INSTALLATION INSTRUCTIONS

Original Issue Date: **2/06**
Model: **12RESL or 12RESM1 Power System Package**
Market: **Residential/Commercial**
Subject: **Prewire Kit GM47160-KA1**

Introduction

The Residential Power System package contains the generator set, transfer switch with load panel, prewire kit, and flexible fuel line. Obtain the items listed under Installer-Supplied Items before starting the installation procedure. Have the generator set installed by a trained, authorized service technician or licensed electrician.

Note: These instructions outline one procedure for installing the generator set and transfer switch. Local codes may require different procedures. Install the equipment in compliance with the National Electrical Code (NEC) and local codes.

Read and follow the safety precautions in these instructions and observe the decals on the equipment. Read the entire installation procedure and compare the parts with the package components and customer-supplied items listed in this publication before beginning installation. Perform the steps in the order shown.

This document does not replace the generator set and transfer switch Operation and Installation Manuals. Refer to the Operation and Installation manuals provided with the equipment for complete installation, operation, and maintenance instructions. Perform the regular maintenance procedures outlined in those documents and exercise the generator set regularly to keep the equipment in good operating condition.

Power System Package Components

- Model 12RESL or 12RESM1 generator set with polymer base
- Model RDT 100-Amp Automatic Transfer Switch with 12-circuit load panel
- Prewire kit GM47160-KA1
- Flexible fuel line GM31054-KA1

Installer-Supplied Items

- A 12-volt battery with a minimum rating of 525 cold cranking amps (CCA) at 0°F. Battery kit GM48808-KP1 is recommended.
- Gravel or crushed stone
- Landscape fabric
- 60 amp double-pole circuit breaker, compatible with the building's main electrical distribution panel
- Circuit breakers for essential load circuits (if existing breakers cannot be moved to the new load panel)
- External disconnect switch (if required by code)
- Fasteners to mount transfer switch and load panel
- Cables and conduit
- Fuel supply line with shut-off valve and pipe sealant (provided by fuel supplier)
- Building permit

Tools Required

- Multimeter (for measuring voltage and current)
- Frequency meter (may be part of multimeter)
- Torque wrench
- Wrenches
- Screwdrivers
- Socket wrenches or nut drivers
- Pliers
- Safety glasses or goggles
- Drill with bits and hole saw
- Panel punches (optional)

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.

Safety Precautions

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

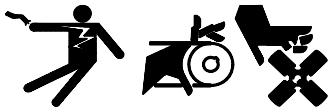
NOTICE

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

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

Accidental Starting

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

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

Battery

⚠ WARNING

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

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

⚠ WARNING

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

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

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

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

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

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

Engine Backfire/Flash Fire

⚠ WARNING

Fire.
Can cause severe injury or death.

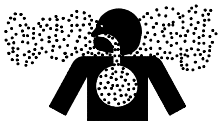
Do not smoke or permit flames or sparks near fuels or the fuel system.

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

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 symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. 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.

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.

Hazardous Voltage/ Electrical Shock

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ WARNING

Hazardous voltage. Moving rotor.
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. Open the main circuit breakers of all power sources before servicing the equipment. Configure the installation to electrically ground the generator set, transfer switch, and related equipment and electrical circuits to comply with applicable codes and standards. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

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

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

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

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

Heavy Equipment

⚠ WARNING

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

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

⚠ WARNING

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

Use adequate lifting capacity.
Never leave the transfer switch standing upright unless it is securely bolted in place or stabilized.

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.

Moving Parts

⚠ WARNING

Hazardous voltage. Moving rotor.
Can cause severe injury or death.

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

⚠ WARNING

Airborne particles.
Can cause severe injury or blindness.

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

Notice

NOTICE

Hardware damage. The engine and generator set may use both American Standard and metric hardware. Use the correct size tools to prevent rounding of the bolt heads and nuts.

NOTICE

When replacing hardware, do not substitute with inferior grade hardware. Screws and nuts are available in different hardness ratings. To indicate hardness, American Standard hardware uses a series of markings, and metric hardware uses a numeric system. Check the markings on the bolt heads and nuts for identification.

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.

Installation Procedure

Prepare the site

1. Choose an outdoor location for the generator set. The location must comply with state and local codes while also adhering to the location requirements in the Installation Manual provided with the generator set.

2. Obtain a building permit and contact your local utility companies to mark the locations of underground pipes and cables near the generator set location.

3. Prepare an area for mounting the generator set.

   a. Lay landscape fabric and a 76 mm (3 in.) layer of compacted gravel over a 1.1 m by 1.4 m (3.5 ft. by 4.5 ft.) level area.

   b. Clear all combustible materials, including plants and shrubs, building materials, and lawn furniture, from an area at least 1.5 m (5 ft.) beyond the exhaust end of the generator set.

Install and Ground the Generator Set

4. Place the generator set's polymer base directly on the compacted gravel. For generator sets with high-wind enclosures, refer to the mounting instructions supplied with the unit.

5. Ground the generator set. The grounding method must comply with NEC and local codes. Connect the gounding 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.

Connect the Fuel Supply to the Generator Set

6. The fuel supplier must provide the primary regulator. Have the fuel supplier install rigid gas piping and a manual fuel shut-off valve. See Figure 1. The fuel supply line should line up with the generator set fuel inlet and end about 12 inches away to allow connection using the flexible fuel line provided with the generator set.

   The fuel supply pressure must be within the specifications shown in Figure 2.

Figure 1 Manual Fuel Valve (provided by fuel supplier)

Fuel Supply	
Fuel supply inlet	1/2 NPT
Fuel supply pressure at rated load, kPa (in. H_2O)	
Natural Gas	1.2–2.7 (5–11)
LP	1.7–2.7 (7-11)

Figure 2 Fuel Supply Requirements

7. Apply pipe sealant that is approved for fuel connections to the threaded fuel connections.

8. Use the flexible fuel line provided with the generator set to connect the fuel supply to the fuel inlet connection on the generator set. See Figure 3 for the fuel inlet connection location.

9. Open the manual fuel valves and leak test all fuel connections using soapy water. If a leak is detected, close the fuel valves, disconnect the lines at the location of the leak, clean the fittings, and apply fresh pipe sealant. Reconnect the lines and recheck for leaks.

   Note: Check for fuel leaks again with the generator set running after the system installation is complete. See the Operation Tests.

Transfer Switch Installation

10. Choose an indoor location for the transfer switch. Select the mounting site to comply with electrical code restrictions for the enclosure types. See Figure 4 for a typical installation.

    Note: The transfer switch enclosure is approved for installation indoors.

    The automatic transfer switch must be mounted on a wall or other rigid supporting structure according to local codes. Ensure adequate space to open the doors and service the units.

Figure 3 Fuel Connection

11. Remove the transfer switch enclosure door. Cover or remove the ATS contactor and circuit board to protect them from debris during installation.

12. Use 1/4-inch hardware to vertically mount the automatic transfer switch through the four holes on the top and bottom of the enclosure. Place washers behind the mounting holes to shim the enclosure to a plumb condition.

    Note: Do not manually operate the transfer switch with power connected.

13. Check the transfer switch manual operation.

    Move the handle up to place the transfer switch in the Normal Source position, or down to place the contactor in the Emergency Source position. Put the transfer switch in the Normal Source position for normal operation.

    Note: Do not place the transfer switch into service if the contactor does not manually operate smoothly without binding; contact an authorized service distributor to service the contactor.

Figure 4 Mounting the Transfer Switch

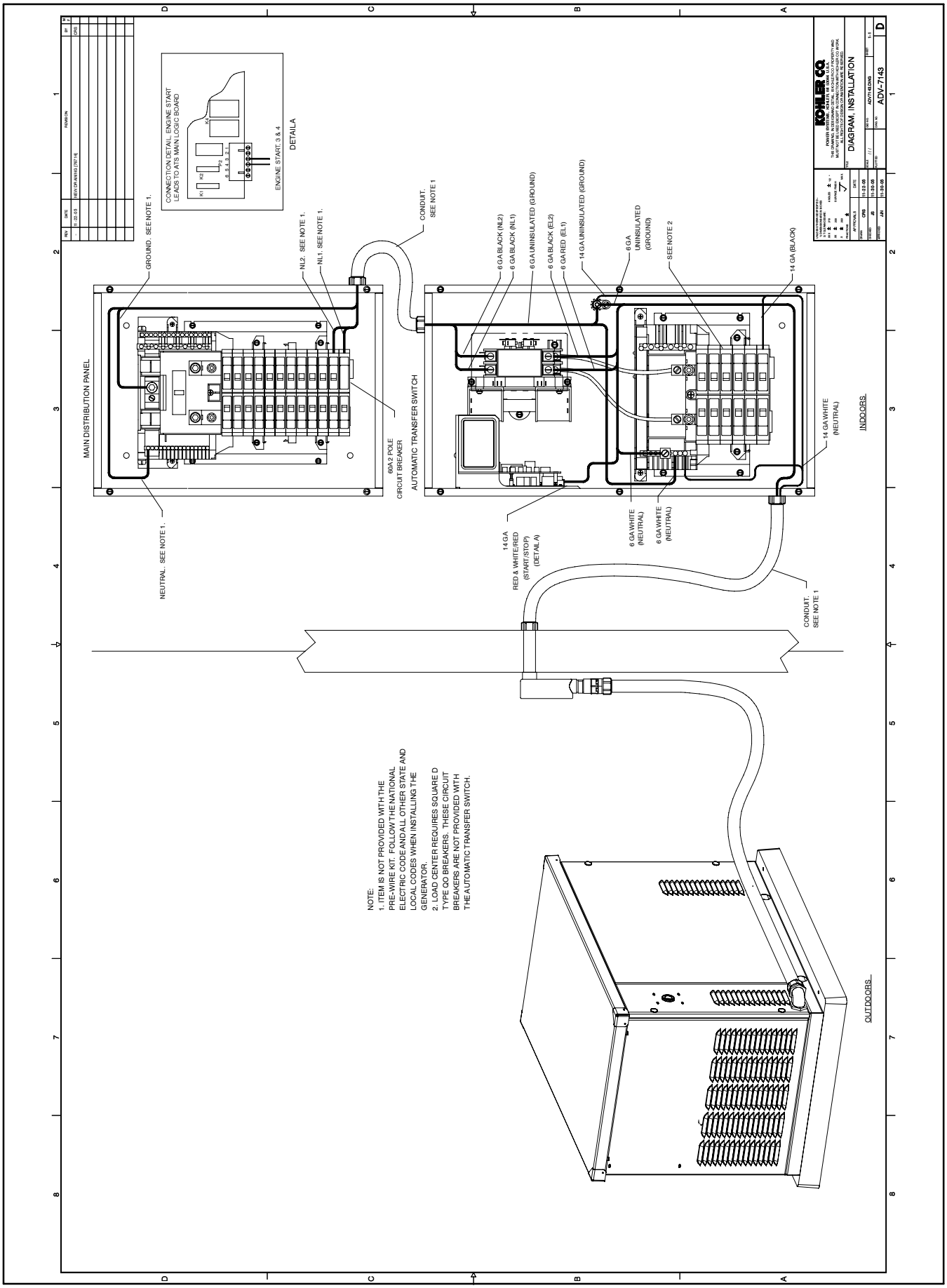


Figure 5 Power System Electrical Connections

Electrical Connections

Refer to Figure 5 as well as the photos and tables in the following steps while making the electrical connections.

Note: Have a licensed electrician make all electrical connections. All connections must comply with state and local codes.

Note: Some codes require the use of an external disconnect switch. Check the code requirements for your location and install a disconnect switch, if required.

14. Determine the location for the conduit from the generator set to enter the house. Check for clearance inside and outside before cutting the hole. Use a hole saw to cut a 2 inch opening for the conduit. See Figure 6.

15. Route the 30-foot end of the wiring kit through the wall and attach the plastic elbow to the wall using the clamp provided. Apply silicone sealant around the plastic pipe for a weather-tight connection. Duct seal may be added for increased insulation.

Figure 6 Wiring Kit Plastic Elbow Mounted to Wall

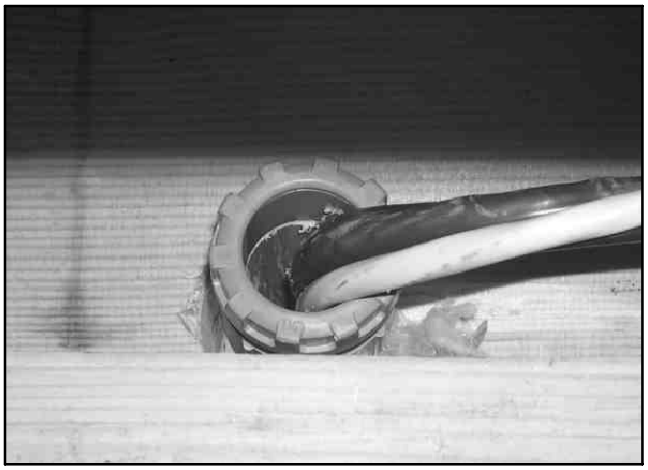


Figure 7 Conduit End Inserted through the Wall

Transfer Switch Connections

16. To connect the transfer switch to the main distribution panel:

    a. Make sure that the main circuit breaker to the distribution panel is OFF or open.

    b. Remove the cover from the main distribution panel. Install the 60-amp double-pole circuit breaker (customer- or installer-provided) into the main distribution panel.

    Note: Reposition circuit breakers or remove unused breakers to make room for the new breaker, if necessary.

    c. Use installer-supplied copper or aluminum wire to connect the normal power source lugs on the transfer switch to the new 60 amp circuit breaker in the main distribution panel.

    Note: Use installer-supplied wire that complies with the NEC and all applicable codes for wire size and rating. The transfer switch lugs use cable sizes from #12 to 1/0 AWG.

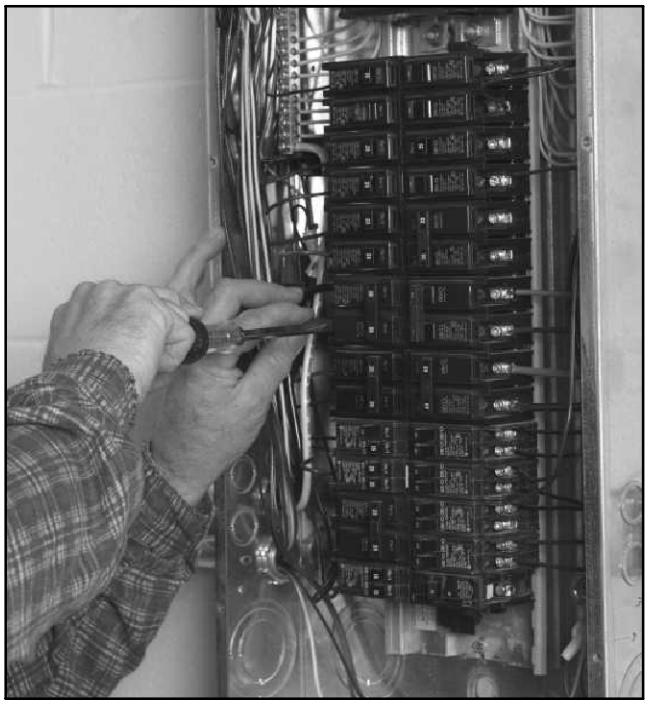


Figure 8 Installing the Two-Pole Breaker into the Main Distribution Panel

17. To use the supplied wiring kit to connect the generator set to the transfer switch:

    a. Route the wiring kit leads into the enclosure through a knockout in the side or bottom of the transfer switch enclosure.

    Note: The wiring is provided in the kit. Add conduit if required by applicable codes and be careful not to damage the wire during installation.

    b. Connect the 6-gauge red and black leads from the generator set wiring kit to the Emergency (E) side of the ATS contactor. See Figure 9. Connect the white lead to the neutral lug. Use a torque wrench to tighten the connections to 12 Nm (9 ft. lbs.)

    c. Connect the uninsulated 6-gauge lead from the wiring kit to the ground stud inside the ATS enclosure.

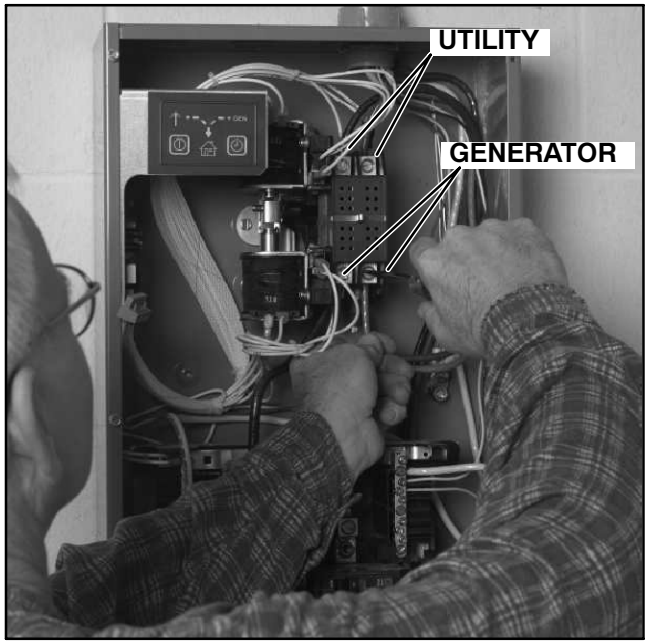


Figure 9 Generator Set Power Connections to the ATS

Cables	ATS Connection Point
Utility power from main panel	Normal (N)
Generator set power	Emergency (E)
Load panel	Factory-connected
Engine start	Terminals ES3 and ES4 on P2

Figure 10 ATS Connections

18. Connect the 14-gauge black lead from the wiring kit to a 120 VAC circuit in the ATS load panel.

    Note: The 120 VAC circuit provides power for the battery charger and the carburetor heater, if equipped. The battery charger and carburetor heater draw about 2 amps, total.

19. Connect the 14-gauge white lead from the wiring kit to the neutral connection on the load panel.

20. Connect the 14-gauge red and red/white engine start leads from the wiring kit to terminals ES3 and ES4 on the 6-terminal engine start connector. Tighten the connector screws to 0.8 Nm (7 in. lb.). Plug the connector into P2 on the ATS controller circuit board. See Figure 12.

Lead Identification		Connection
14 ga.	Red	Engine start leads 3 and 4 to the ATS
	White/Red	
	Black	120 VAC circuit on essential loads panel for engine battery charger and optional carburetor heater
	White	
	Uninsulated	
6 ga.	Red	ATS emergency source lugs EL1 and EL2
	Black	
	White	Neutral
	Uninsulated	Ground

Figure 11 Wiring Kit Field Connections

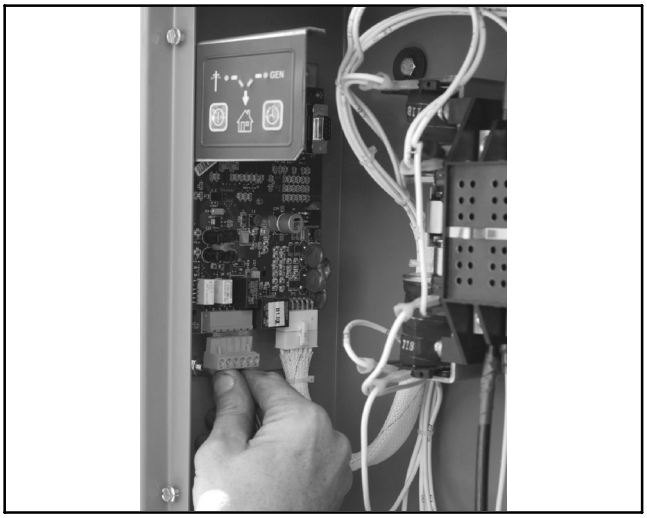


Figure 12 Engine Start Connection to the ATS

Circuit Connections

21. Make sure that the main circuit breaker to the distribution panel is OFF or open.

22. At the main distribution panel, identify the circuits to be connected to the emergency power system. Obtain Square D Type QO circuit breakers for each circuit or move the circuit breakers from the distribution panel to the ATS load panel.

    Note: For each circuit being reconnected, make sure that the rating of the load panel circuit breaker matches the rating of the breaker in the main distribution panel.

23. Remove knockout from the main panel and run a lead from the ATS to the main panel for each circuit to be reconnected.

    Note: Use installer-supplied wire that complies with the NEC and all applicable codes for wire size and rating.

24. For each circuit, disconnect the hot (typically black) lead from the circuit breaker. Use UL-approved wire nuts to connect the lead to a circuit breaker in the ATS load panel.

    The neutral (typically white) leads in the main panel can remain connected to the neutral bar.

25. Replace the transfer switch enclosure cover and tighten the screws that hold it in place.

Figure 13 ATS and Main Distribution Panel

Generator Set Preparation

1. Verify that the generator set master switch is in the OFF/RESET position.

2. Install the battery in the battery compartment:

   a. Ensure that the starting battery is fully charged before placing the battery in service.

   b. Clean the battery posts and/or adapters if necessary.

   c. Install battery post adapters, if needed.

   d. Place the battery in the housing.

3. Connect the battery cables:

   a. Connect the red cable to the positive (+) battery terminal.

   b. Connect the black cable to the negative (-) battery terminal.

   c. Place the boots over the battery terminals.

Figure 14 Battery Installation

4. Check that the battery charger and carburetor heater (if equipped) power cords are plugged into the 120 VAC receptacle. See Figure 15.

5. Check the oil level and add oil if necessary.

6. Check the fuel supply and verify that the manual fuel valve is open.

7. Move the main circuit breaker to the ON or closed position. Close the two-pole circuit breaker in the main panel.

8. Move the generator set master switch to the AUTO position. See Figure 16.

9. Install the generator set enclosure door.

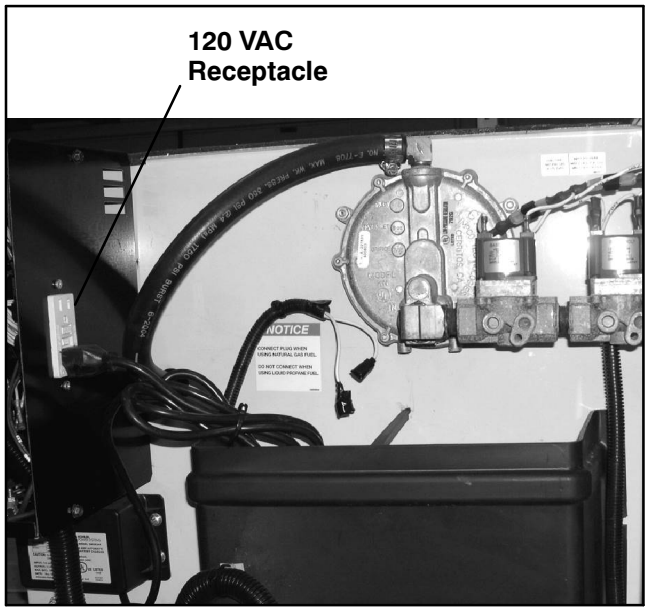


Figure 15 Receptacle Location

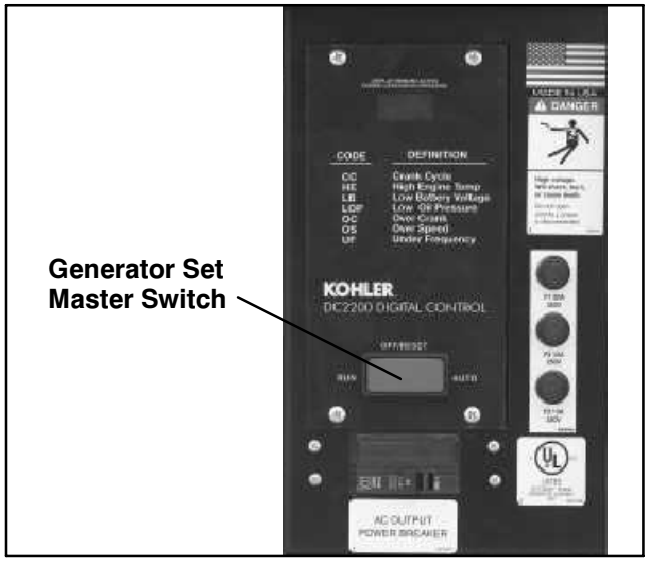


Figure 16 Generator Set Master Switch

Operation Tests

1. Follow the instructions in the ATS Operation and Installation manual to check the source voltages. Connect the sources by closing switches and circuit breakers when instructed to do so during the voltage check procedures. While the generator set is running, check the fuel connections for leaks.

2. Run a test as described in the ATS Operation and Installation manual.

3. Set the exerciser. See Figure 17. Press and hold the exercise button for 3 seconds to set an unloaded exercise (generator set runs but the ATS does not transfer the load). Press and hold the exercise button for 6 seconds to set a loaded exercise (generator set runs and ATS transfers the load). The exercise will run every week at the same day and time. Refer to the ATS Operation and Installation manual for more information.

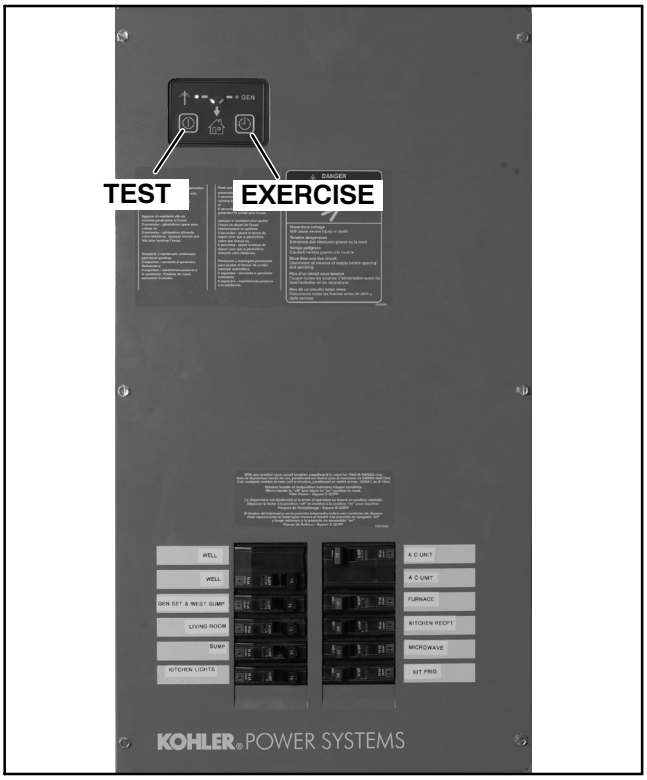


Figure 17 Transfer Switch Controls

Parts List

Prewire Kit

Kit: GM47160-KA1		
Qty.	**Description**	**Part Number**
1	Clamp, Pipe	GM46978
1	Assembly, Harness 12RESM1	GM46984