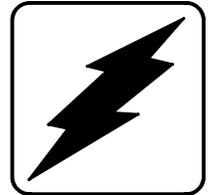


Installation

Residential/Commercial Generator Sets



Models:

12RESM1
12/17/18RESL
12/17/18RESNT
12/18RESHD

Controller:

DC-RET Digital Control



KOHLER[®]
POWER SYSTEMS

TP-6516 4/09d

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 _____

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Notes

Safety Precautions and Instructions

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.**

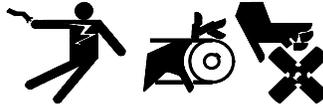
NOTICE

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

<p>Fire. Can cause severe injury or death.</p> <p>Do not smoke or permit flames or sparks near fuels or the fuel system.</p>

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

<p>Carbon monoxide. Can cause severe nausea, fainting, or death.</p> <p>The exhaust system must be leakproof and routinely inspected.</p>

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 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

<p>Explosive fuel vapors. Can cause severe injury or death.</p> <p>Use extreme care when handling, storing, and using fuels.</p>

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.

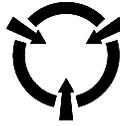
⚠ WARNING



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. Electrocutation 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.

⚠ WARNING



Airborne particles.
Can cause severe injury or blindness.

Wear protective goggles and clothing when using power tools, hand tools, or compressed air.

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.

Introduction

This manual provides installation instructions for 12, 17, and 18 kW residential/commercial generator sets equipped with the Kohler® DC-RET Digital Control. Refer to TP-6517, 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.

See Figure 1 or Figure 2 for generator set component locations.

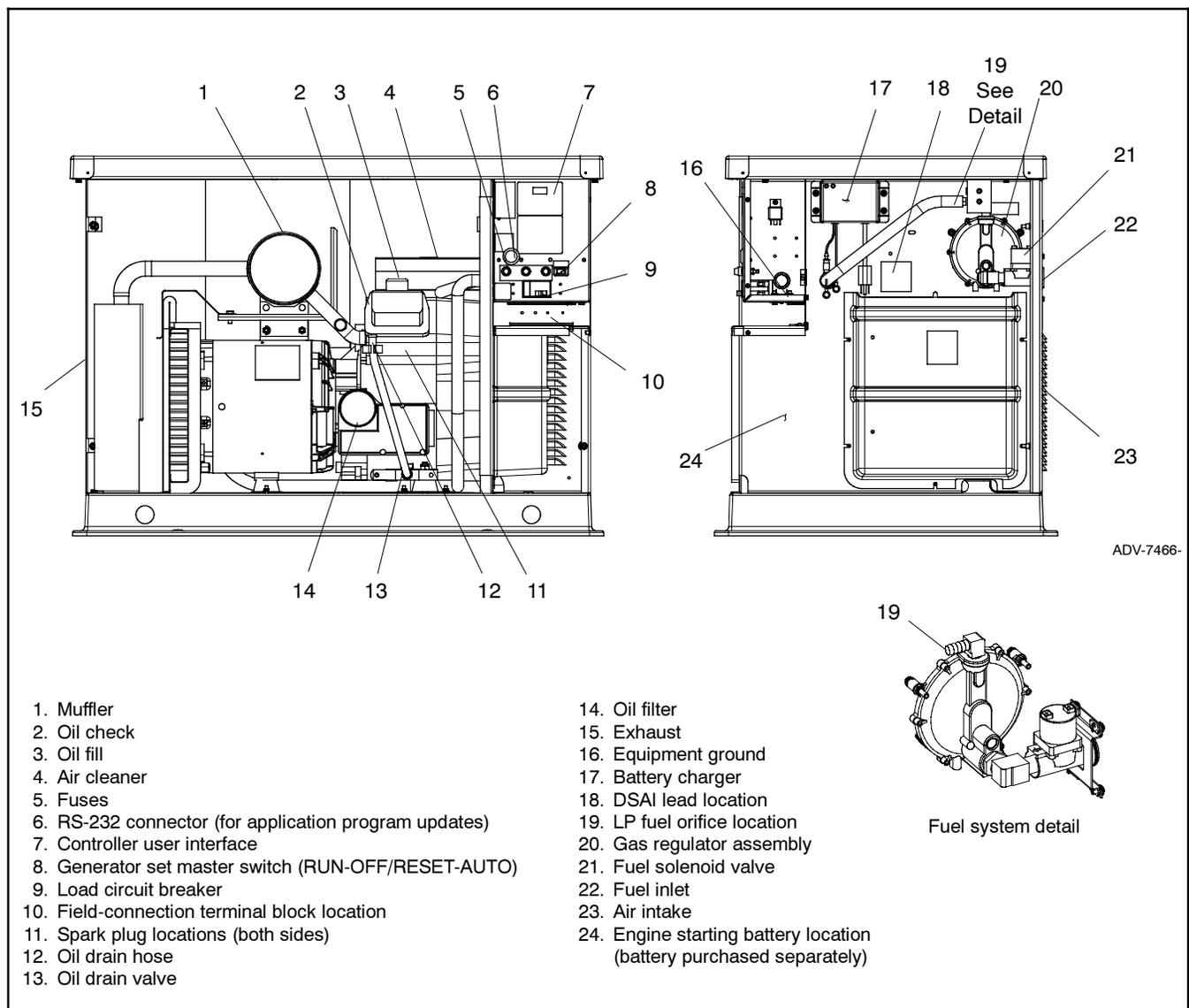


Figure 1 Generator Set Component Locations, 12 kW Models

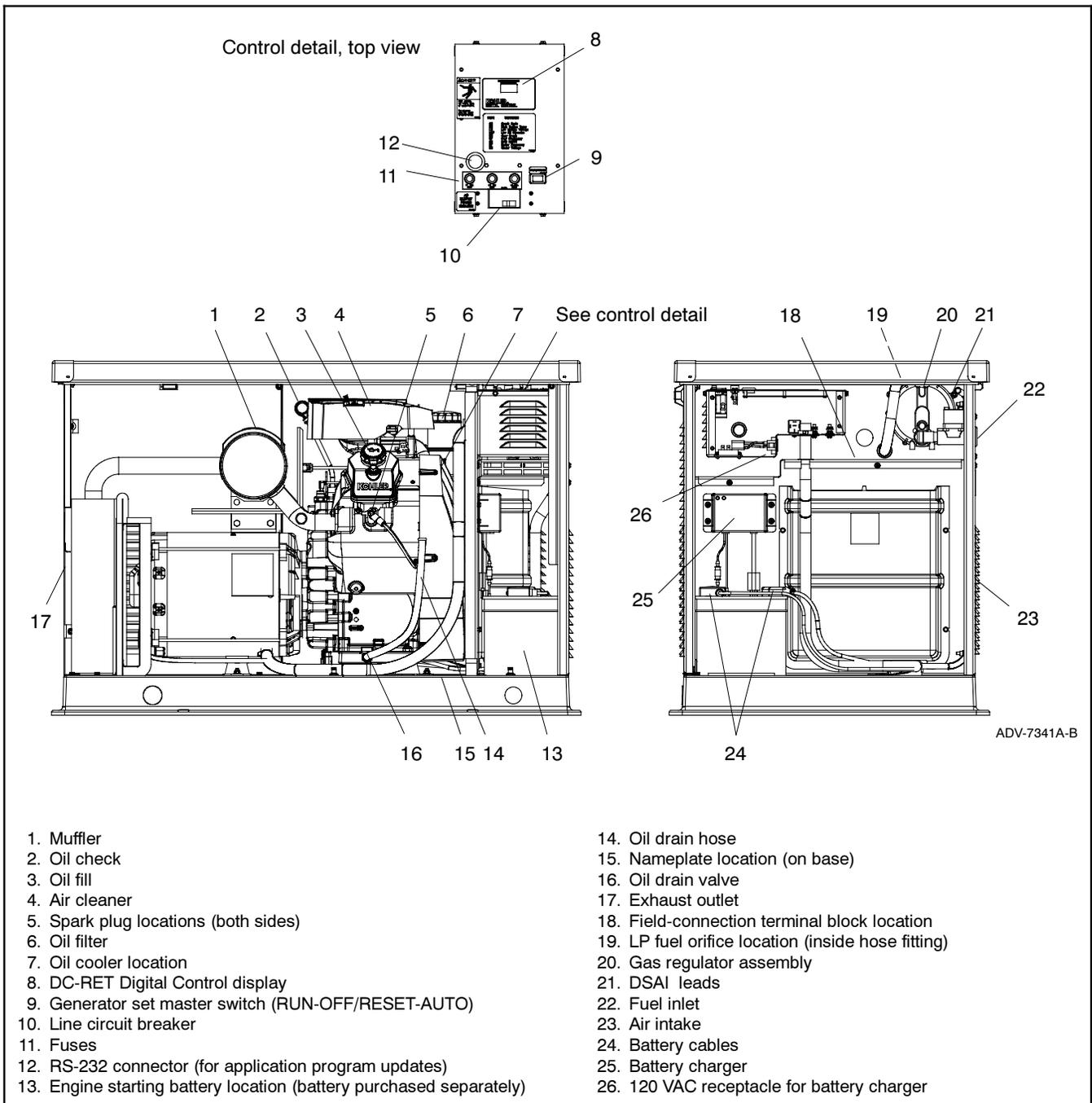


Figure 2 Generator Set Component Locations, 17/18 kW Models

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

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

Headquarters Europe, Middle East, Africa (EMEA)

Kohler Power Systems
3 rue de Brennus
93200 Saint Denis
France
Phone: (33) 1 49 178300
Fax: (33) 1 49 178301

Asia Pacific

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

China

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

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

India, Bangladesh, Sri Lanka

India Regional Office
Bangalore, India
Phone: (91) 80 3366208
(91) 80 3366231
Fax: (91) 80 3315972

Japan, Korea

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

Notes

1.1 General

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.

Use the generator set and transfer switch dimension drawings and wiring diagrams for installation.

1.2 Lifting

⚠ WARNING

<p>Unbalanced weight. Improper lifting can cause severe injury or death and equipment damage.</p> <p>Do not use lifting eyes. Lift the generator set using lifting bars inserted through the lifting holes on the skid.</p>

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 Figure 1-2 or Figure 1-4 for lifting hole locations.

Model	Weight, kg (lb.)
12 kW	186 (410)
17/18 kW	227 (500)

Figure 1-1 Approximate Weights

1.3 Generator Set Inspection

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

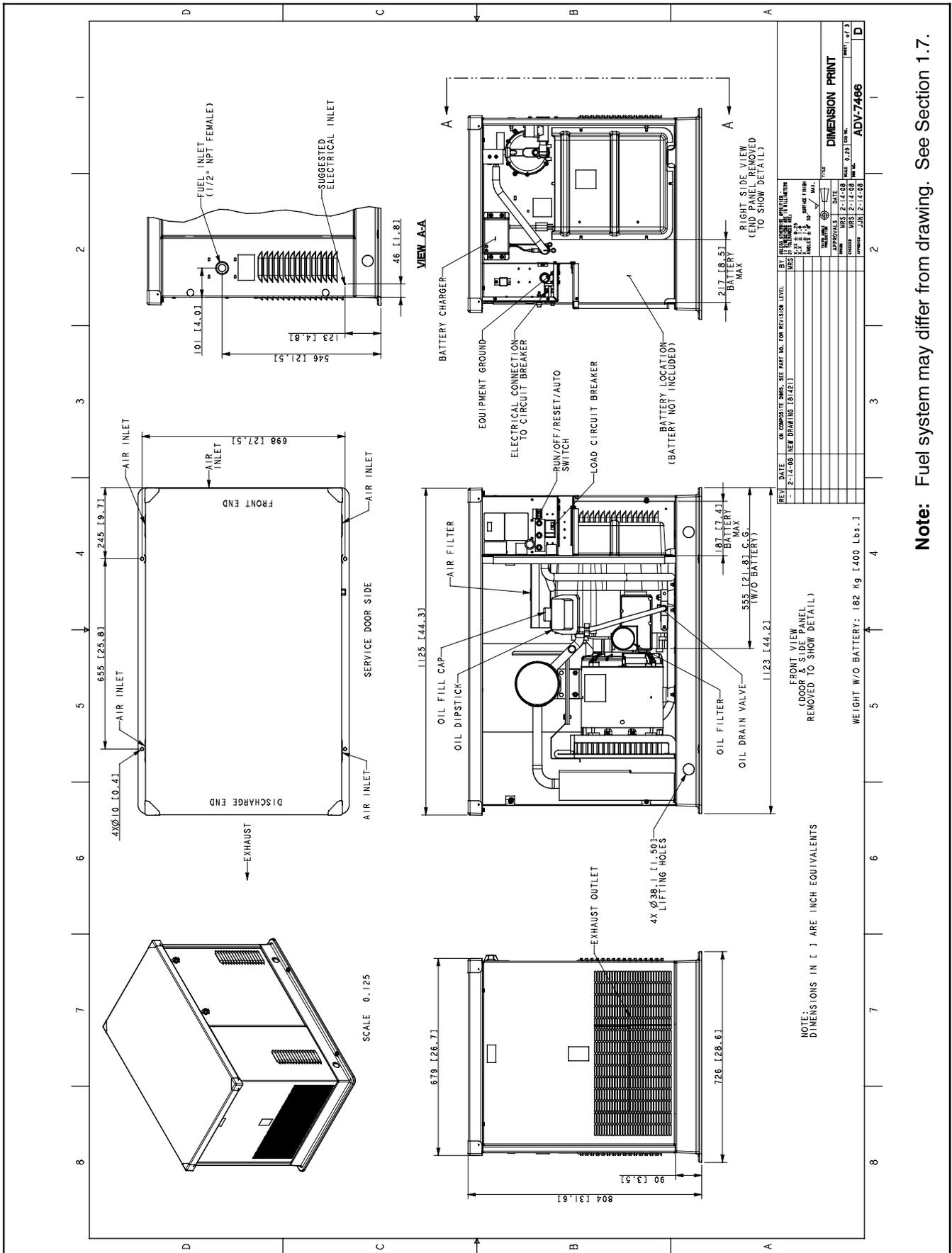
1. Inspect the generator set for loose or damaged parts or wires. Repair or tighten any loose parts before installation.
2. Check the engine oil. Fill, if necessary, with the recommended viscosity and grade of oil. Use synthetic oil, API (American Petroleum Institute) Service Class SG or higher. See TP-6517, Operation Manual, for additional information.

1.4 Location and Mounting

See Figure 1-2 (12 kW) or Figure 1-4 (17/18 kW) 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 Figure 1-3 or Figure 1-5. 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.

The generator set is shipped on a plastic mounting pad. Prepare a flat, level mounting area covered with a weed barrier and gravel as shown in Figure 1-5. Set the plastic mounting pad directly on the gravel. Do not install the mounting pad directly on grass.



Note: Fuel system may differ from drawing. See Section 1.7.

Figure 1-2 Generator Set Mounting Details and Dimensions, 12 kW Models, ADV-7466, Sheet 1

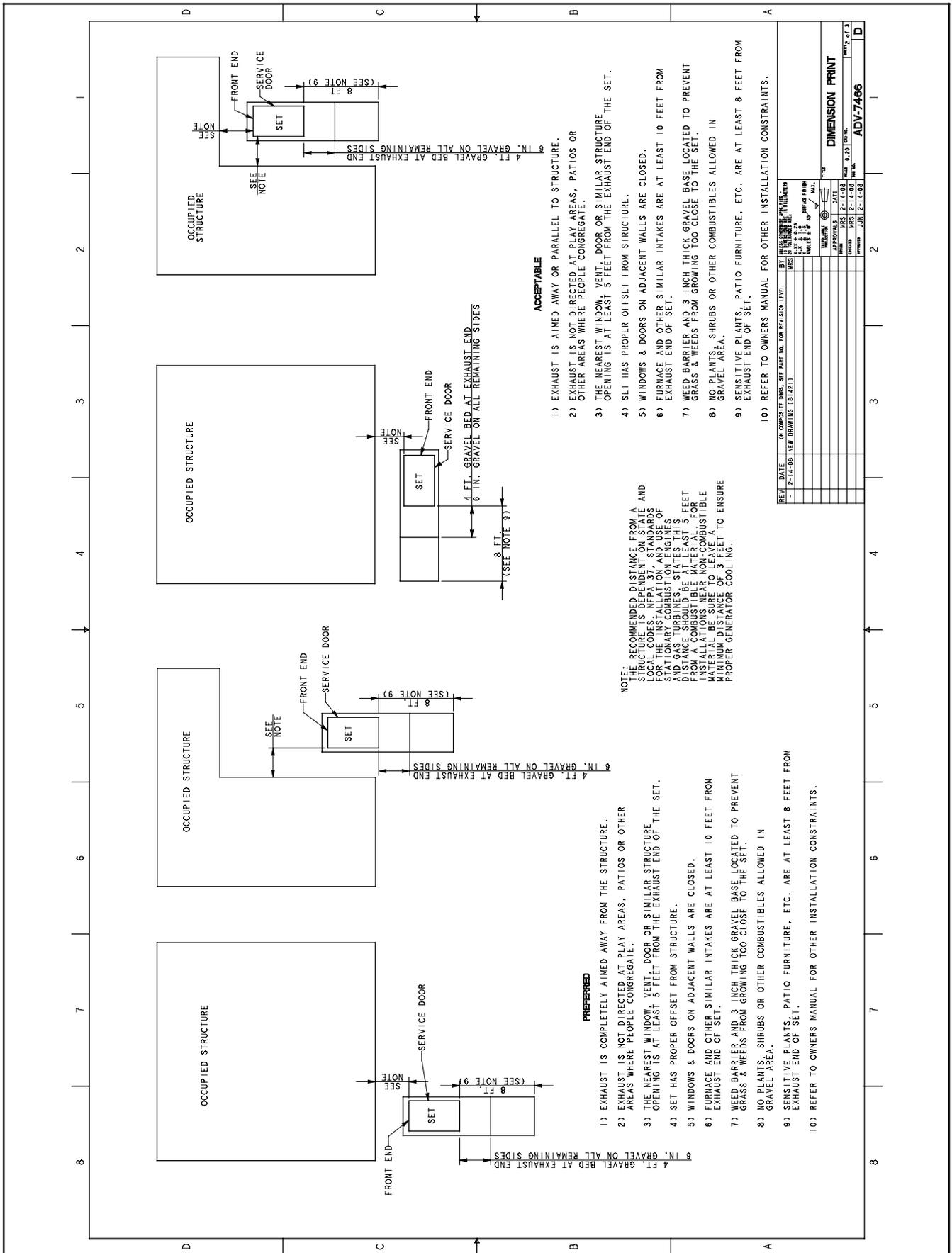


Figure 1-3 Generator Set Clearances, 12 kW Models, ADV-7466, Sheet 2

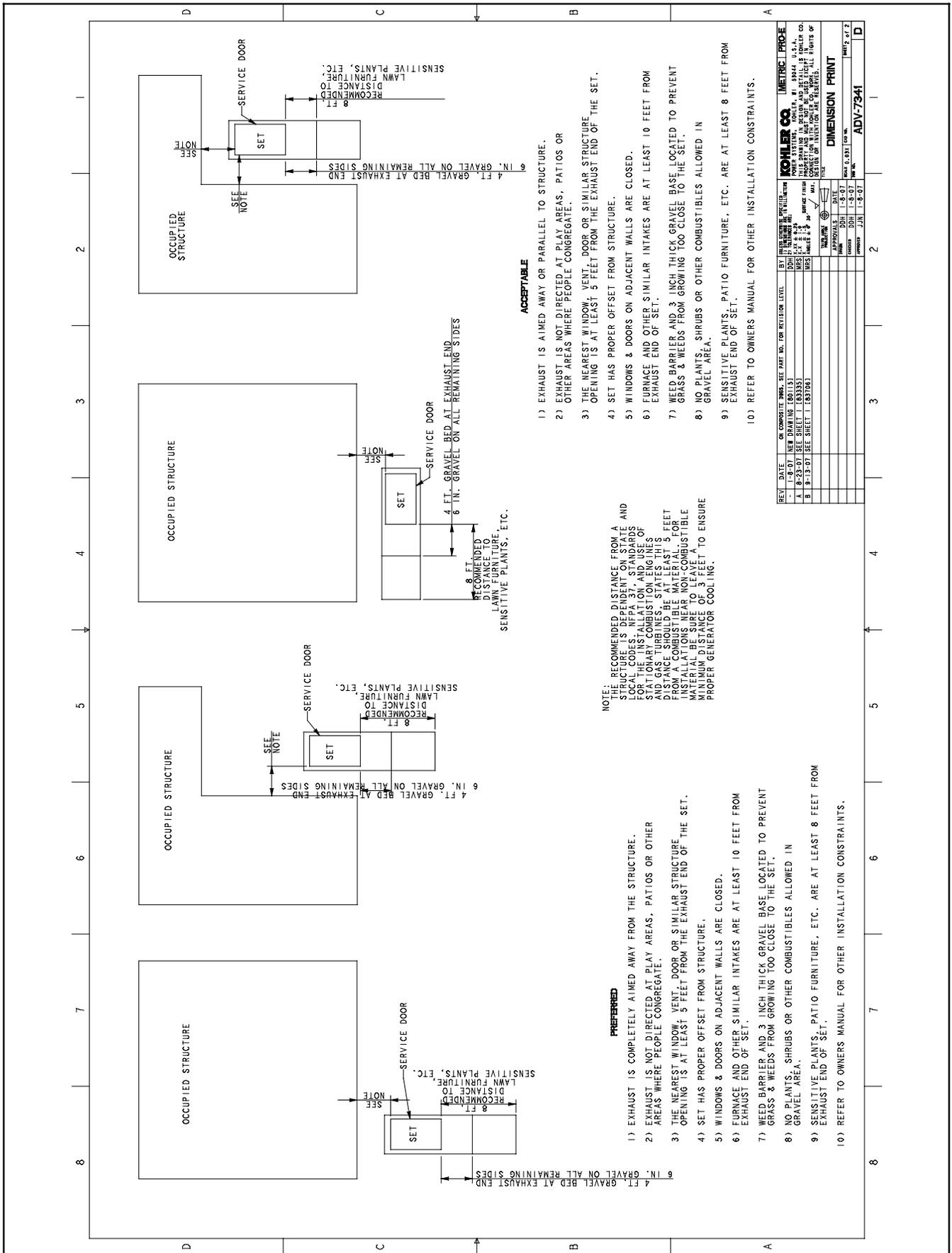


Figure 1-5 Generator Set Clearances, 17/18 kW Models, ADV-7341-B, Sheet 2

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 1-6 gives the exhaust flow and 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 1-5.

Exhaust System	60 Hz
Exhaust flow at rated kW, m ³ /min. (cfm)	
12 kW	3.8 (135)
17/18 kW	5.3 (187)
Exhaust gas temperature exiting the enclosure at rated kW, °C (°F)	216 (420)

Figure 1-6 Exhaust Flow and Temperature

1.4.2 Air Requirements

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 1-7 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.

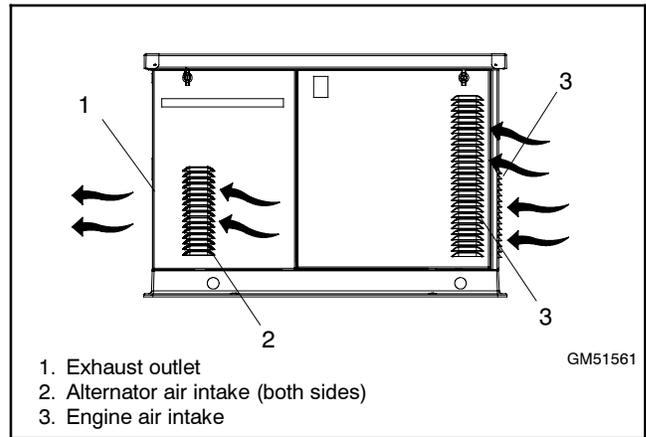


Figure 1-7 Cooling Air Intake and Exhaust

Model	Air Requirements, m ³ /min. (cfm)			
	Hz	Cooling Air	Combustion Air	Total Inlet Air
12 kW	60	26.9 (950)	1.1 (39.2)	28.0 (990)
	50	22.4 (790)	0.9 (32.6)	23.4 (826)
17/18 kW	60	28.0 (989)	1.62 (57.3)	29.6 (1045)
	50	22.6 (798)	1.42 (50.1)	24.0 (848)

Figure 1-8 Air Requirements

1.5 Power Supply

Power must be supplied from a source that is GFCI protected to the generator set location for the battery charger and the optional carburetor heater. See Section 1.8. Connect power from a circuit on the essential loads panel to the 120-VAC receptacles. Figure 1-9 lists the power requirements for the battery charger and accessories.

Equipment	Power Requirement, Max.		
	Watts	Amps	Volts
Battery charger	192	1.6	120
Carburetor heater:			
12 kW	38	0.32	
17/18 kW	40	0.34	
Battery heater	110	0.92	

Figure 1-9 Power Requirements

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 1-10 lists the recommended fuel ratings and other fuel supply information for natural gas and LP vapor fuels.

Fuel types	Natural Gas	LP Vapor
Fuel supply inlet	1/2 NPT	
Fuel supply pressure, kPa (in. H ₂ O), 12 kW	1.3-2.7 (5-11)	1.7-2.7 (7-11)
Fuel supply pressure, kPa (in. H ₂ O), 17/18 kW	1.7-2.7 (7-11)	
Fuel flow rate, Btu/hr., 12 kW	193000	203000
Fuel flow rate, Btu/hr., 17/18 kW	242000	280000
Nominal Fuel Rating, Btu/ft³		
Natural gas	1000	
LP vapor	2500	

Figure 1-10 Fuel Supply

Verify that the output pressure from the primary gas utility (or LP tank) pressure regulator is within the range shown in Figure 1-10 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 1-11 or Figure 1-12 for fuel consumption. Contact the fuel supplier for flow rate information or a gas meter upgrade.

See Figure 1-2 or Figure 1-4 for 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.

Fuel Consumption at % Rated Load	
Natural Gas, m³/hr. (cfh)	
100%	5.9 (209)
75%	4.8 (168)
50%	3.6 (127)
25%	2.4 (85)
LP Vapor, m³/hr. (cfh)	
100%	3.1 (108)
75%	2.5 (87)
50%	1.9 (65)
25%	1.2 (44)
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 1-11 Fuel Consumption, 12 kW Models

Fuel Consumption at % Rated Load	
Natural Gas, m³/hr. (cfh)	
100%	6.9 (242)
75%	5.8 (204)
50%	4.4 (155)
25%	3.4 (120)
LP Vapor, m³/hr. (cfh)	
100%	3.2 (112)
75%	2.7 (96)
50%	2.1 (74)
25%	1.6 (57)
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 1-12 Fuel Consumption, 17/18 kW Models

1.6.2 Fuel Pipe Size

Ensure that the natural gas pipe size and length meet the specifications in Figure 1-13 or Figure 1-14. 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 1-13 or Figure 1-14 to find the required pipe size.

Contact the local LP provider for LP installation information.

Maximum Pipe Length, m (ft.)	Pipe Size, in. NPT
9.2 (30)	3/4
30.0 (100)	1
68.6 (225)	1 1/4

Figure 1-13 12 kW Models, Fuel Pipe Size, Natural Gas

Minimum Gas Pipe Size Recommendation, in. NPT		
Pipe Length, m (ft.)	Natural Gas (242,000 Btu/hr.)	LP Vapor (280,000 Btu/hr.)
8 (25)	1	3/4
15 (50)	1	1
30 (100)	1 1/4	1
46 (150)	1 1/4	1 1/4
61 (200)	1 1/4	1 1/4

Figure 1-14 17/18 kW Models, Fuel Pipe Size, Natural Gas

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 authorized distributor/dealer can convert the 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.

1.7.1 Fuel Conversion

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 line. 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

1. Place the generator set master switch in the OFF position.
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.

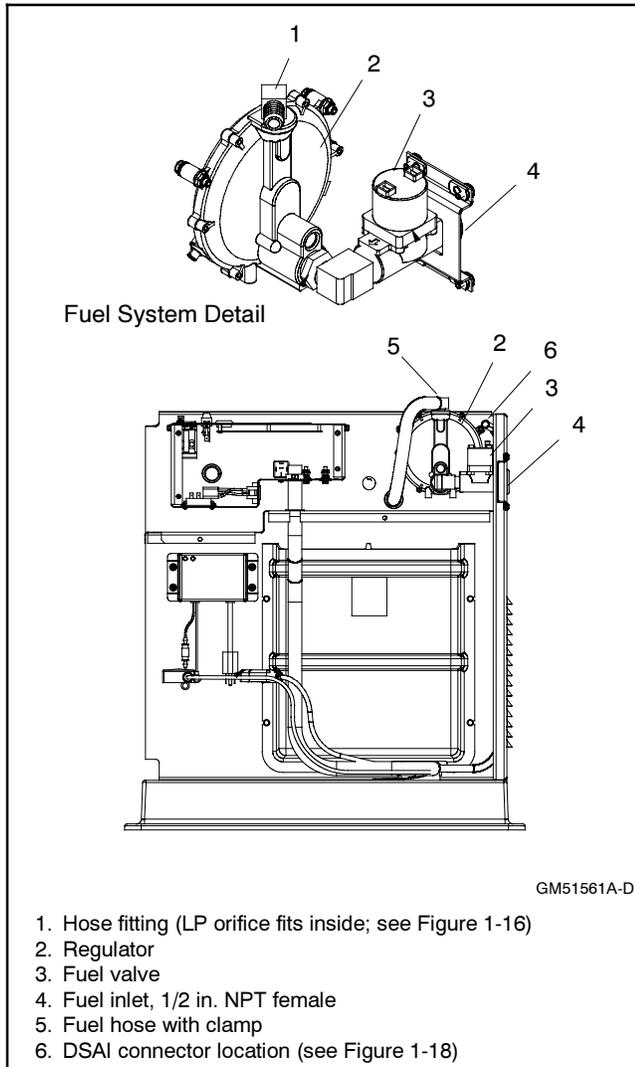


Figure 1-15 Fuel System Components, Air Inlet Side, 17/18 kW Shown

6. Place the orifice into the hose fitting. See Figure 1-16.

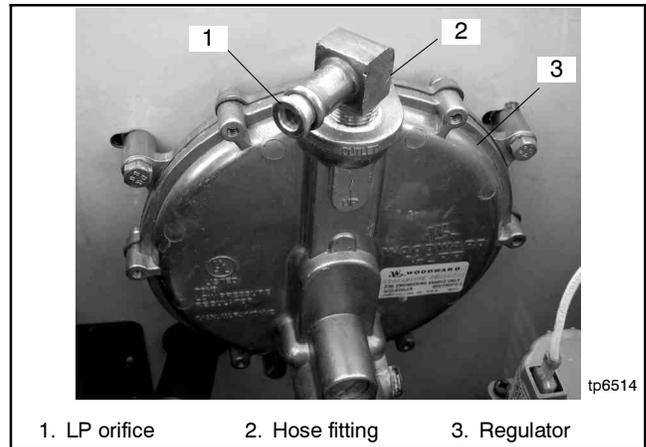


Figure 1-16 LP Fuel Orifice Installation

7. Slide the hose onto the hose fitting and secure it with the clamp.
8. Disconnect the digital spark-advance module (DSAI) leads for LP. (Connect the leads for natural gas.) See Figure 1-17 and Figure 1-18.

Fuel	DSAI Leads
Natural Gas	Connect
LP	Disconnect

Figure 1-17 DSAI Connection

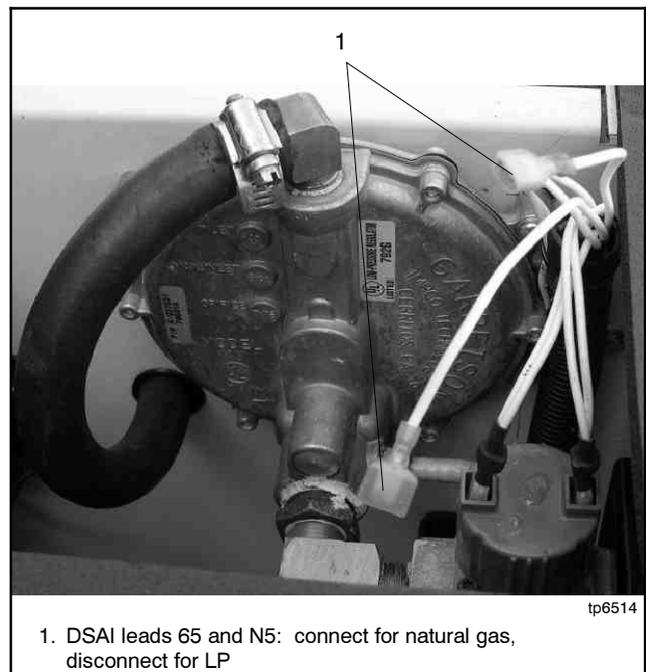
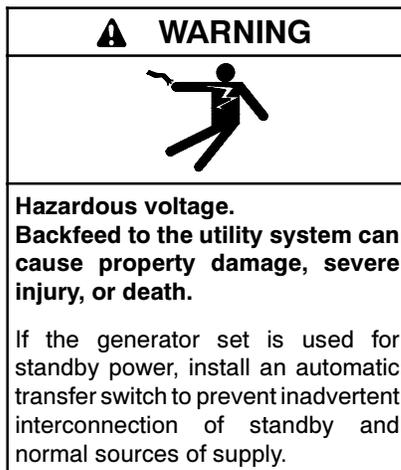


Figure 1-18 Digital Spark Advance (DSAI) Leads (located in generator set air intake area)

9. Connect and turn on the new fuel supply.
10. Check that the generator set master switch is in the OFF position.
11. Reconnect the generator set engine starting battery leads, negative (-) lead last.
12. Reconnect power to the battery charger.
13. Start the generator set by moving the generator set master switch to the RUN position.
14. Check for leaks using a gas leak detector.
15. Move the generator set master switch to the OFF/RESET position to shut down the generator set.

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

1.8 Electrical Connections



Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocutation 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. Verify that the electrical installation complies with the National Electrical Code (NEC) and all applicable local codes. Ground the generator set from the GRD terminal inside the controller compartment according to applicable codes.

1.8.1 AC Connections

The generator set is equipped with a field-connection terminal block located in the air inlet area near the junction box. See Figure 1-19 and Figure 1-20. Also see Section 2, Wiring Diagrams.

Refer to the transfer switch specifications and Figure 1-20 for the acceptable cable sizes. 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.

The electrical installation must comply with the National Electrical Code (NEC) and all applicable local codes.

Connection Procedure

See Figure 1-20. Leads have been factory-installed from the junction box to the terminal block for easier field wiring. Refer to the decal near the terminal block for connections.

1. Connect the leads from the transfer switch emergency source lugs to the L1 and L2 connections on the generator set terminal block.
2. 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 1.8.3, Grounding.
3. The terminal block kit includes 120VAC receptacles for the battery charger and optional carburetor heater. Connect utility power to the terminal block as shown. Connect to a circuit that is supplied by the generator set if utility power is lost.

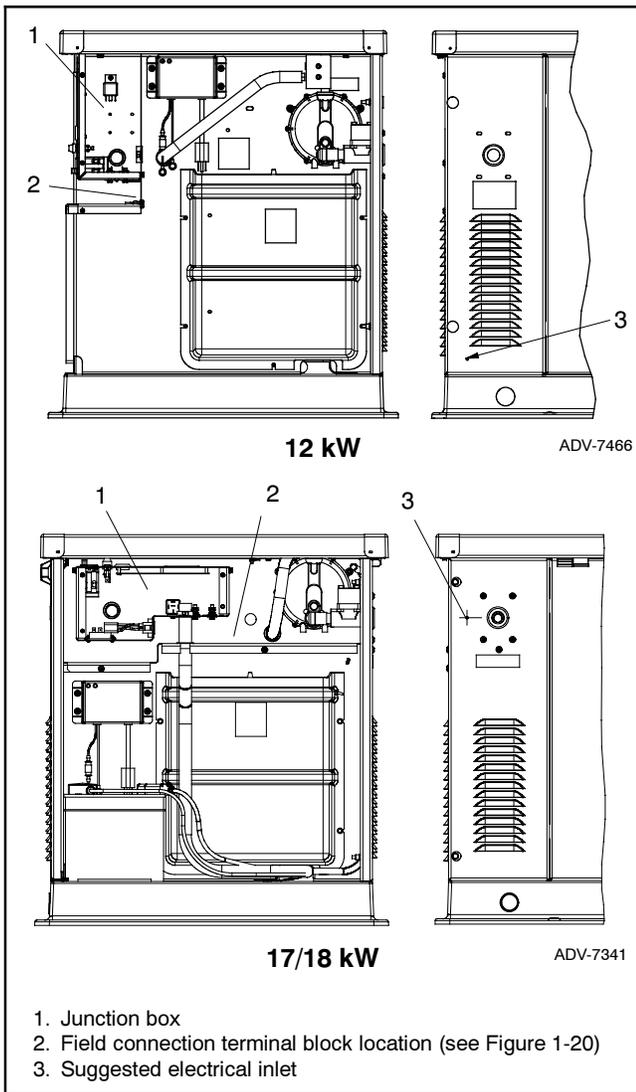


Figure 1-19 Field Wiring

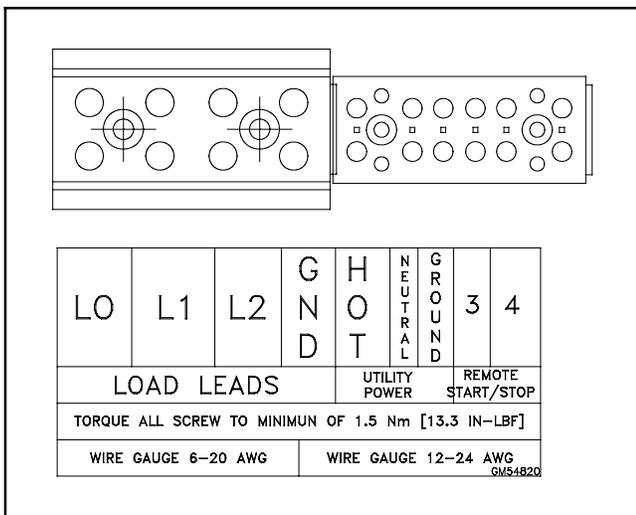


Figure 1-20 Field-Connection Terminal Block

1.8.2 Remote Start Connection

Connect engine start leads from terminals 3 and 4 to the automatic transfer switch's engine start terminals or to an optional remote start/stop switch. Route the engine start leads through separate conduit from the AC power and load leads.

1.8.3 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.

Kohler generator sets are shipped with the generator neutral attached to the generator in the junction box. 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 2002 Section 250.20 is one example that has a very good explanation of the neutral grounding requirements for generators.

1.8.4 Battery Charger

A 6-amp 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.

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 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 battery with a minimum rating of 525 cold cranking amps at 0°F. The generator set uses a negative ground with a 12-volt engine electrical system. See Figure 1-21 for battery connections. Make sure that the battery is correctly connected and the terminals are tight.

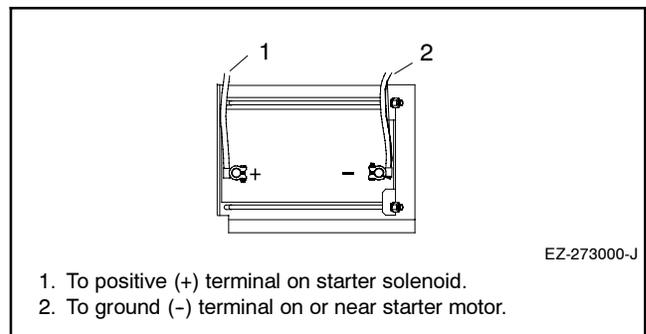


Figure 1-21 12-Volt Engine Electrical System Single Starter Motor Typical Battery Connection

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

Figure 1-22 shows the location of the engine starting battery. Standard battery cables provide easy connection to the battery. Use the following procedure to install and connect the battery.

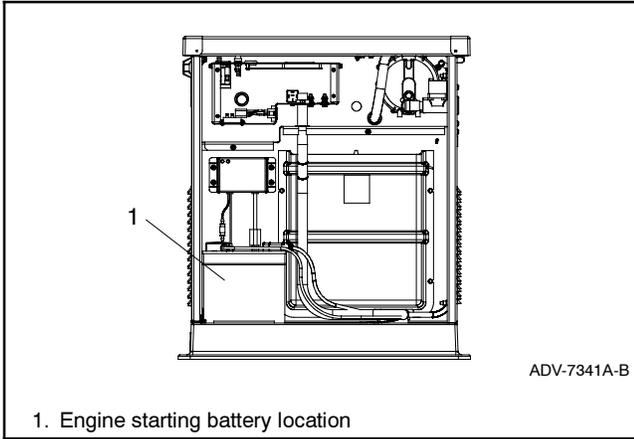


Figure 1-22 Battery Location, Air Intake End

Battery Installation Procedure

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

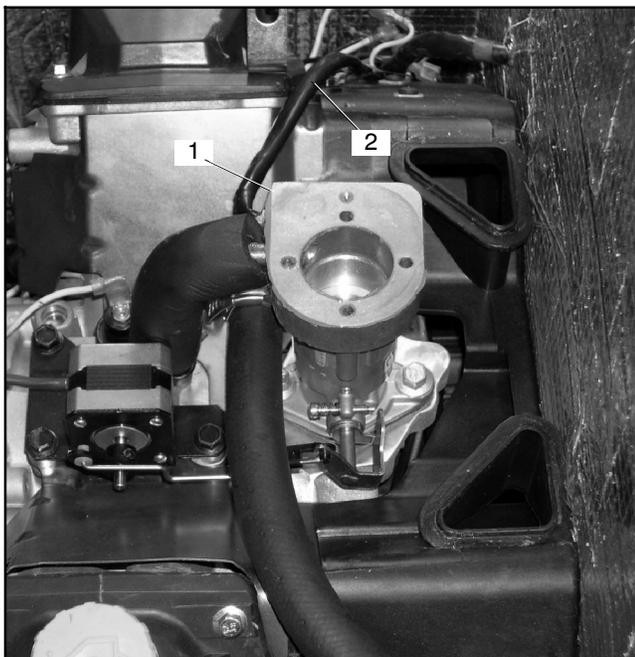
Refer to the generator set Operation Manual and the battery manufacturer's instructions for battery maintenance instructions.

1.10 Carburetor Heater (optional)

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.

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). See Figure 1-23 through Figure 1-26.

The heater thermostat is installed in the cord. Figure 1-26 shows the location of the thermostat on the power cord.



tp6195

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

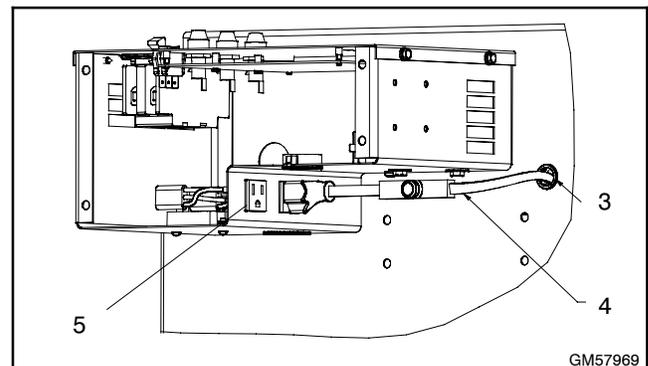
Figure 1-23 Carburetor Heater Location, 12 kW

The heater requires a continuous source of 120 VAC power. The heater power cord and thermostat are located in the generator set housing air intake area/

battery compartment. See Figure 1-22 and Figure 1-24. Plug the carburetor heater into an outlet that supplies continuous 120 VAC power.

Note: Do not place the heater thermostat inside the generator set engine compartment. The thermostat must be exposed to the ambient air. Thermostat will shut off power to the heater when ambient temperature reaches approximately 16°C (60°F).

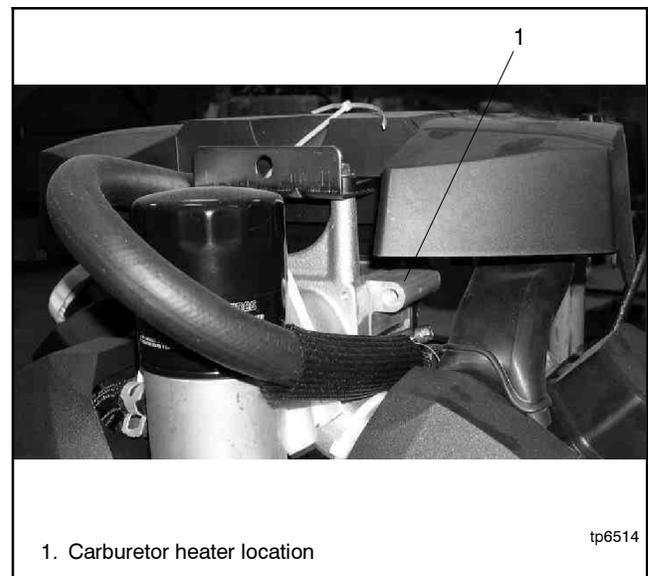
Figure 1-25 shows the location of the carburetor heater on the 17/18 kW generator set engine for reference. (The engine has been removed from the generator set in this photo for a clear view.)



GM57969

1. Thermostat
2. Heater
3. Bulkhead opening for carburetor heater access
4. Carburetor heater cord with thermostat
5. 120 VAC receptacles for carburetor heater and battery charger

Figure 1-24 Carburetor Heater, 17/18 kW



tp6514

1. Carburetor heater location

Figure 1-25 Carburetor Heater Location, 17/18 kW

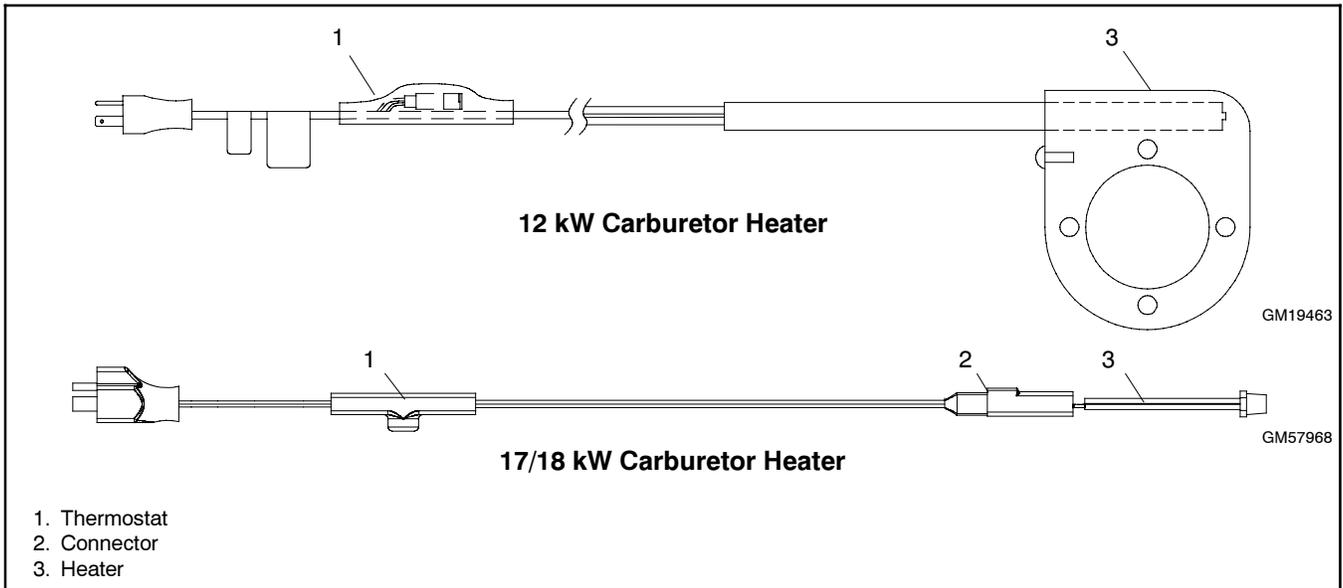


Figure 1-26 Carburetor Heaters

1.11 Prestart Installation Check

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

Prestart Checklist

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

Air Inlets. Check for clean and unobstructed air inlets.

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

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 Startup Notification

Complete the startup and installation checklists supplied with the startup notification form. Complete and sign the startup notification form and return copies to Kohler Co. and the distributor/dealer as instructed on the form.

Standby systems not registered within 60 days of startup are automatically registered using the manufacturer's ship date as the startup date.

Notes

Section 2 Wiring Diagrams

Figure 2-1 lists the wiring diagram drawing numbers and drawing references.

Wiring Diagram Description	Drawing Number	Reference	Page
Schematic Diagram, 12 kW Models	ADV-7351	Figure 2-2	30
Point-to-Point Wiring Diagram, 12 kW Models	GM52471	Figure 2-3	31
Schematic Diagram, 17/18 kW Models	ADV-7353	Figure 2-4	32
Point-to-Point Wiring Diagram, 17/18 kW Models	GM52541	Figure 2-5	33

Figure 2-1 Wiring Diagrams and Schematics

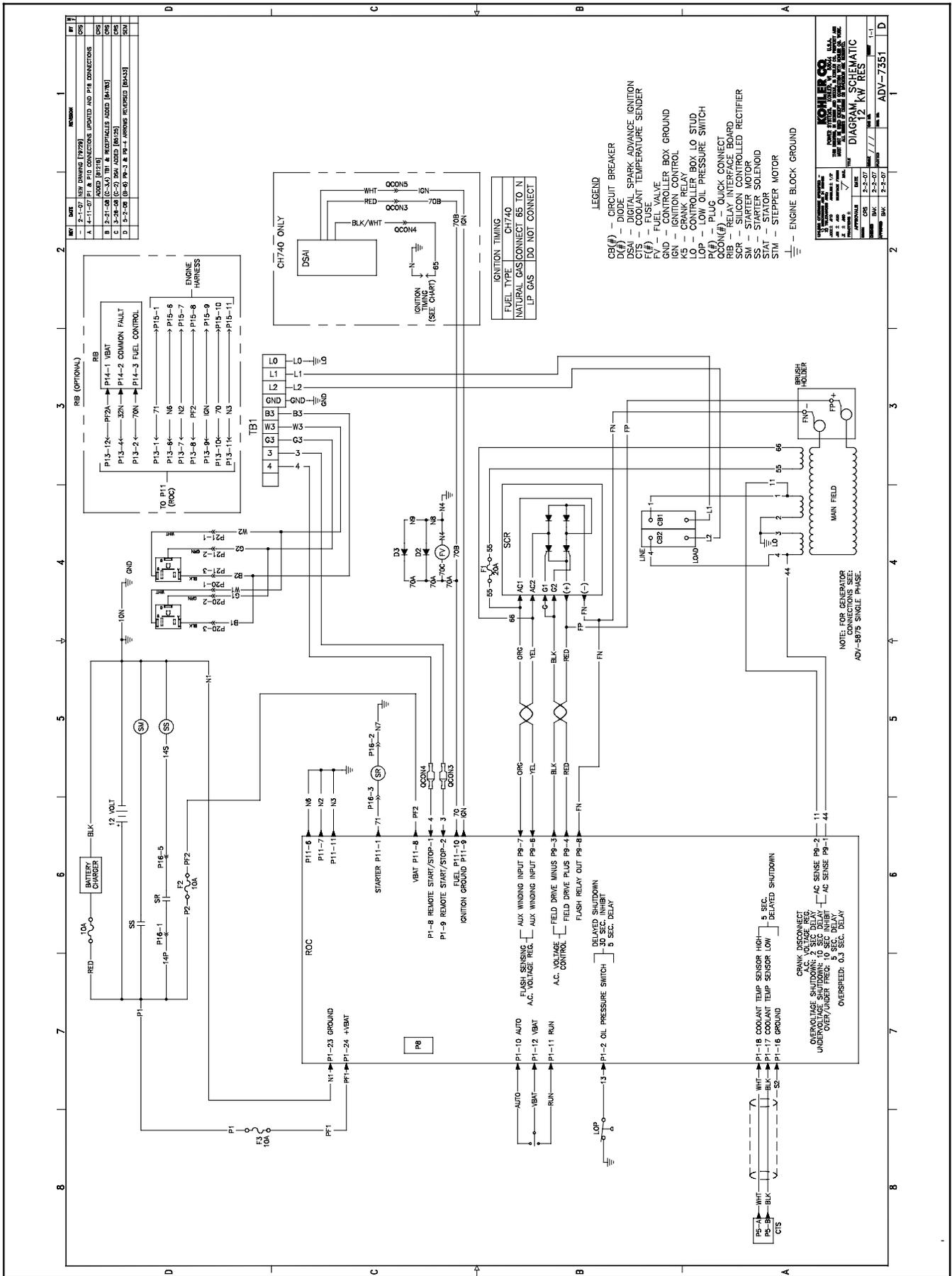


Figure 2-2 Schematic Diagram, 12 kW Models, ADV-7351

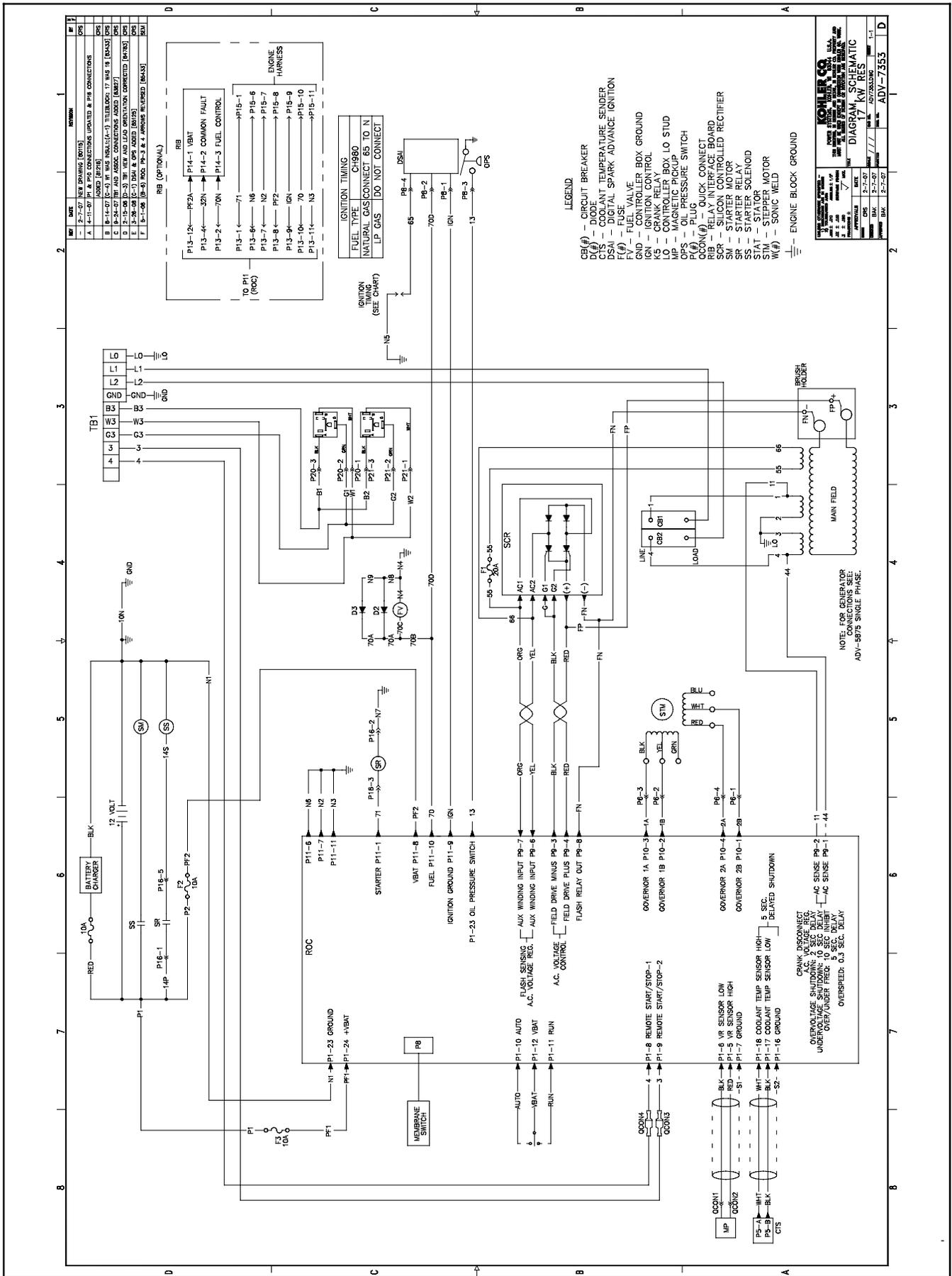


Figure 2-4 Schematic Diagram, Single Phase, 17/18 kW Models, ADV-7353

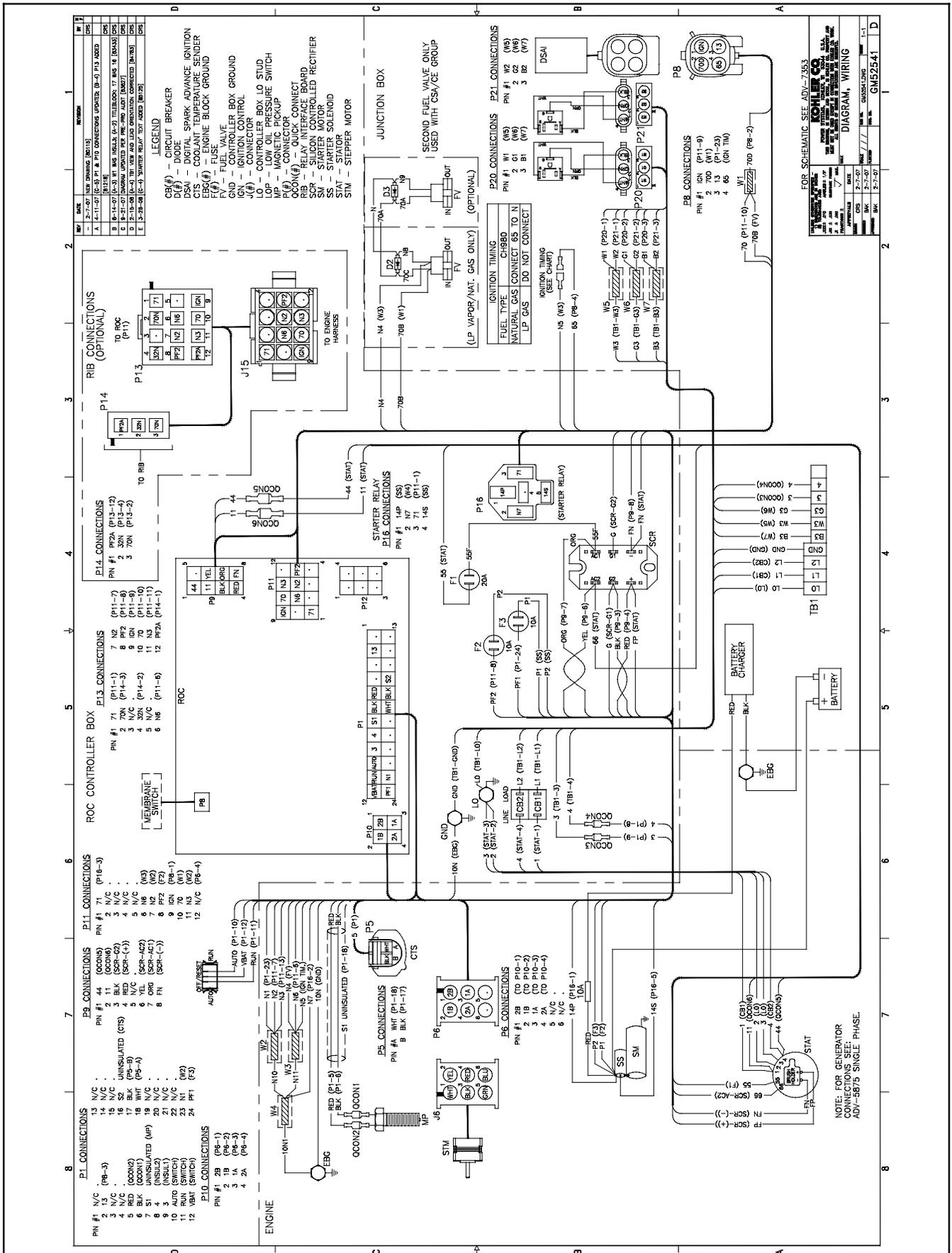


Figure 2-5 Point-to-Point Wiring Diagram, Single Phase, 17/18 kW Models, GM52541

Notes

Appendix A Abbreviations

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

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

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

Notes

Notes

TP-6516 4/09d

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