Installation

DC Generator Sets

Models:

6VSG

24VDC
36VDC
48VDC

Controller:

VSC

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

KOHLER® Power Systems

TP-6842 7/15b

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**
Service Assistance **10**
Section 1 Installation **11**
1.1 Introduction 11
1.2 Lifting 11
1.3 Generator Set Inspection 12
1.4 Location and Mounting 12
1.4.1 Mounting Area 12
1.4.2 Vibration Isolation 12
1.4.3 Exhaust Requirements 12
1.5 Dimension Drawings 12
1.6 Fuel Requirements 12
1.6.1 Fuel Supply 13
1.6.2 Fuel Pipe Size 13
1.7 Fuel Conversion 14
1.7.1 Fuel Conversion, 6VSG 14
1.8 Electrical Connections 15
1.8.1 Grounding 15
1.8.2 Electrical Lead Entry 16
1.8.3 Field-Connection Terminal Block 16
1.8.4 Power Supply 17
1.8.5 Programmable Interface Module (PIM) Connection 17
1.8.6 PIM Input and Output Connections 18
1.8.7 Communications Kit Output Connections 18
1.8.8 Optional Remote Engine Start Connection 19
1.9 Engine Starting Battery 20
1.9.1 Engine Starting Battery Installation Procedure 21
1.10 Generator Set Accessories 21
1.10.1 Carburetor Heater 21
1.10.2 OnCue® Generator Management System 22
1.10.3 Communications Kit 22
1.11 Prestart Installation Check 23
1.12 Set the Exerciser 23
1.13 Checking Generator Parameters 24
1.13.1 System Voltage 24
1.13.2 Auto Start Volt 25
1.13.3 Auto Stop Load 25
1.13.4 Load Limit 25
1.13.5 Delay *(seconds)* *25*
Section 2 Installation Drawings **27**
Appendix A Abbreviations **39**

IMPORTANT SAFETY INSTRUCTIONS Electro-mechanical 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***.

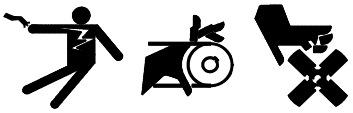
NOTICE

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

Risk of fire.
Can cause severe injury or death.

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

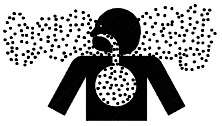
Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner removed.

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.

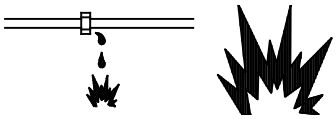
Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning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

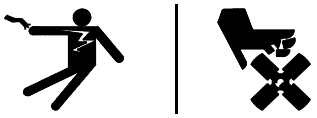
Hazardous Voltage/ Moving Parts

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.

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.

This manual provides installation instructions for the DC (direct current) variable speed Model 6VSG generator set. Refer to TP-6843, Operation Manual, for generator set operation and maintenance instructions.

This generator set is approved for use in stationary applications in locations served by a public utility, photovoltaic cells, wind turbines, or any combination of power sources tied to a battery bank.

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.

List of Related Literature

Figure 1 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
Operation Manual, 6VSG Generator Set	TP-6843
Service Manual, 6VSG Generator Set	TP-6844
Operation Manual, OnCue® Software	TP-6796
Operation Manual, SiteTech™ Software	TP-6701
Installation Instructions, Programmable Interface Module (PIM)	TT-1584

Figure 1 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 decals 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 Netherlands B.V.
Kristallaan 1
4761 ZC Zevenbergen
The Netherlands

Phone: (31) 168 331630

Fax: (31) 168 331631

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.

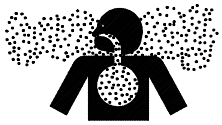
Note: Install carbon monoxide (CO) detector(s) on each level of any building adjacent to a generator set. Locate the detectors to adequately warn the building's occupants of the presence of carbon monoxide.

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.)
6VSG	190 (420)

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 in Section 2 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-6843, Operation Manual, for additional information.

1.4 Location and Mounting

Install the generator set outdoors. Choose a location that is away from any building or structure and near the incoming gas service. Allow 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.

Refer to your local codes and ordinances. See Figure 2-5 for more details.

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 will 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

Install the generator set on a single, level concrete mounting pad. This method provides maximum stability and ensures correct cooling air flow through the generator set. The recommended mounting pad dimensions are shown in the dimension drawings in Section 2.

1.4.2 Vibration Isolation

The generator set is equipped with neoprene vibration isolators. Connections between the generator set or its mounting base and any conduits or fuel lines must include flexible sections to prevent breakage and to isolate vibration.

1.4.3 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 2-5.

Exhaust	Temperature, °C (°F)
Exhaust gas exiting the enclosure at rated kW, °C (°F)	110 (230)

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. Inspect the air inlet and outlet openings inside and outside the housing to ensure that the air flow is not blocked.

1.5 Dimension Drawings

See the dimension drawings in Figure 2-3 through Figure 2-5 for the generator set dimensions, fuel and electric inlet locations, and recommended clearance.

1.6 Fuel Requirements

The generator set operates using natural gas or LPG fuel. The generator set is EPA-certified for both natural gas and LPG 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 1-3 lists the recommended fuel ratings and other fuel supply information for natural gas and LPG fuels.

Fuel type	Natural Gas	LPG
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.	115,000	106,000
Nominal Fuel Rating, Btu/ft.^{3}		
Natural gas	1000	
LPG	2500	

Figure 1-3 Fuel Supply

Verify that the output pressure from the primary gas utility pressure regulator is as shown in Figure 1-3 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 LPG tanks, verify that the output pressure is as shown in Figure 1-3. See Figure 1-5 for fuel consumption. Contact the fuel supplier for flow rate information or a gas meter upgrade.

The dimension drawings in Figure 2-3 and 2-4 shows the location of the fuel inlet connection. Use flexible sections to prevent fuel line breakage caused by vibration. 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 1-4. 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 1-4 to find the required pipe size.

Contact local LPG or natural gas provider for LPG or natural gas installation information.

Minimum Gas Pipe Size Recommendation, in. NPT		
Pipe Length, m (ft.)	**Natural Gas (115,000 Btu/hr.)**	**LPG (106,000 Btu/hr.)**
8 (25)	3/4	1/2
15 (50)	1	3/4
30 (100)	1	3/4
46 (150)	1	3/4
61 (200)	1	1

Figure 1-4 Fuel Pipe Size Recommendations

Model	Fuel Type	% Load	Fuel Consumption, m^3/hr. (cfh)
6VSG	Natural Gas	100	3.3 (116)
		75	2.7 (96)
		50	2.1 (75)
		25	1.8 (62)
	LPG	100	1.2 (42)
		75	1.0 (35)
		50	0.9 (32)
		25	0.7 (27)
Nominal fuel rating:	Natural gas:	37 MJ/m^3 (1000 Btu/ft.^{3})	
	LPG	93 MJ/m^3 (2500 Btu/ft.^{3})	
LPG conversion factors:		8.58 ft.^{3} = 1 lb. 0.535 m^3 = 1 kg 36.39 ft.^{3} = 1 gal.	

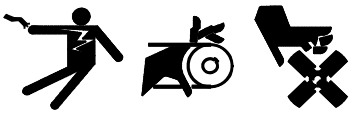
Figure 1-5 Fuel Consumption

1.7 Fuel Conversion

The multi-fuel system allows conversion from natural gas to LPG (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 1-6 shows the fuel system components.

WARNING

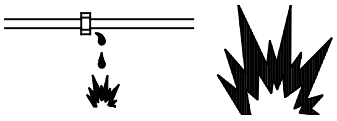


Accidental starting.
Can cause severe injury or death.

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.

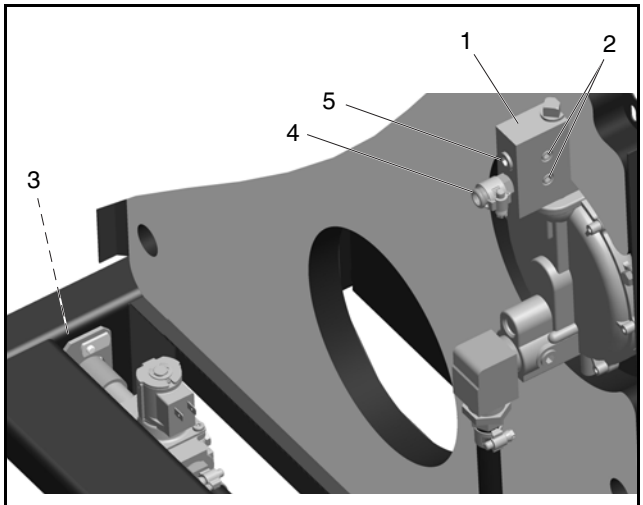
Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: (1) Press the generator set OFF/RESET button to shut down the generator set. (2) Disconnect the power to the battery charger. (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.



KPS_036

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 1-6 Fuel Block, 6VSG

1.7.1 Fuel Conversion, 6VSG

Two fuel connections on the fuel block allow field conversion between LPG and natural gas. 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.

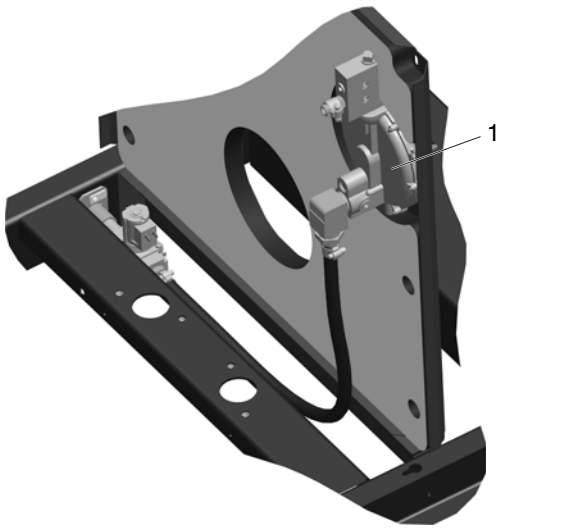
Use the following procedure to convert from LPG to natural gas (NG). The procedure includes moving the fuel connection from the LP port to the natural gas, plugging the LP port.

Procedure to convert from LPG to NG, 6VSG

1. Press the OFF button on the generator set controller.
2. Disconnect the utility power to the generator set.
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 1-7.
6. Remove the hose fitting from the LP port in the fuel block. See Figure 1-7.
7. Remove the plug from the NG port in the fuel block. See Figure 1-7.

8. Clean the plug with a dry cloth or brush, apply fresh pipe sealant, and install the plug into the LP 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 NG port.

   Note: Do not adjust the fuel metering valves.
10. Slide the hose onto the hose fitting and secure it with the clamp.
11. Connect and turn on the new fuel supply.



1. Fuel regulator

Figure 1-7 Fuel System

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

Conversion from Natural Gas to LPG

To convert from natural gas to LPG, follow the fuel conversion procedure above, moving the hose fitting to the LPG port and plugging the NG port.

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.

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.

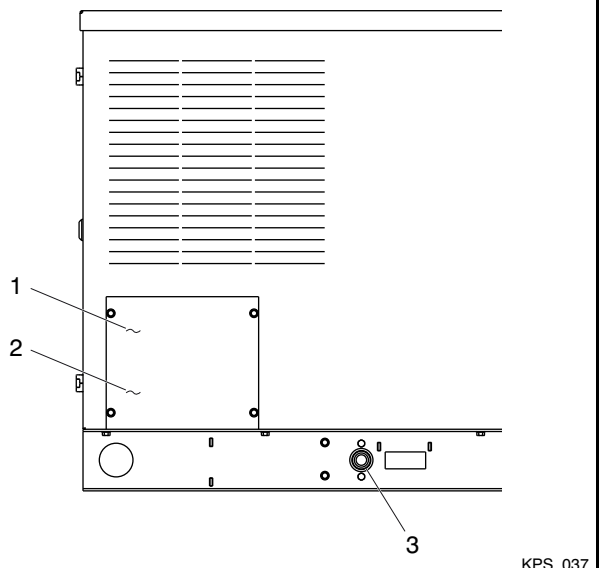
1.8.1 Grounding

The 6VSG has an isolated output, which should be referenced to ground. This can be accomplished by connecting either the positive or the negative DC output lead to ground. A floating voltage is not recommended in this application.

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

1.8.2 Electrical Lead Entry

Drill or punch holes in the enclosure for the electrical conduit in the locations shown in Figure 1-8.



1. DC electrical lead entry point
2. Utility voltage electrical lead entry point
3. 1/2 in. NPT female fuel inlet

Figure 1-8 Electrical Lead Entry

1.8.3 Field-Connection Terminal Block

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

See the dimension drawings in Figure 2-3 through Figure 2-5 for the customer field connection terminal block location. See Figure 1-9 for terminal block details. Refer to the terminal block decal for connections and wire sizes. Size the wire according to the length of run and 115% of the circuit current (amperage) based on 75°C wire rating or less as directed by the National Electrical Code (NEC) in ANSI/NFPA 70. Also see Section 2, Wiring Diagrams.

Route AC and DC 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 AC and DC leads through separate conduit.

Procedure

1. Drill holes for the conduit fittings. See Figure 1-8 for the recommended electrical inlet locations. Feed the cables through the openings.

2. Connect the leads from the battery bank to the "+" and "–" connections on the generator set terminal block.

3. Connect the ground (GRD) lead 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.

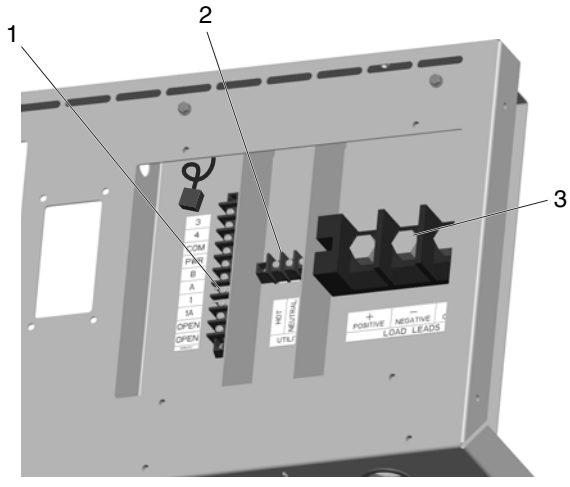
5. For connection of the programmable interface module (PIM), see Section 1.8.6.

6. If the OnCue® 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), in separate conduit from the AC load leads. If the network cable is longer than 100 m (328 ft.), use a repeater or switch.

   b. Use an RJ-45 inline coupler to connect the Ethernet cable to the cable in the customer connection box. See Figure 1-21. The inline coupler is included with the OnCue® kit.



1. Low voltage communication and engine start connections
2. AC utility power connections
3. DC load connections

Figure 1-9 Electrical Connections

1.8.4 Power Supply

Provide AC power for the battery charger (integral to the VSC controller) and optional carburetor heater. The power requirements are shown in Figure 1-10. 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 primary 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 shown in Figure 1-9. See Section 1.8.3 and the wiring diagrams in Section 2 for connection details.

Equipment	Power Requirement, Max.		
	Watts	Amps	Volts
Battery charger (standard, integral to VSC controller)	120	1	100-250 VAC 50/60 Hz
Carburetor heater (optional)	37	0.33	120 VAC 50/60 Hz

Figure 1-10 Power Requirements

1.8.5 Programmable Interface Module (PIM) Connection

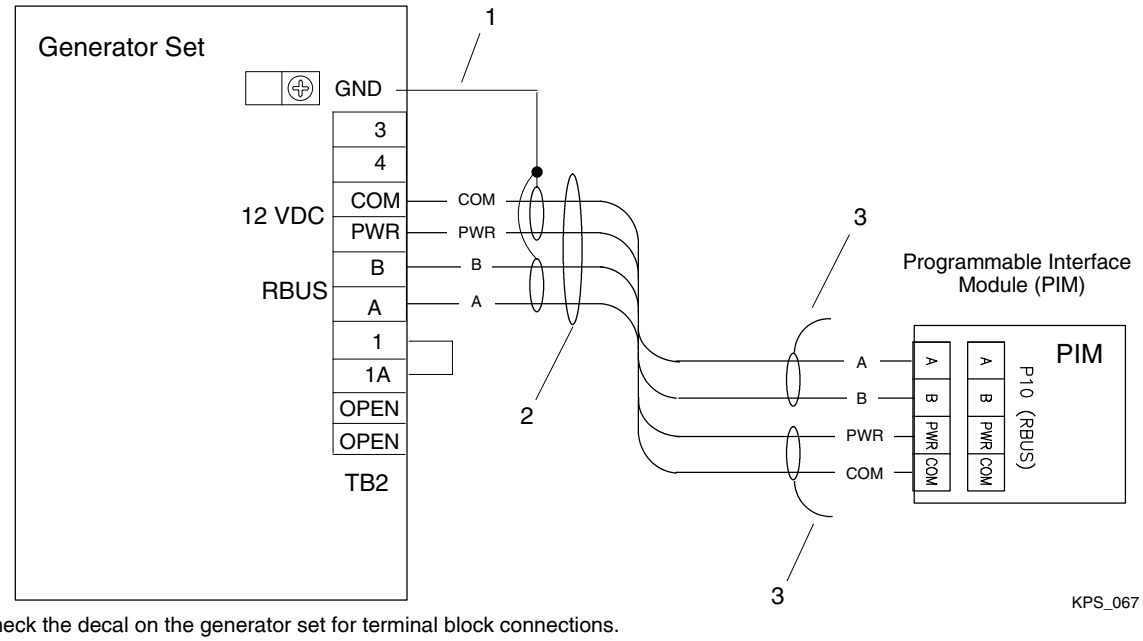
One programmable interface module can be connected to the generator set. Route low-voltage communication leads through separate conduit. All connections must comply with applicable state and local codes.

See Figure 1-12. Use Belden #9402 or equivalent 20 AWG shielded, twisted-pair cable to connect P10-1 through P10-4 on the programmable interface module (PIM) to the generator set terminal block TB1 connections A, B, PWR, and COM. Note the shield connections shown in Figure 1-12. The maximum cable length using Belden #9402 cable is 61 m (200 ft.).

For longer cable runs, use Belden #8762 or equivalent 20 AWG shielded, twisted-pair cable with 2 conductors for the A and B connections, and use 12-14 AWG wire for the COM and PWR connections. See Figure 1-11 for the maximum cable lengths.

Cable PWR and COM Connections	Maximum length meters (ft.)
Belden #9402 or equivalent 20AWG	61 (200)
14 AWG	152 (500)
12 AWG	152 (500)

Figure 1-11 Maximum Cable Lengths



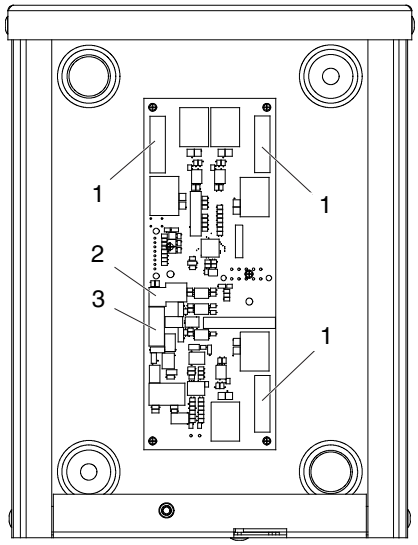
Note: Check the decal on the generator set for terminal block connections.

1. Connect one end of each cable shield to GROUND at the generator set.
2. Communication cable Belden #9402 or equivalent 20 AWG shielded, twisted-pair cable
3. Leave one end of each cable shield disconnected.

Figure 1-12 Programmable Interface Module (PIM) Communication Connection to Generator Set Terminal Block

1.8.6 PIM Input and Output Connections

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

Figure 1-13 Optional PIM

The default settings for the inputs and outputs are shown in Figure 1-14. 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.

Connection	PIM Settings
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 1-14 PIM Factory Default Inputs and Outputs

1.8.7 Communications Kit Output Connections

The communications kit includes an interface board, which is factory-installed inside the generator set enclosure. The inputs and outputs are factory-set to the settings shown in Figure 1-15.

The outputs are factory-wired from the circuit board to terminal blocks in the customer connection area. Do not attempt to connect directly to the interface board. The output contacts are normally open (NO); outputs close on activation. Connect customer equipment to the outputs at the terminal blocks as shown in Figure 1-15.

Connection	Communications Kit
Input 1	Fuel Pressure
Input 2	Enclosure Intrusion Alarm
Output 1 (Relay 1)	Run
Output 2 (Relay 2)	Common Fault
Output 3 (Relay 3)	Battery Voltage
Output 4 (Relay 4)	Fuel Pressure Low Warning
Output 5 (Relay 5)	Enclosure Intrusion Alarm Warning
Output 6 (Relay 6)	Reserve Oil Empty (oil makeup kit required)

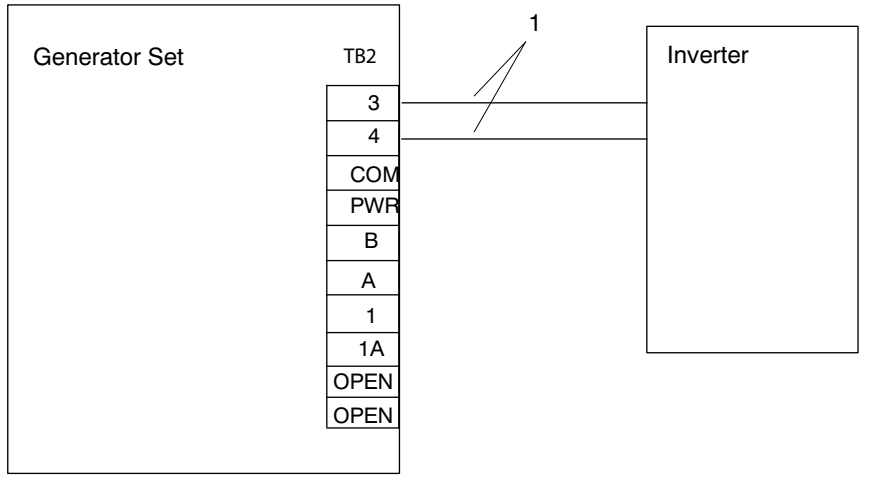
Figure 1-15 Communications Kit Factory Default Inputs and Outputs

1. Output connections (6 outputs)

Figure 1-16 Communications Kit Output Connections

1.8.8 Optional Remote Engine Start Connection

A remote start switch can be connected to the generator set. Connect the engine start leads from a remote start switch to terminals 3 and 4 on the terminal block. See Figure 1-17. Route the engine start leads through separate conduit from the AC accessory power leads.



1. Remote engine start leads 3 and 4. Close the contact across 3 and 4 to start the generator set. Open the contact to stop the generator set.

Figure 1-17 Remote Engine Start Connections

1.9 Engine Starting 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.

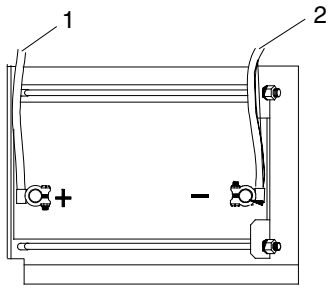
Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the 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 1-18 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 drawings in Figure 2-3 through 2-5 for the engine starting battery location behind the service door on the generator set. Standard battery cables provide easy connection to the battery.



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

Figure 1-18 Typical Battery Connection

1.9.1 Engine Starting Battery Installation Procedure

Use the following procedure to install and connect the generator set engine starting battery.

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 inside 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 VSC 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 the generator set operation manual for instructions.

If the battery is disconnected for service or replacement, the exercise settings on the VSC controller are lost. Set the exerciser after installing and connecting the battery.

1.10 Generator Set Accessories

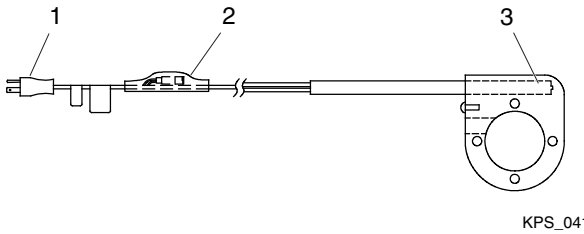
Have accessories installed by an authorized distributor/dealer or a licensed electrician. Follow the installation instructions provided with each kit. Use separate conduit for AC and DC leads to reduce the possibility of electrical interference. Verify that the leads and conduit do not interfere with 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 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 1-19.

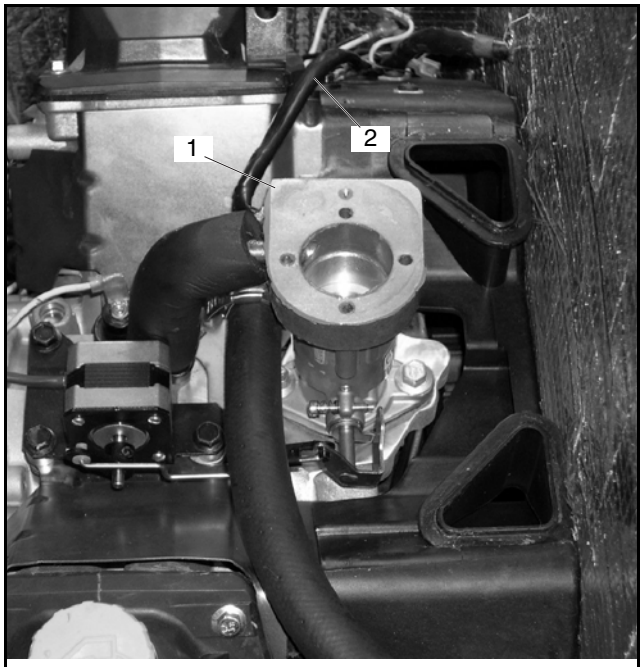
To install the carburetor heater, follow the instructions provided with the kit. Figure 1-20 shows the installed carburetor heater kit installed for a 6 kW generator set.

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



1. Power plug
2. Thermostat
3. Heater

Figure 1-19 6VSG Carburetor Heater



KPS_042

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

Figure 1-20 6VSG Carburetor Heater

1.10.2 OnCue® Generator Management System

The OnCue® 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.

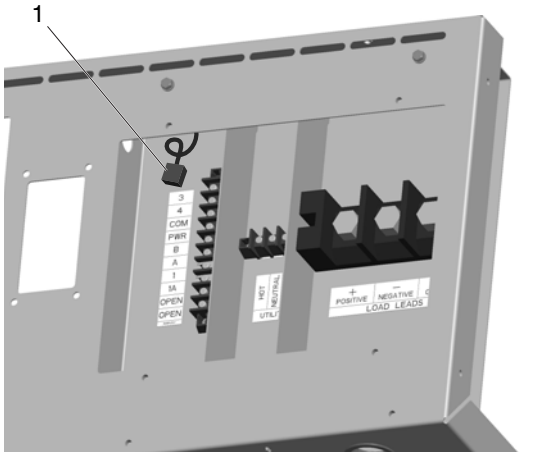
The OnCue® system is available separately as a loose kit. Use category 5E network cable to connect the VSC controller to the customer-supplied Ethernet router and cable or DSL modem. Route the cable with other low-voltage signal wiring (for example, the RBUS communication leads or engine start leads), in separate conduit from the AC accessory power. 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 1-21. Use an RJ-45 inline coupler, provided with the OnCue® kit, to connect the customer's Ethernet cable to the cable in the customer connection box.



KPS_043

1. Ethernet cable for optional OnCue® connection

Figure 1-21 Network Connection for OnCue®

1.10.3 Communications Kit

The optional communications kit is factory installed. The communications kit includes the following items:

- Interface board with factory set inputs and outputs
- Customer connection terminal blocks
- Enclosure intrusion alarm switch
- Fuel pressure sensor

Connect the outputs to customer-supplied equipment as shown in Section 1.8.7, Communications Kit Output Connections, or on the wiring diagram.

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.

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.

When power is applied to the VSC controller (when the battery or the AC 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.

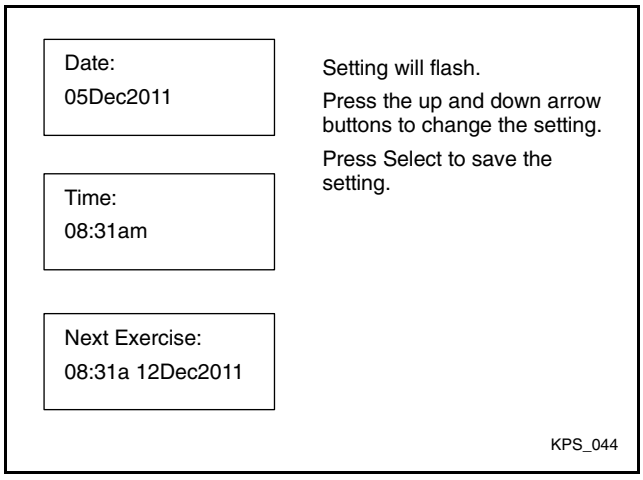


Figure 1-22 Set Time, Date, and Exercise (VSC)

1.13 Checking Generator Parameters

Note: Changing these settings can damage your generator set and batteries. Always refer to the information provided by the battery bank manufacturer for the correct voltage and charge current limits for your batteries. Contact an authorized Kohler distributor or dealer for assistance if the settings need to be changed.

1.13.1 System Voltage

This should be set for the required output voltage to properly support the load and charge the battery. Refer to battery manufacturer to correctly set the value. This value should not be confused with the voltage designation of the battery bank (four 12-volt batteries wired in series results in a 48V battery bank but the output voltage needed to charge the battery bank is 54V). Faults and warnings related to voltage are based off this value. For example, for a 6VSG-48V, setting this value to 54V will result in an output of the VSG to be 54V. This value relates to the recommended charging voltage specified by the battery manufacturer. The output of a 6VSG-48V set at 54V will have an output of 6 kW; however as you increase the system voltage, the output drops below 6 kW due to the fixed rpm range.

Note: Setting the system voltage to a higher value than the factory default setting will decrease the power output of the generator set.

A 6VSG set at the default system voltage will have an output of 6 kW. If the system voltage is set to a higher value, the output current decreases. The available power output also decreases below 6 kW due to the limits on the engine speed. The graphs in Figure 1-24 illustrate the effect of changing the system voltage.

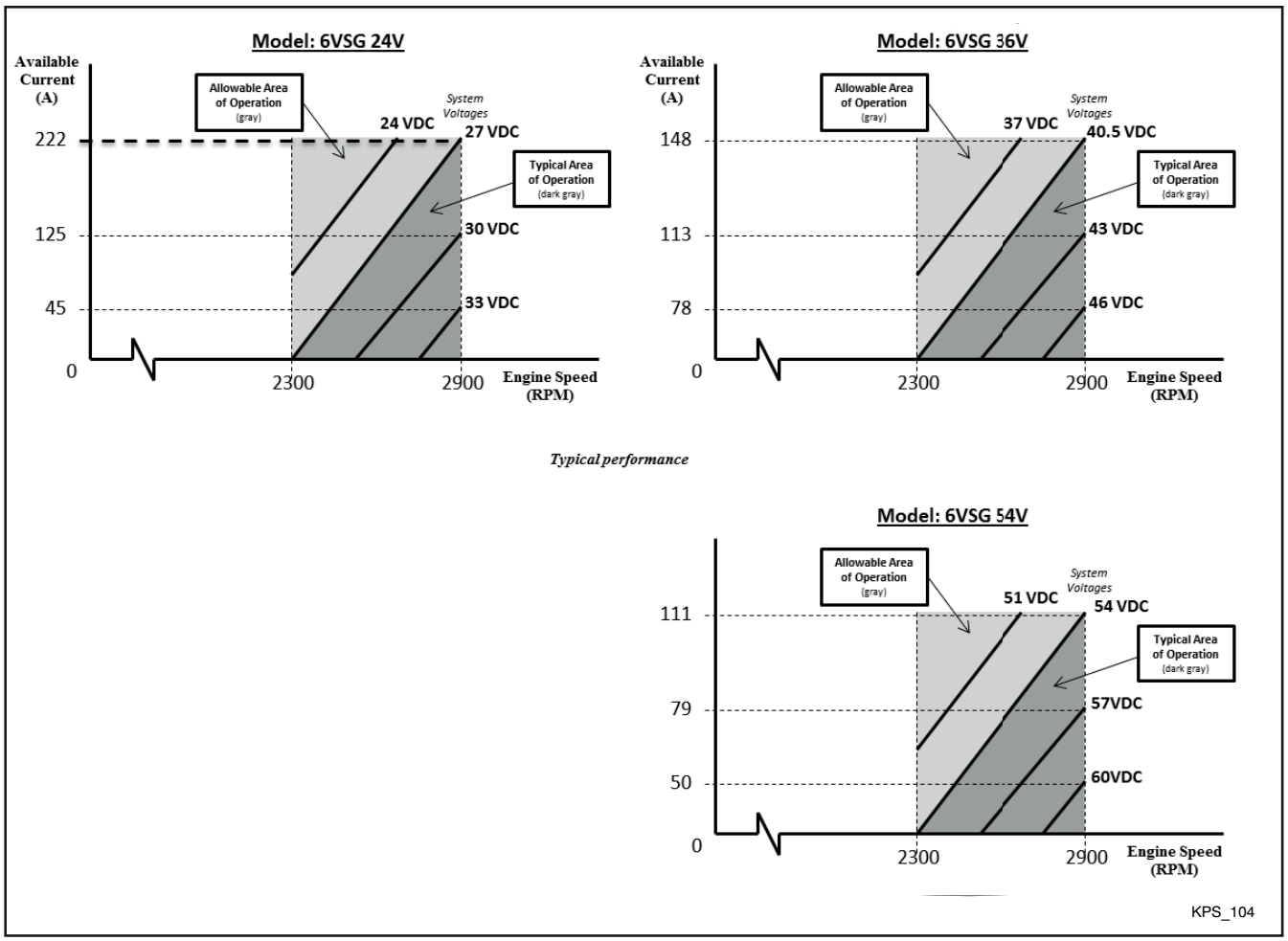


Figure 1-23 Effect of Changing the System Voltage Setting

1.13.2 Auto Start Volt

This value is the voltage at which the 6VSG will automatically start. The automatic start criteria are met when this voltage has reached or fallen below this value for the specified delay period (standard 3 minutes, only changed using SiteTech). This voltage is detected at the generator and may differ from the voltage measured at the load or the battery due to voltage drop in the lines.

	6VSG-24V	6VSG-36V	6VSG-48V
Default	25 VDC	37.5 VDC	50 VDC
Minimal value	15 VDC	15 VDC	15 VDC
Maximal value	60 VDC	60 VDC	60 VDC

Figure 1-24 Auto Start Voltage Settings

1.13.3 Auto Stop Load

This value is the load level at which the 6VSG will automatically stop. The automatic stop criteria are met when the load has reached or fallen below this value for the specified delay period (standard 3 minutes and only changed using SiteTech). This load is detected at the generator.

	6VSG-24V	6VSG-36V	6VSG-48V
Default	40%	40%	40%
Minimal value	0%	0%	0%
Maximal value	100%	100%	100%

Figure 1-25 Auto Stop Load Settings

1.13.4 Load Limit

This value is the limit to the generator capacity. This allows the 6VSG to limit current output to the maximum charge rate specified by the battery manufacturer or load in the application. Adjustments should be done by qualified individuals after referring to battery manufacturer's recommended maximum charge rate.

	6VSG-24V	6VSG-36V	6VSG-48V
Default	100%	100%	100%
Minimal value	0%	0%	0%
Maximal value	120%	120%	120%

Figure 1-26 Load Limit

$$\text{Load limit} = \frac{(\text{Charge voltage} \times \text{Charge current})}{60}$$

1.13.5 Delay *(seconds)*

This delay is used to determine the amount of time a value (Auto Start Volt or Auto Stop Load) needs to be sustained before the respective action is taken pertaining to the value. The delay can only be changed using a personal computer (laptop) and Kohler SiteTech software. Contact an authorized Kohler distributor or dealer to adjust the setting, if necessary.

	6VSG-24V	6VSG-36V	6VSG-48V
Default	3 minutes	3 minutes	3 minutes
Minimal value	1 second	1 second	1 second
Maximal value	60 minutes	60 minutes	60 minutes

Figure 1-27 Auto Start/Auto Stop Delay Settings

Notes

Compare the controller on your generator set with the illustrations in Figure 2-1 to determine whether you have the original or revised controller. Then find the correct drawings for your unit in Figure 2-2.

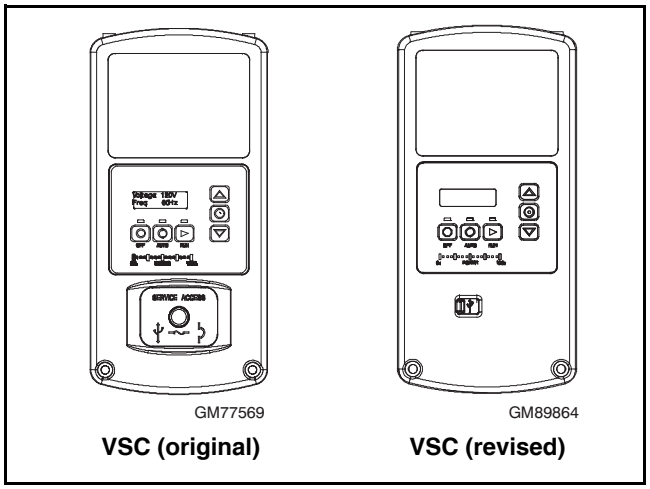


Figure 2-1 Original and Revised VSC Controllers

Installation Drawing Description	Drawing Number	Page
Dimension Drawing	ADV-8060, Sheet 1	28
Dimension Drawing	ADV-8060, Sheet 2	29
Dimension Drawing	ADV-8060, Sheet 3	30
Original Controller		
Schematic Diagram	ADV-8460, Sheet 1	31
Schematic Diagram	ADV-8460, Sheet 2	32
Point-to-Point Wiring Diagram	GM81321, Sheet 1	33
Point-to-Point Wiring Diagram	GM81321, Sheet 2	34
Revised Controller		
Schematic Diagram	ADV-8707, Sheet 1	35
Schematic Diagram	ADV-8707, Sheet 2	36
Point-to-Point Wiring Diagram	GM93380, Sheet 1	37
Point-to-Point Wiring Diagram	GM93380, Sheet 2	38

Figure 2-2 Dimension Drawings, Wiring Diagrams, and Schematics

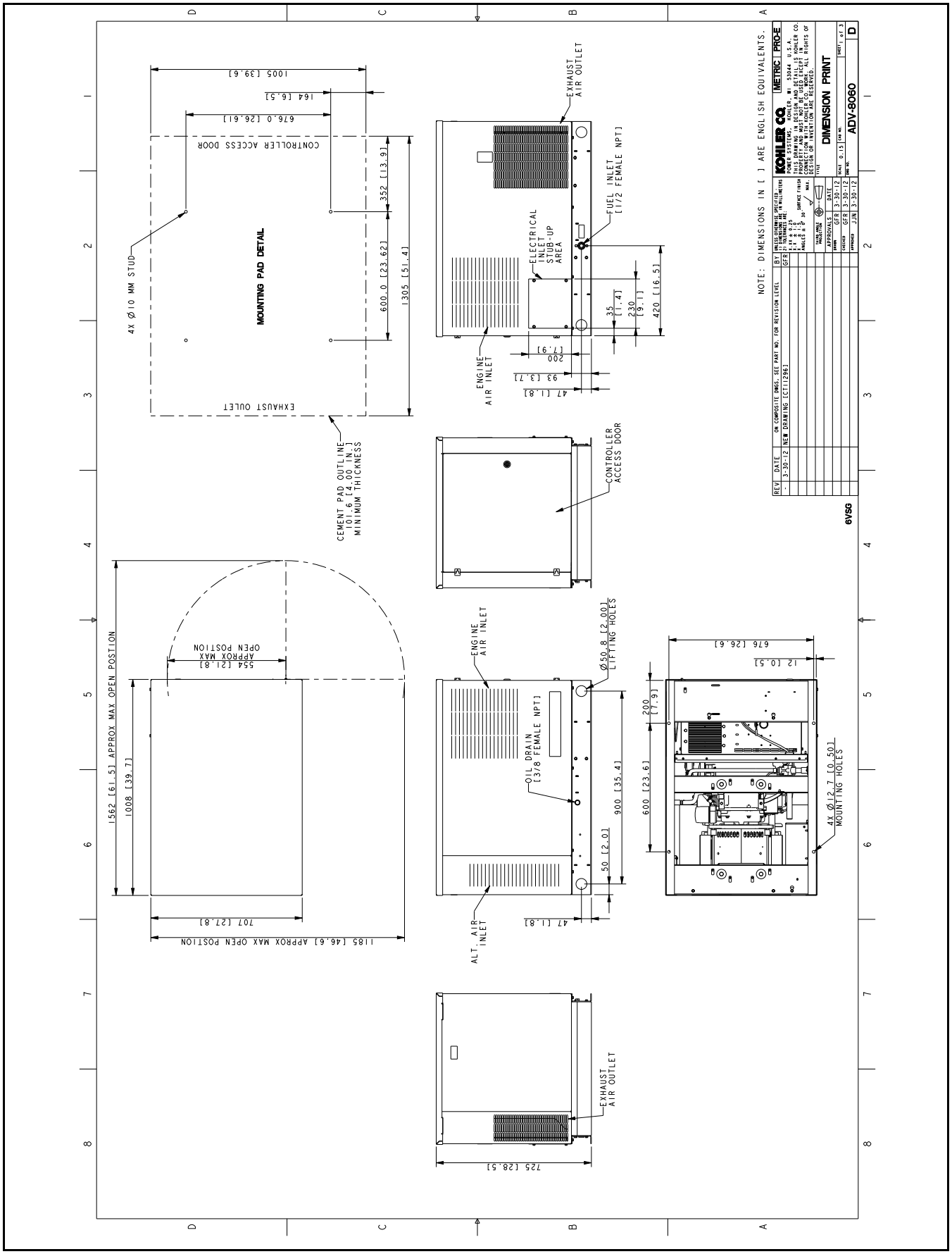


Figure 2-3 Dimension Drawing ADV-8060, Sheet 1

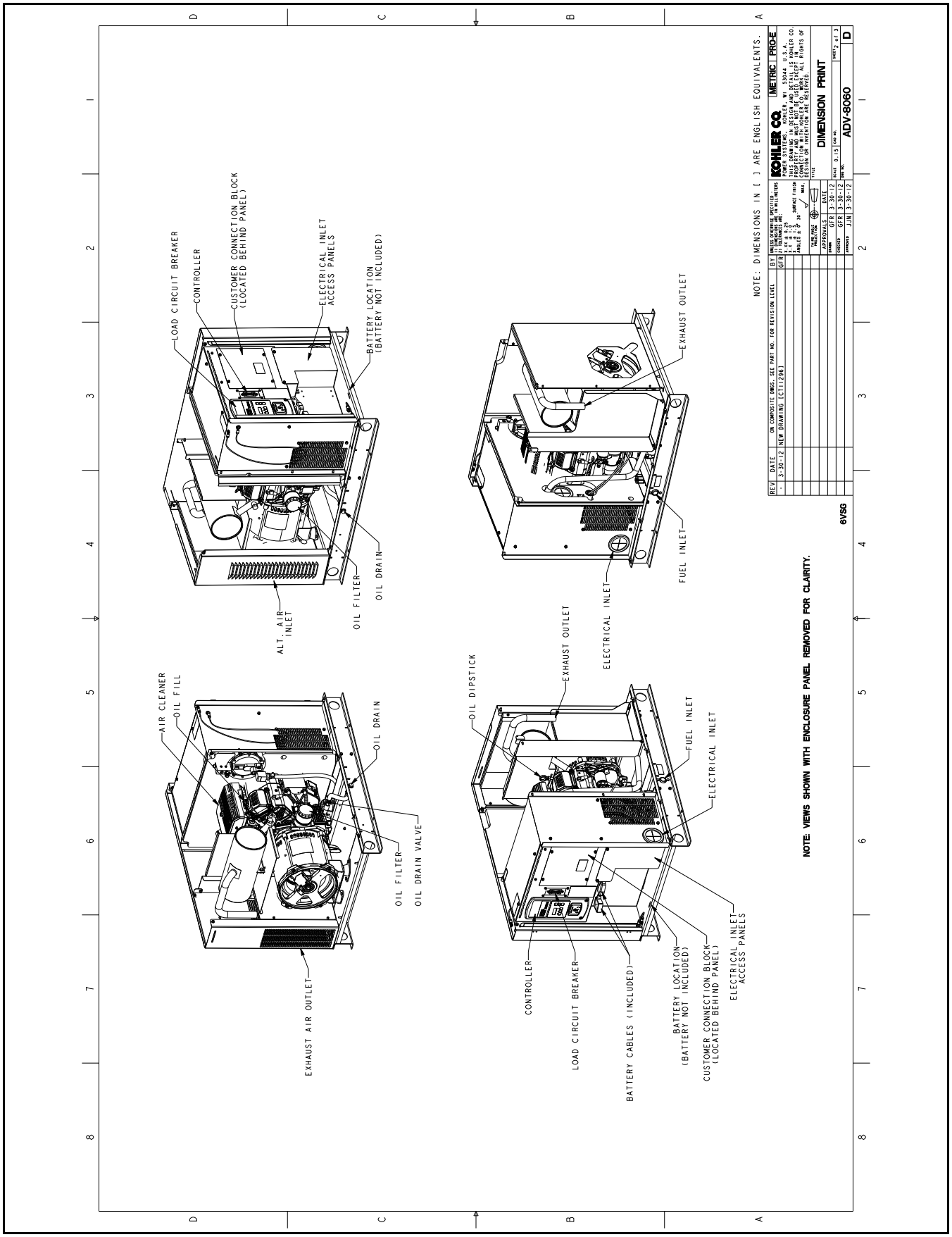


Figure 2-4 Dimension Drawing ADV-8060, Sheet 2

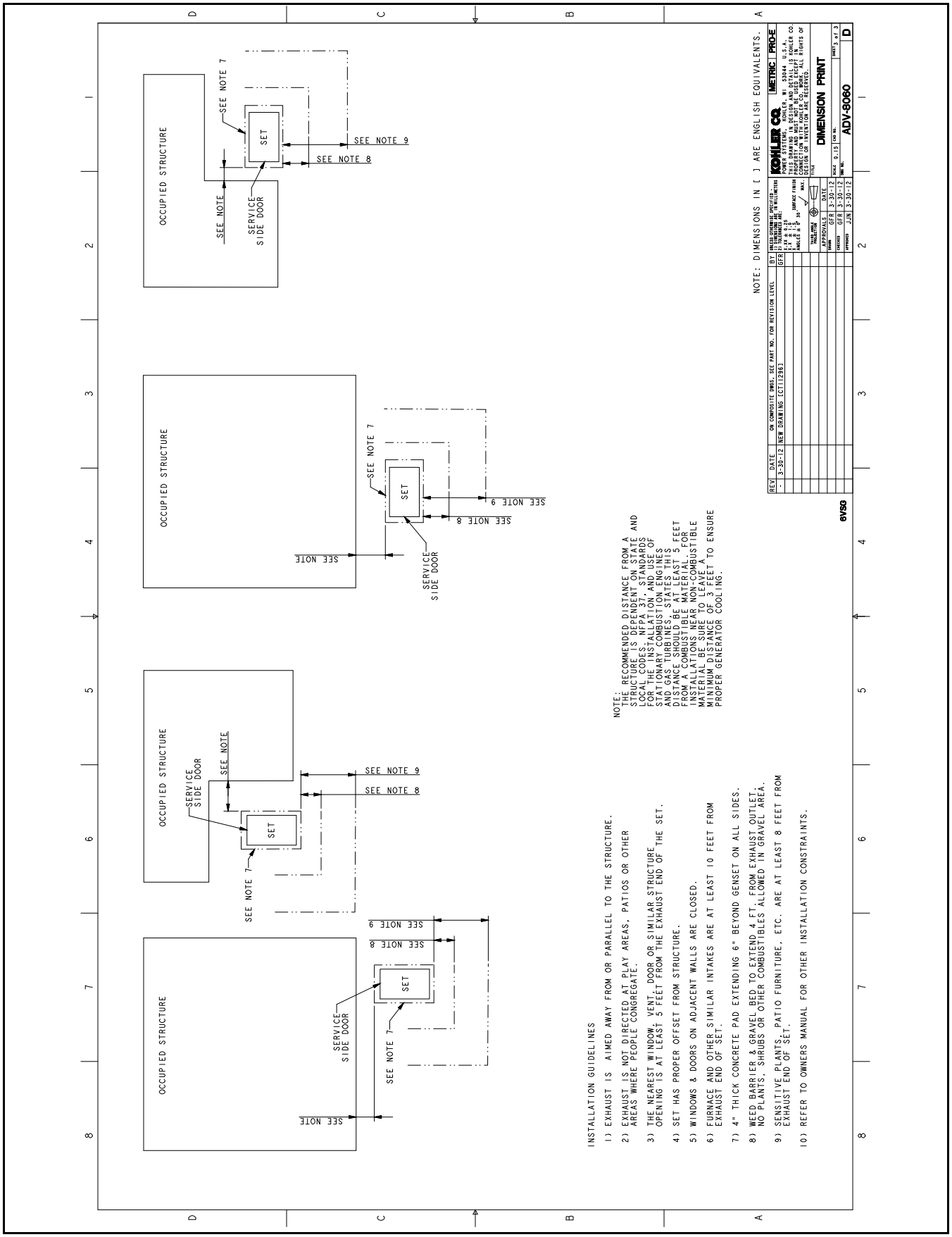


Figure 2-5 Dimension Drawing ADV-8060, Sheet 3

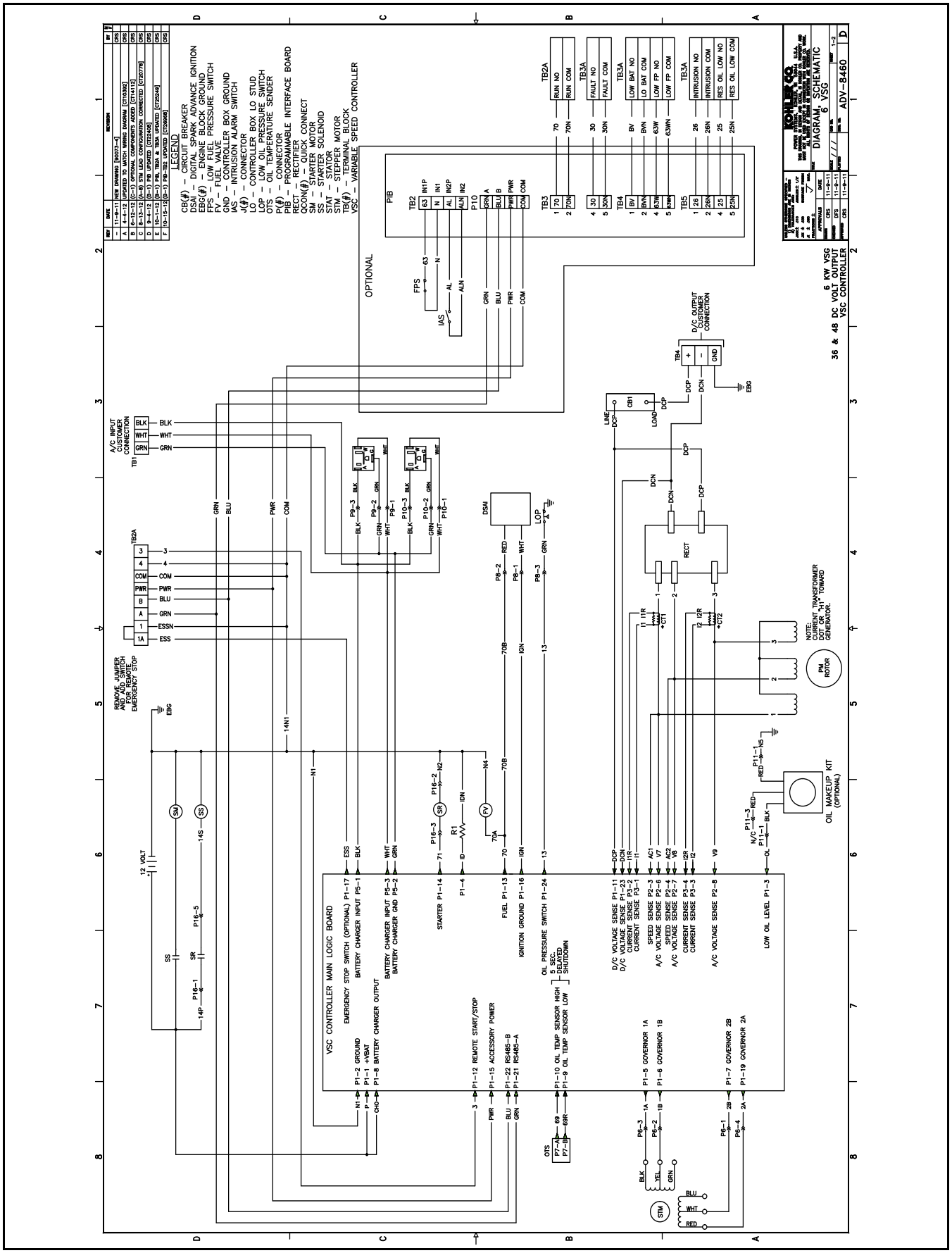


Figure 2-6 Schematic Diagram, ADV-8460, Sheet 1

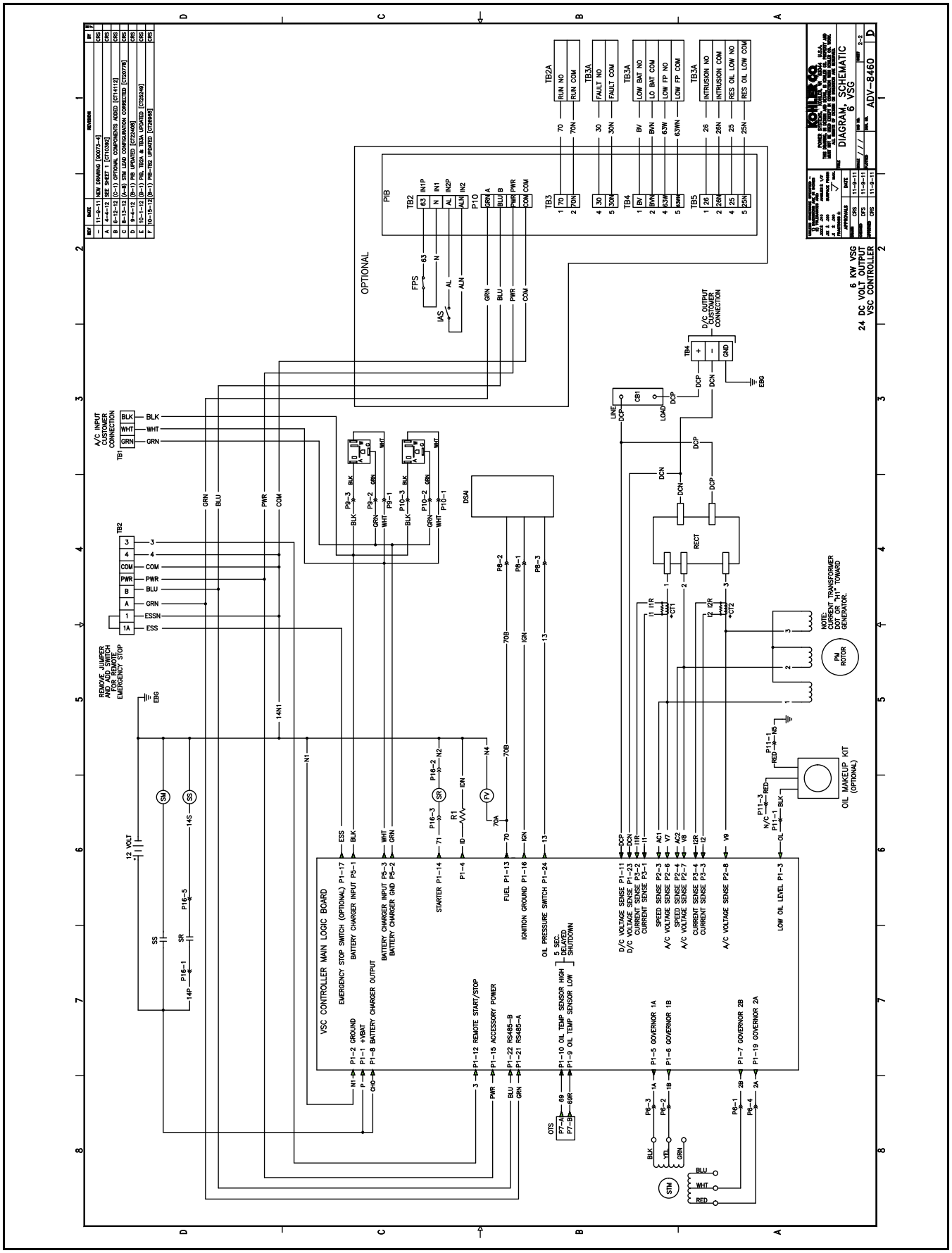


Figure 2-7 Schematic Diagram, ADV-8460, Sheet 2

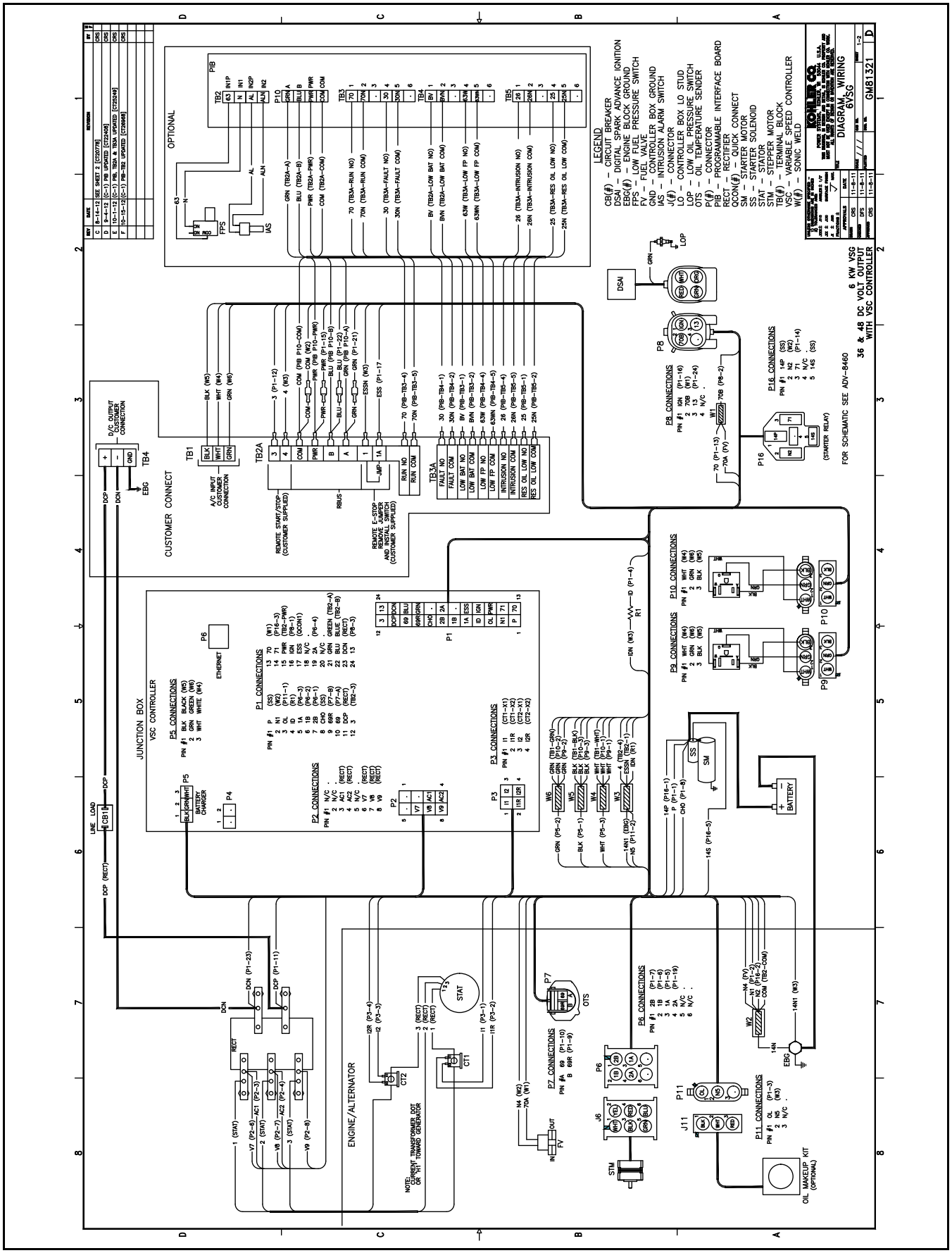


Figure 2-8 Point-to-Point Wiring Diagram, GM81321, Sheet 1

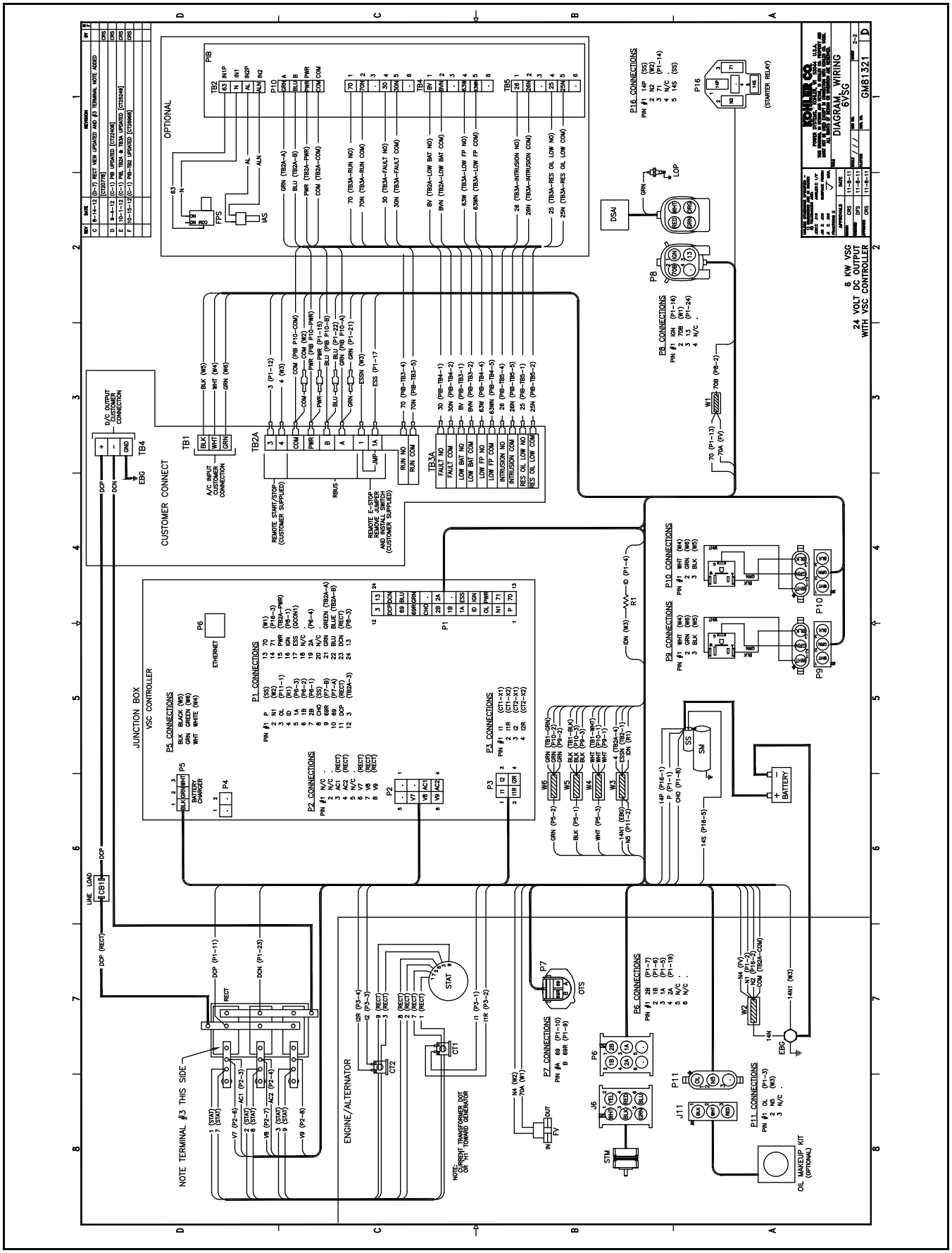


Figure 2-9 Point-to-Point Wiring Diagram, GM81321, Sheet 2

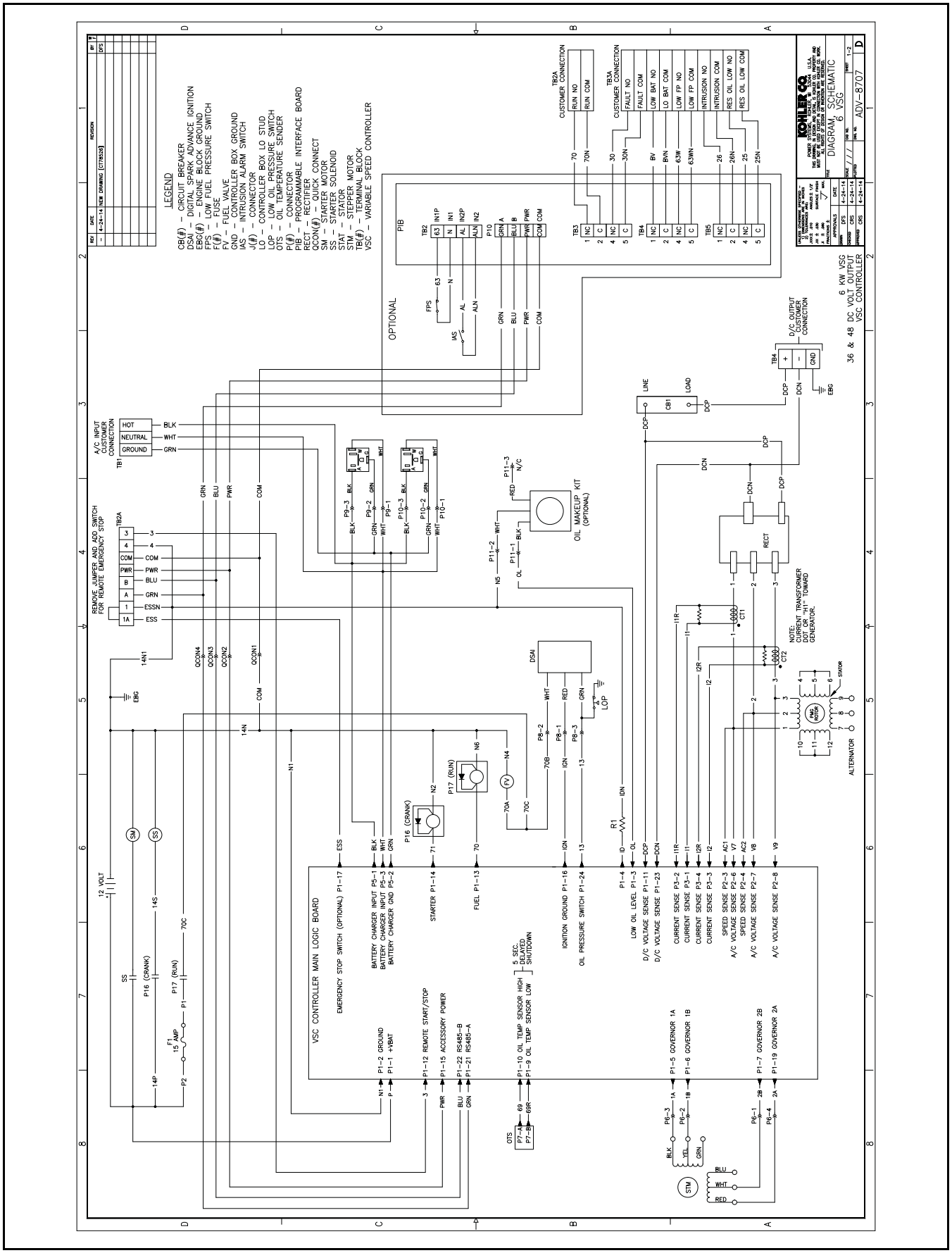


Figure 2-10 Schematic Diagram, ADV-8707, Sheet 1

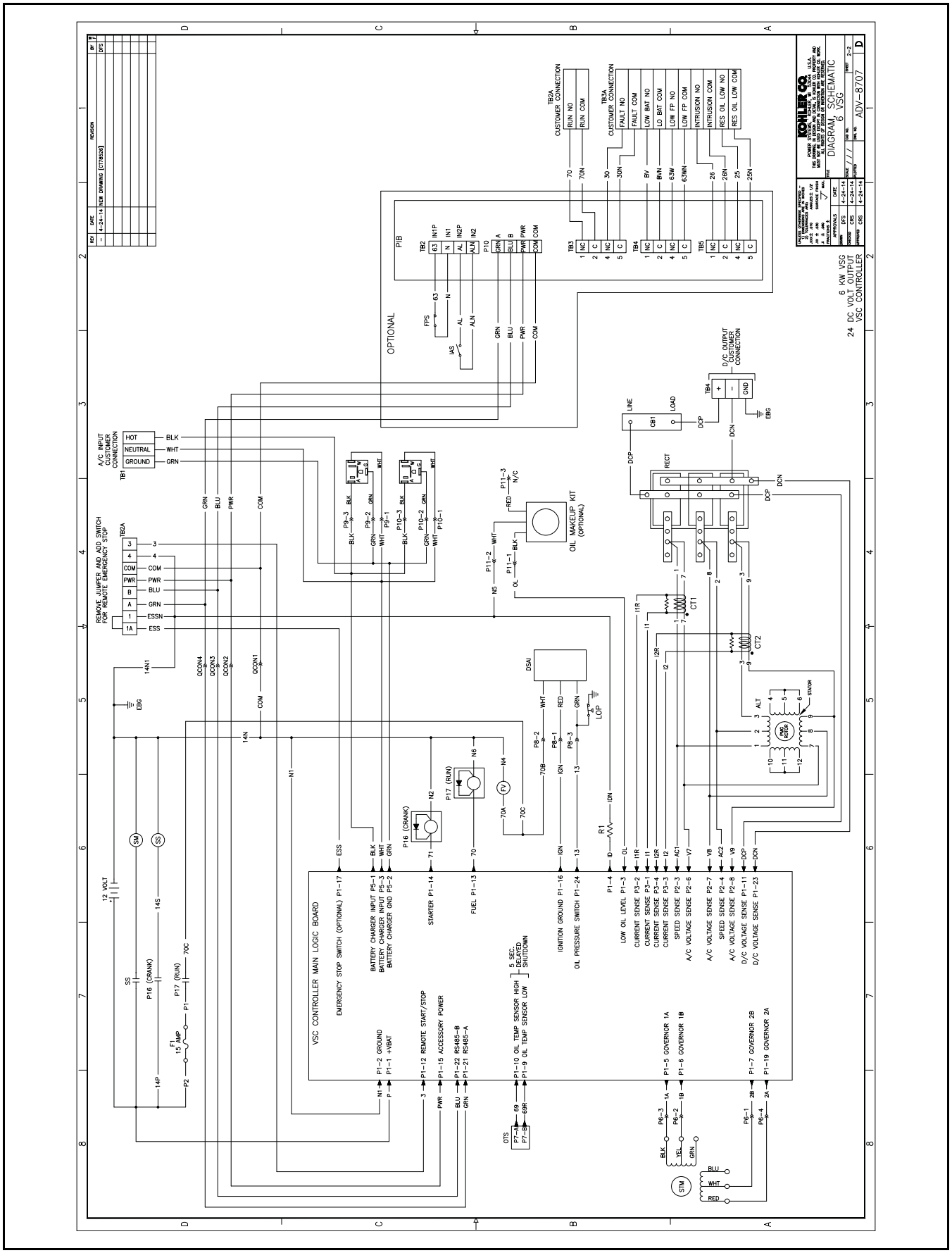


Figure 2-11 Schematic Diagram, ADV-8707, Sheet 2

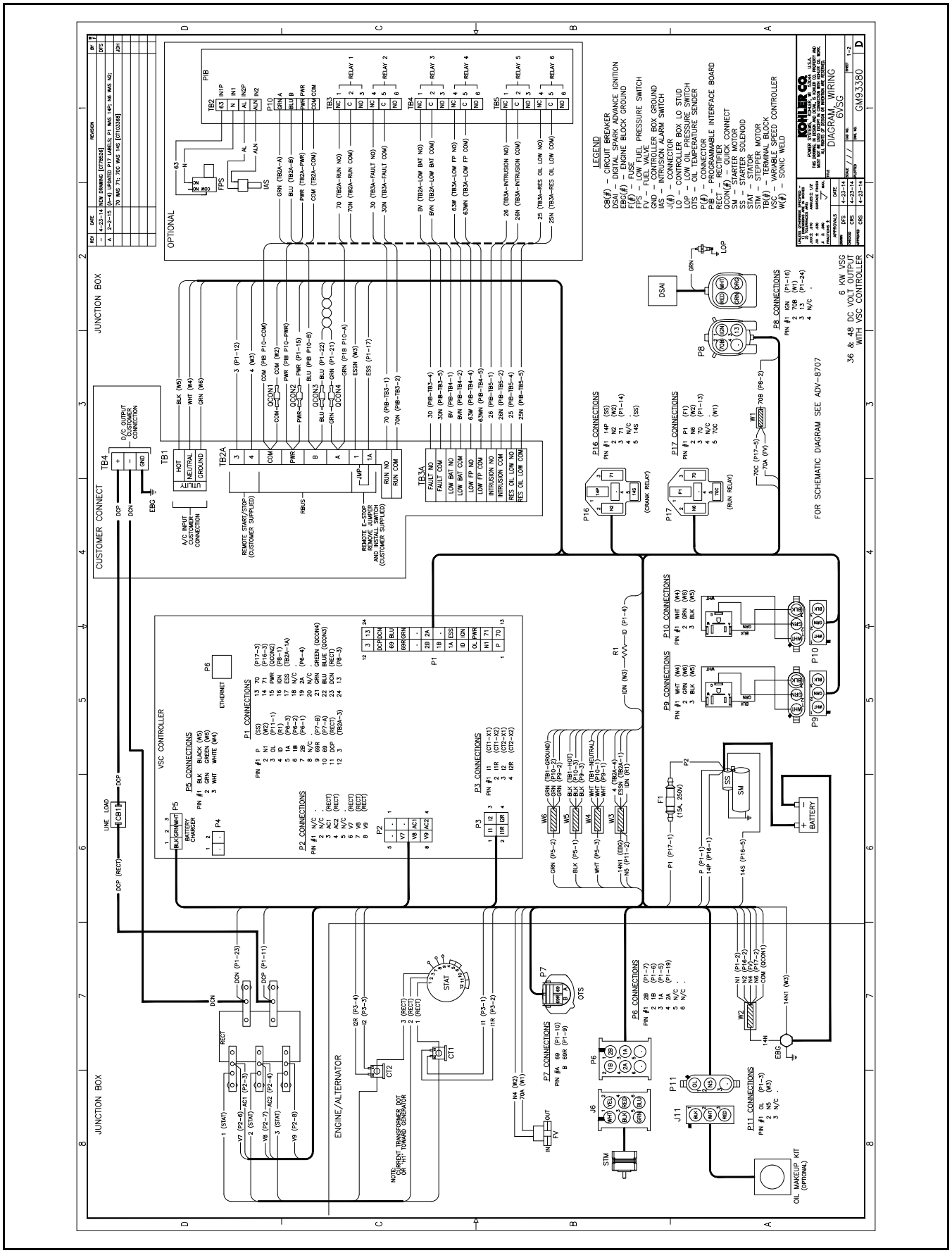


Figure 2-12 Point-to-Point Wiring Diagram, GM93380, Sheet 1

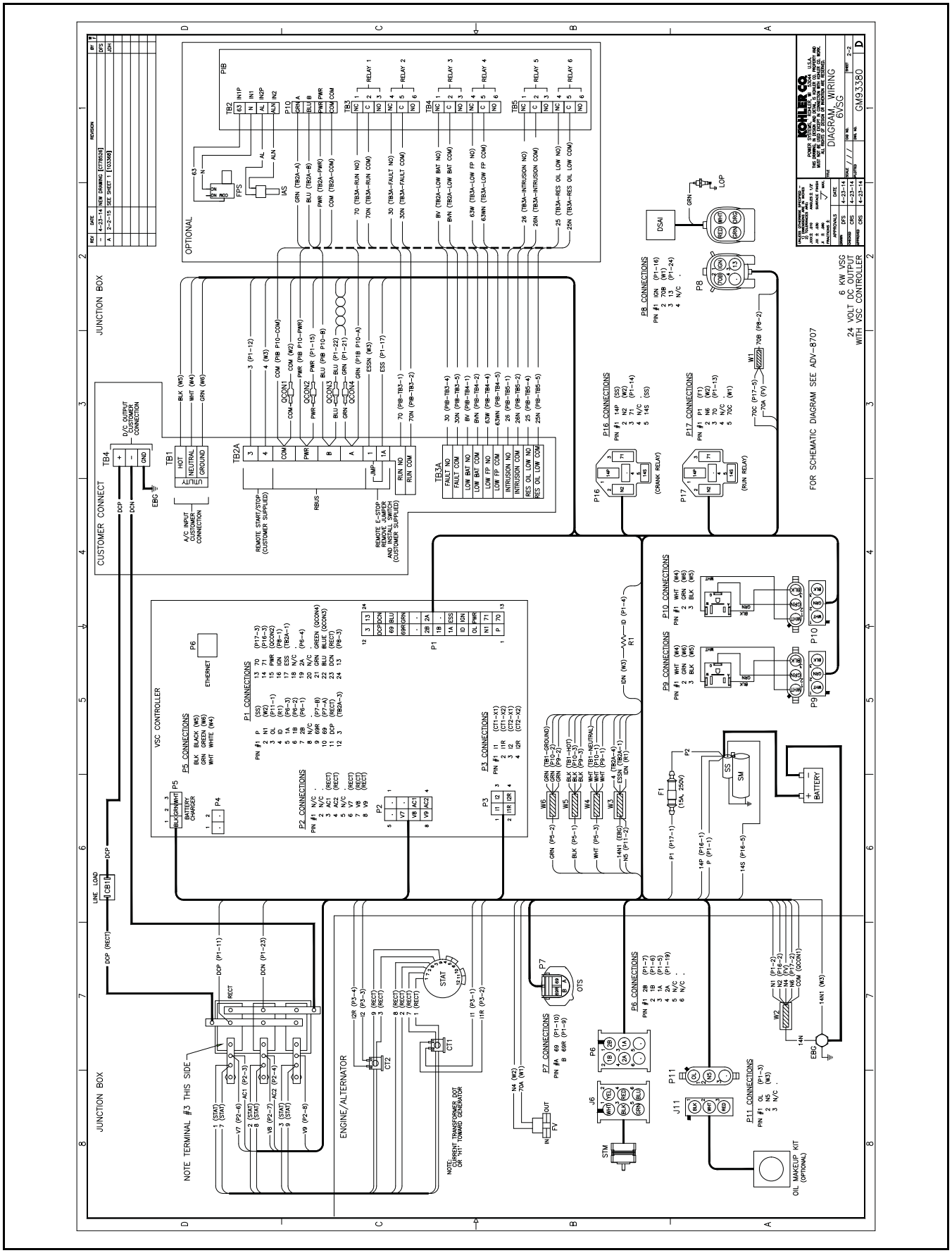


Figure 2-13 Point-to-Point Wiring Diagram, GM93380, Sheet 2

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	mproved 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 pic	ofarad
PF	power factor
ph., Ø	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

Notes

Notes

KOHLER®
Power Systems

KOHLER CO. Kohler, Wisconsin 53044
Phone 920-457-4441, Fax 920-459-1646

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

For the nearest KOHLER authorized installation, service, and sales dealer in the US and Canada:
Call 1-800-544-2444 or visit KOHLERPower.com

TP-6842 7/15b