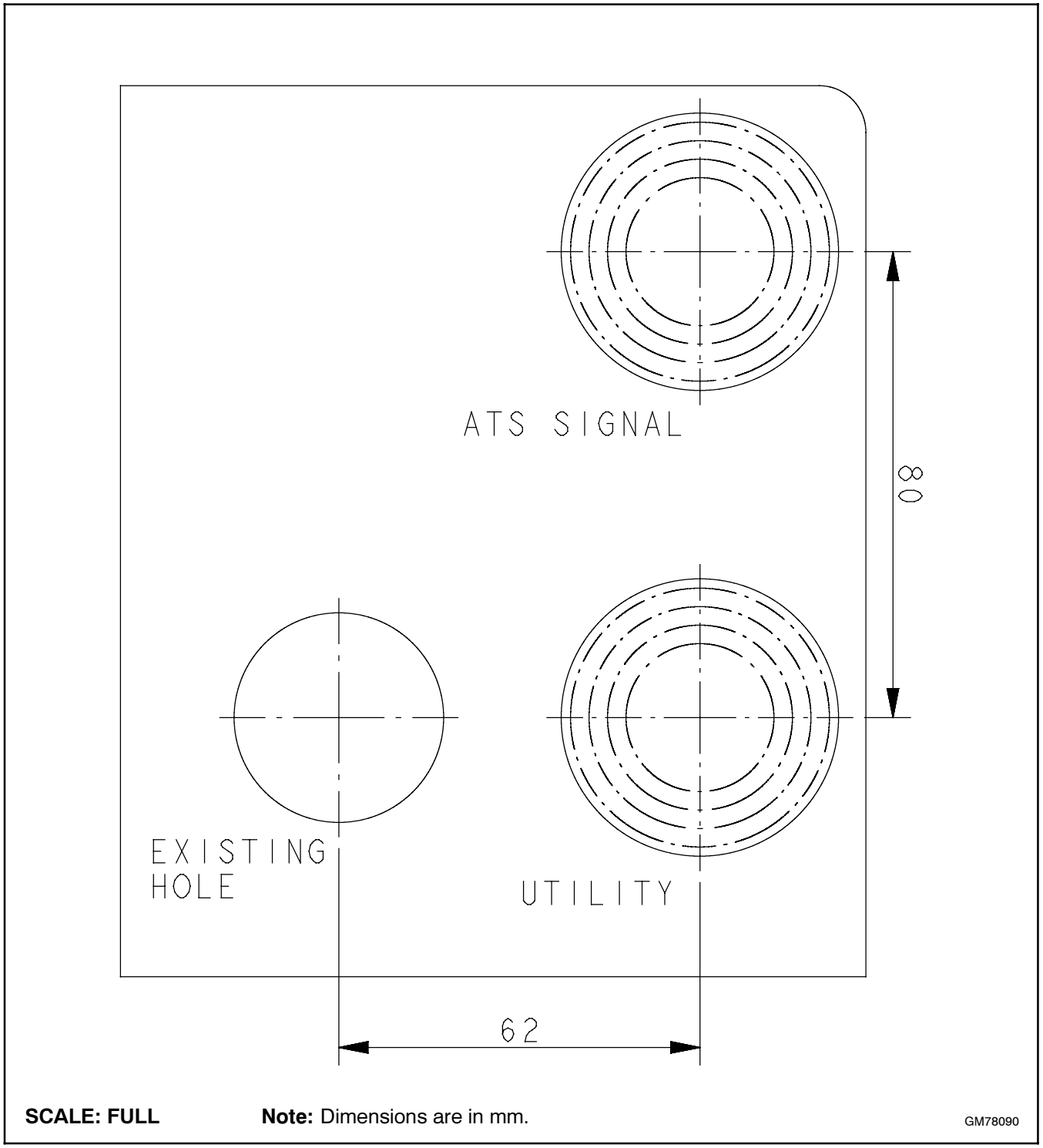


Figure 2 Template, Electrical

Notes

Notes

Notes

KOHLER®
POWER SYSTEMS

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TP-6733 8/11a