Operation

Residential/Commercial Generator Sets

Models:

14RCA
14RCAL
20RCA
20RCAL

Controller:

RDC2

KOHLER®

TP-7092 2/21a

⚠ WARNING: This product can expose you to chemicals, including carbon monoxide and benzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm.
For more information go to www.P65warnings.ca.gov

Kohler strongly recommends that only factory-authorized distributors or dealers install and service the generator.

Product Identification Information

Product identification numbers determine service parts. Record the product identification numbers in the spaces below immediately after unpacking the products so that the numbers are readily available for future reference. Record field-installed kit numbers after installing the kits.

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

Controller Identification

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

Controller Description _____

Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

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Notes

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

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

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

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 LPG vapor 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.

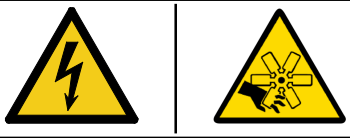
Hazardous Voltage/ Moving Parts

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

⚠ DANGER



Hazardous voltage. Moving parts.
Will 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.

Welding on generator set will cause serious damage to engine electronic controls components. Disconnect all engine electronic control connections before welding.

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

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

Heavy Equipment

⚠ WARNING

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

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

Hot Parts

⚠ WARNING

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

Do not work on the generator set until it cools.

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

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

Notice

NOTICE

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

This manual provides operation and maintenance instructions for residential/commercial model 14/20RCA/RCAL generator sets equipped with the RDC2 generator set/transfer switch controller. See Figure 1.

Kohler strongly recommends that only factory-authorized distributors or dealers install and service the generator.

Have the generator set installed by an authorized distributor/dealer or service technician. Refer to the Installation Manual for installation instructions.

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. Keep this manual with the equipment for future reference.

The equipment service requirements are very important to safe and efficient operation. Inspect the parts often and perform required service at the prescribed intervals. Obtain service from an authorized service distributor/dealer to keep equipment in top condition.

Figure 1 Generator Set

List of Related Literature

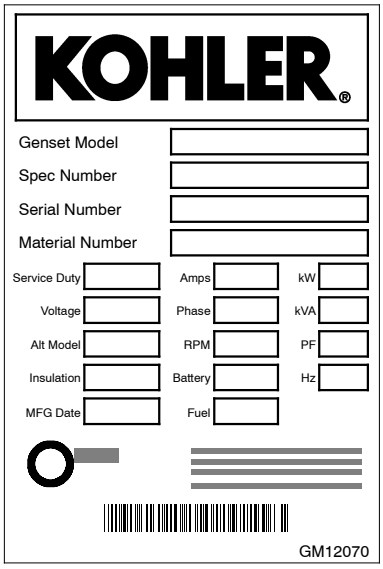
Figure 2 identifies literature available for the generator sets covered in this manual and related accessories. Only trained and qualified personnel should install or service the generator set.

Generator Set Literature	Part Number
Specification Sheet, 14RCA/L	G4-270
Specification Sheet, 20RCA/L	G4-272
Installation Manual, Generator Set	TP-7091
Service Manual, Generator Set	TP-7093
Transfer Switch Literature	
Operation/Installation Manual, Model RXT Automatic Transfer Switch	TP-6807
Operation/Installation Manual, Model RDT Automatic Transfer Switch	TP-6345
Accessory Literature	
User Guide, OnCue® Plus	TP-7006
Technical Manual, OnCue® Plus	TP-7007
Operation Manual, SiteTech™ Software	TP-6701
Installation Instructions, Load Shed Kit	TT-1609
Installation Instructions, Programmable Interface Module (PIM)	TT-1584
Installation Instructions, PowerSync® Automatic Paralleling Module (APM)	TT-1596
Installation Instructions, Carburettor Heater Kit	TT- 1297 TT- 1482
Installation Instructions, Fuel Regulator Heater Kit	TT- 1569
Installation Instructions, Battery Heater Kit	TT- 1634
Installation Instructions, Breather Tube Heater and Oil Heater	TT- 1709
Installation Instructions, Oil Pressure Sensor Boot Kit	TT- 1717
Installation Instructions, Remote Emergency Stop Switch (Lockable)	TT- 1795

Figure 2 Related Literature

Nameplate

The following illustration shows a typical generator set nameplate. Copy the model, serial, and specification numbers from the nameplate into the spaces provided in the product information section on the inside front cover of this manual. See the service views in Section 1.9 for the nameplate location.



Emission Information

The Kohler® Model CH740 engine used on the 14RCA/RCAL generator set is certified to operate using natural gas or propane fuel.

The Kohler® Model CH1000 engine used on the 20RCA/RCAL generator sets is certified to operate using natural gas or propane fuel for emergency standby use only. This generator set is certified by the U.S. EPA for emergency standby operation backing up a reliable utility source. Operation outside these guidelines is a violation of national EPA regulations.

The Emission Compliance Period referred to on the Emission Control or Air Index label indicates the number of operating hours for which the engine has been shown to meet CARB or EPA emission requirements. Figure 3 provides the engine compliance period (in hours) associated with the category descriptor, which may be found on the certification label.

Emission Compliance Period			
EPA	Category C 250 hours	Category B 500 hours	Category A 1000 hours
CARB	Moderate 125 hours	Intermediate 250 hours	Extended 500 hours

Figure 3 Emission Compliance Period

Refer to the certification label for engine displacement.

The exhaust emission control system for the CH740 engines (14RCA/L) is EM for U.S. EPA, California, and Europe.

The exhaust emission control system for the CH1000 engine (20RCA/L) is EM for U.S. EPA, California, and Europe.

Generator Set Application

Kohler® Co. ensures that all Kohler® generator sets are certified to applicable standards for their intended application. It is the owner/operator's responsibility to operate Kohler® generator sets exclusively according to the directions provided in the accompanying operation manuals.

Kohler® generator sets designated as Stationary Standby, Emergency or Emergency Standby may only be operated for emergency power generation and for maintenance/testing. Emergency power generation is limited to power production when electric power from a local utility (or the normal power source, if the facility runs on its own power production) is interrupted. Stationary non-emergency application of a Standby, Emergency, or Emergency Standby rated generator set is not allowed.

The U.S. Clean Air Act explicitly prohibits using Emergency Standby generator sets as a primary electric power source regardless of whether a site is connected to the electrical grid. Emergency Standby generators may NOT be used to power sites which are not connected to an electric utility.

Owners/operators must ensure that the generator is operated, exercised, and maintained according to this operation manual. Owners/operators must retain maintenance records.

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

- Visit the Kohler Co. 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 EMEA Headquarters
Netherlands B.V.
Kristallaan 1
4761 ZC Zevenbergen
The Netherlands
Phone: (31) 168 331630
Fax: (31) 168 331631

Asia Pacific
Kohler Asia Pacific Headquarters
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 Introduction

The generator set specification sheets provide specific generator and engine information. Refer to the spec sheet for data not supplied in this manual. Consult the generator set service manual, engine operation manual, and engine service manual for additional specifications. Obtain copies of the latest spec sheets, manuals, diagrams, and drawings from your local distributor/ dealer.

1.2 Engine

The generator set has a four-cycle, twin cylinder, air-cooled Kohler® engine. The engine operates on clean-burning natural gas or LPG. Engine features include:

- Efficient overhead valve design and full pressure lubrication for maximum power, torque, and reliability under all operating conditions.
- Dependable, maintenance-free electronic ignition.
- Precision-formulated cast iron construction of parts subjected to the most wear and tear.
- Field-convertible multi-fuel systems that allow fuel changeover from natural gas to LPG (and vice- versa) while maintaining emissions certification.
- Digital spark advance optimizes ignition timing for the selected fuel.

1.3 Alternator

The generator uses Kohler's unique PowerBoost™ voltage regulation system, which provides instant response to load changes.

PowerBoost™ ensures reliable motor starting and consistent voltage levels. PowerBoost™ utilizes a voltage excitation system that employs a winding independent of the main output windings to provide excitation voltage.

1.4 Generator Set Enclosure

The generator set is housed in an aluminum enclosure with our fade-, scratch-, and corrosion-resistant Kohler® Power Armor™ automotive-grade textured cashmere finish. The enclosure has a hinged, locking roof that allows easy access to the generator set controller when required, but locks securely to prevent unauthorized access.

To open the roof, insert the key provided with the enclosure and turn counterclockwise 1/4 turn. Then just raise the roof. The roof stays open until you are ready to close it.

Be sure to close and lock the enclosure, and keep the key in a secure location.

1.5 Transfer Switch

The RDC2 controller is designed to interface with and control the Kohler Model RXT Automatic Transfer Switch (ATS).

If the power system uses a different model transfer switch, the RDC2 controller will not control the transfer switch. An ATS other than the Model RXT must be equipped with a transfer switch controller and engine start contacts that connect to the remote engine start terminals on the generator set.

1.6 Controller

RCA and RCAL models are equipped with the RDC2 controller. See Figure 1-1.

The controller provides integrated control for the generator set, Kohler® Model RXT transfer switch, programmable interface module (PIM) and load management devices.

The controller's 2-line LCD screen displays status messages and system settings that are clear and easy to read, even in direct sunlight or low light.

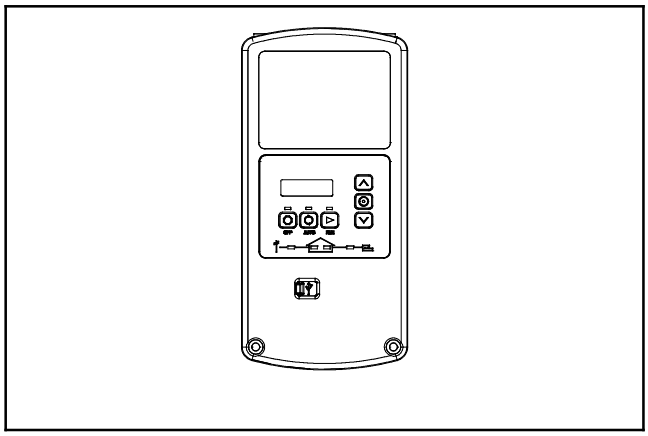


Figure 1-1 RDC2 Generator Set Controller

RDC2 Controller Features

- Six-button keypad
  - OFF, AUTO, and RUN pushbuttons
  - Select and arrow buttons for access to system configuration and adjustment menus
- LED indicators for OFF, AUTO, and RUN modes
- LED indicators for utility power and generator set source availability and ATS position (Model RXT transfer switch required)
- LCD display
  - Two lines x 16 characters per line
  - Backlit display with adjustable contrast for excellent visibility in all lighting conditions
- Scrolling system status display
  - Generator set status
  - Voltage and frequency
  - Engine lube oil temperature
  - Oil pressure
  - Battery voltage
  - Engine runtime hours
- Date and time displays
- Smart engine cooldown senses engine temperature
- Digital isochronous governor to maintain steady-state speed at all loads
- Digital voltage regulation: ±0.5% RMS no-load to full-load
- Automatic start with programmed cranking cycle
- Programmable exerciser can be set to start automatically on any future day and time, and run every week or every two weeks
- Exercise modes
  - Unloaded cycle exercise with complete system diagnostics
  - Unloaded full-speed exercise
  - Loaded full-speed exercise (Model RXT ATS required)
- Front-access mini USB connector for Kohler® SiteTech™ connection
- Integral Ethernet connector for the Kohler® OnCue® Plus Generator Management System
- Built-in battery charger
- Remote two-wire start/stop capability for connection of Model RDT or other transfer switches
- Diagnostic messages
  - Displays diagnostic messages for the engine, generator, Model RXT transfer switch, programmable interface module (PIM), and load management device
  - Over 70 diagnostic messages can be displayed
- Maintenance reminders
- System settings
  - System voltage, frequency, and phase
  - Voltage adjustment
  - Measurement system, English or metric
- ATS status (Model RXT ATS required)
  - Source availability
  - ATS position (normal/utility or emergency/generator)
  - Source voltage and frequency
- ATS control (Model RXT ATS required)
  - Source voltage and frequency settings
  - Engine start time delay
  - Transfer time delays
  - Voltage calibration
  - Fixed pickup and dropout settings
- Programmable Interface Module (PIM) status displays
  - Input status (active/inactive)
  - Output status (active/inactive)
- Load control menus
  - Load status
  - Test function

1.7 OnCue Plus Generator Management System

The Kohler® OnCue® Plus Generator Management System is now included with the generator set. The OnCue® Plus System allows monitoring and control of your generator set from your home or other location with Internet access using a computer or mobile device. OnCue® Plus can be configured to send email or text message notifications in the event of a generator set fault.

You can also use Google Assistant or Amazon Alexa and your smart device to control your generator. Use voice commands to check your generator's status, check for active alerts, and start or stop an exercise. See the OnCue® Plus User Guide, TP- 7006, for simple setup instructions and voice commands

OnCue® Plus Wireless is also available. OnCue® Plus Wireless works with the customer's wireless ethernet router and does not require the installation of a network cable between the generator set and the customer's router/modem.

1.8 Accessories

The following optional accessories are offered for the generator sets.

1.8.1 Cold Weather Package Kit

Heater kits are recommended for improved cold starting in locations where the ambient temperature drops below 0°C (32°F).

The cold weather package kit includes:

- Alternator brush cover
- Battery heater
- Breather tube heater
- Fuel regulator heater
- Oil heater
- Oil pressure sensor cover
- 3-way extension cord for power connection

The heaters require a continuous source of AC power. See the generator set Installation Manual and the installation instructions provided with the kits for more information.

1.8.2 Programmable Interface Module (PIM)

The optional Programmable Interface Module (PIM) provides two programmable inputs and six programmable dry contact outputs for connection to customer-supplied equipment. The outputs are controlled by the RDC2 controller, and can also be controlled remotely using OnCue Plus.

The PIM is mounted in a NEMA 3R aluminum enclosure, which can be mounted indoors or outdoors. See the installation instructions provided with the PIM.

1.8.3 Load Management

Two optional load management devices are available for use with single-phase generator sets and a model RXT or RDT transfer switch.

- The optional Load Shed Kit mounts inside a model RDT or RXT transfer switch.
- The combined interface/load management board is available for the Model RXT transfer switch.

The load management devices provide an automatic load management system to comply with Section 702.5 of NEC 2008. The installer is responsible for ensuring that the power system installation complies with all applicable state and local codes.

Note: The load management devices are only compatible with single-phase generator sets.

The load management device automatically manages up to six residential loads. Two relays are provided to control two independent air conditioner loads. Up to four power relay modules can be connected for management of non-essential secondary loads.

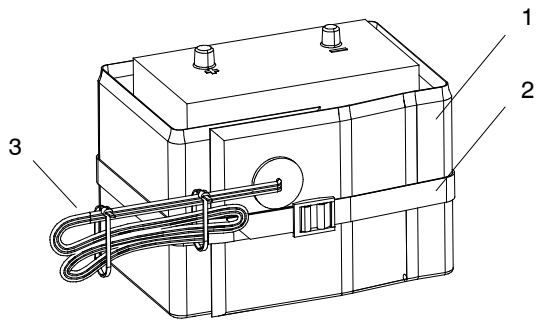
The load management device is controlled by the RDC2 controller. The load on the generator set is monitored, and loads are added or shed in the order of their priority. See the installation instructions provided with the load shed kit or the Model RXT Operation and Installation Manual for more information.

1.8.4 Battery Heater Kit

The battery heater kit contains a heating wrap to help warm the battery in cold climates. See Figure 4. The battery heater is equipped with a thermostat that turns the heater on at 16-18°C (60-65°F) and off at 27°C (80°F). Battery heaters are recommended for regions where the temperature regularly falls below 0°C (32°F).

Note: Battery heaters are compatible with all Kohler-supplied lead-acid batteries.* For other battery types, check the battery manufacturer's instructions for any restrictions regarding the use of battery heaters.

The battery heater requires a source of AC power. Verify that AC power is connected to the generator set as described in the generator set Installation Manual. The circuit must be backed up by the generator set to provide power at all times.



1. Battery heater wrap
2. Retaining strap or cable ties (included)
3. Power cord

Figure 4 Battery Heater (typical)

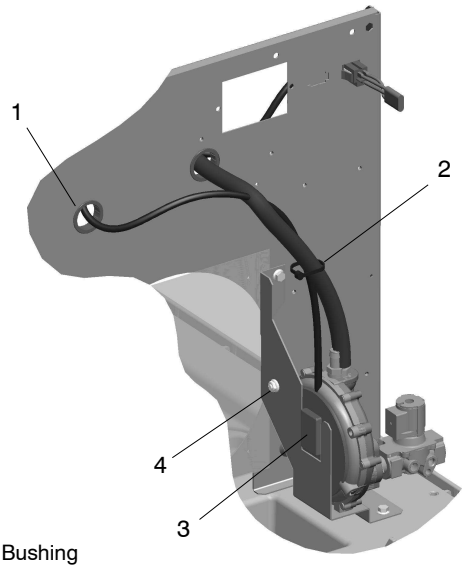
1.8.5 Fuel Regulator Heater (20kW models only)

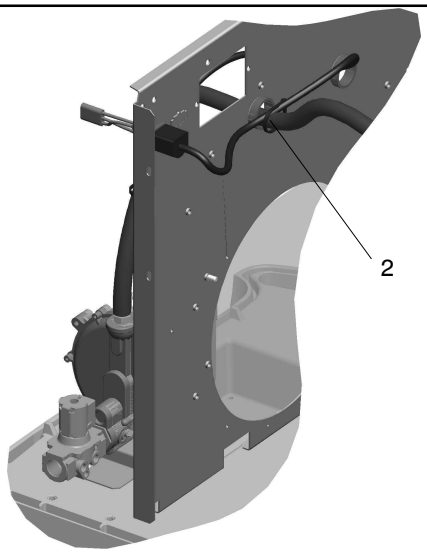
An optional fuel regulator heater for the 20RCA/L is recommended for improved cold starting in locations where the ambient temperature drops below -18°C (0°F). The heater requires a continuous source of AC power.

Heater rating	120 VAC, 60 W	240 VAC, 100 W
Thermostat	4°C/13°C (40°F/55°F) Snap action	
Pad diameter	127 mm (5 in.)	
Cord length	914 mm (36 in.)	

Figure 5 Regulator Heater Kit Specifications

Figure 6 120 VAC Fuel Regulator Heater





1. Bushing
2. Cable ties
3. Heater, fuel regulator pad
4. Screw, spacer, and existing nut
   Note: Place spacer between regulator and mounting bracket

Figure 7 Fuel Regulator Heater Installation, 20RCA/L

1.8.6 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 requires a continuous source of AC power.

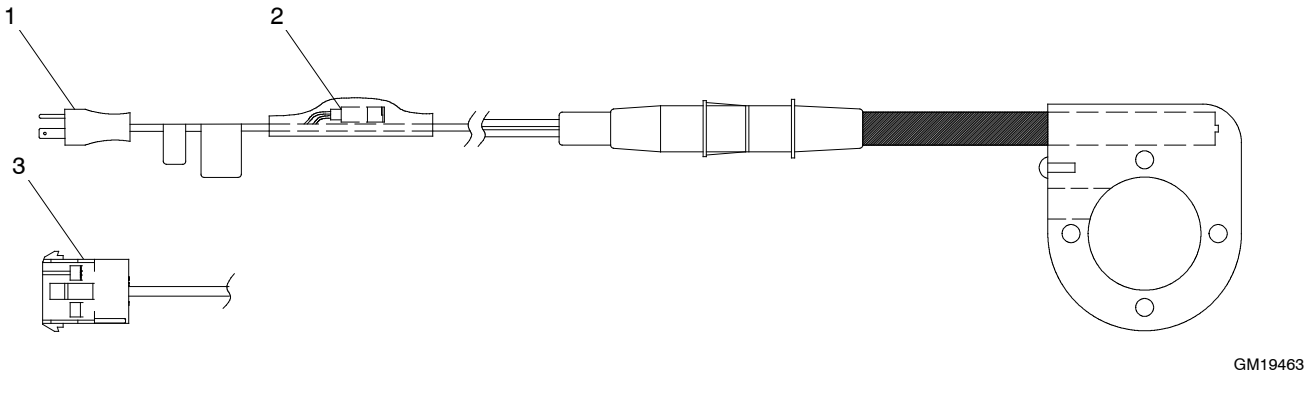
See the generator set Installation manual for more information.

Voltage	120 VAC	240 VAC
Thermostat ON	4 ± 3°C (40 ± 5°F)	
Thermostat OFF	16 ± 3°C (60 ± 5°F)	

Figure 8 Heater Specifications, 14kW Models

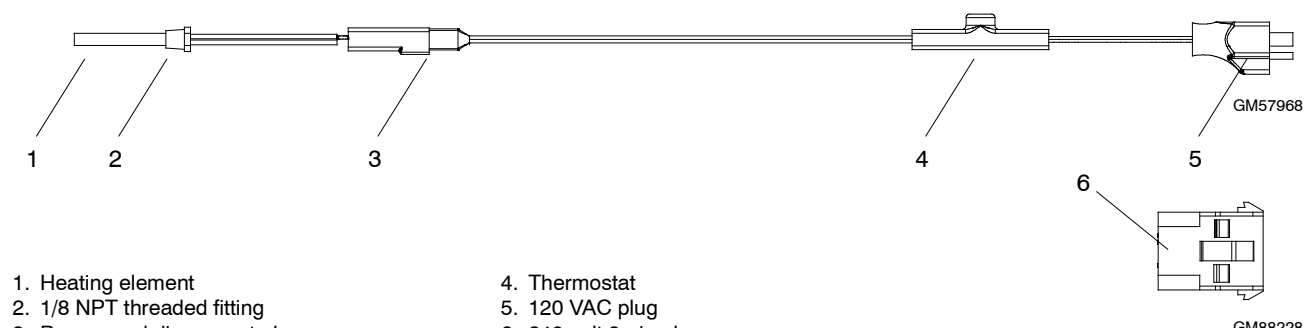
Voltage	120 VAC	240 VAC
Thermostat ON	4 ± 4°C (40 ± 7°F)	
Thermostat OFF	16 ± 3°C (60 ± 5°F)	

Figure 9 Heater Specifications, 20kW Models



1. 120 VAC plug
2. Thermostat
3. 240 VAC 3-pin Mate-N-Lock connector.

Figure 10 Carburetor Heater with Thermostat and Power Connectors, 14kW Models



1. Heating element
2. 1/8 NPT threaded fitting
3. Power cord disconnect plug
4. Thermostat
5. 120 VAC plug
6. 240 volt 3-pin plug

Figure 11 Carburetor Heater, 20kW Models

1.8.7 Emergency Stop Kit

An emergency stop button is available as a loose kit. Pressing the emergency stop button causes the generator set to shut down immediately. The generator controller displays an emergency stop shutdown message after the button is pressed.

E-stop assembly harness contains the E-stop, contact block, and two leads connected to the contact block. The harness is factory-assembled. The kit also includes the emergency stop switch decal.

The generator set enclosure is designed with an opening for the emergency stop button. Install the emergency stop button as described in the TT-1613 and TT-1795 instructions.

RDC2 firmware to version 5.5 or higher is required for E-stop operation. Use a personal computer (laptop) and Kohler® SiteTech™ software or the USB Utility to update the controller firmware, if necessary. See TP-6701, SiteTech Operation Manual, or TT-1636, Firmware Update Using the USB Utility, for instructions if necessary.

1.8.8 Breather Tube Heater and Oil Heater Kit

The breather tube heater and oil heater kit is recommended for improved cold starting in locations where the ambient temperature drops below 0°C (32°F).

Note: The heaters require a continuous source of AC power. See Figure 12 and Figure 13 for the power supply voltage required.

Note: The breather tube heater and oil heater must be used together.

Verify that AC power is connected to the generator set as described in the generator set Installation Manual. The circuit must be backed up by the generator set to provide power at all times. Refer to TT-1709 for instructions to install the heaters and connect 120VAC power.

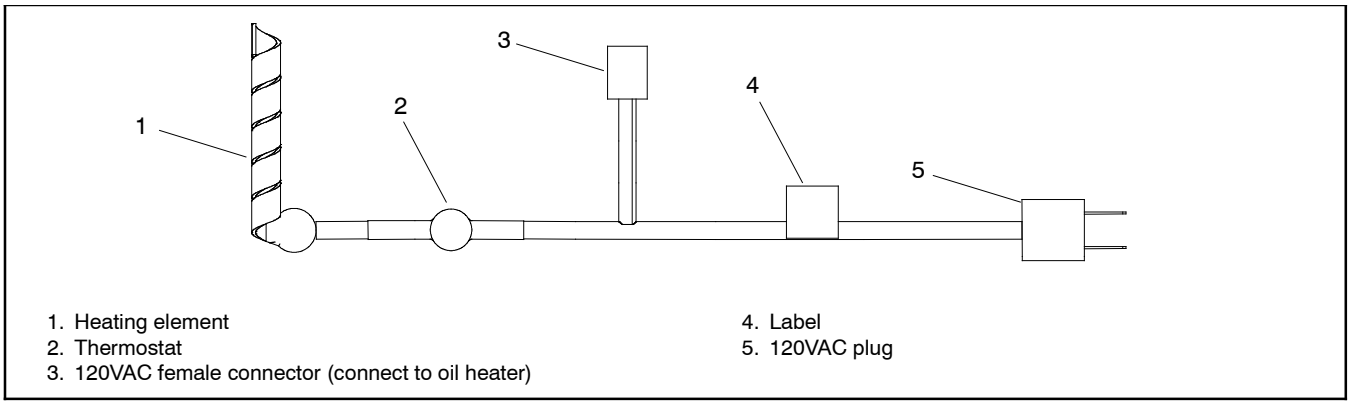
See Figure 14 and Figure 15 for illustrations of the 120VAC breather tube heater and oil heater.

Heater Part Number	GM110893, GM110894
Voltage	120VAC
Thermostat ON	4°C (40°F)
Thermostat OFF	13°C (55°F)

Figure 12 Breather Tube Heater Specifications

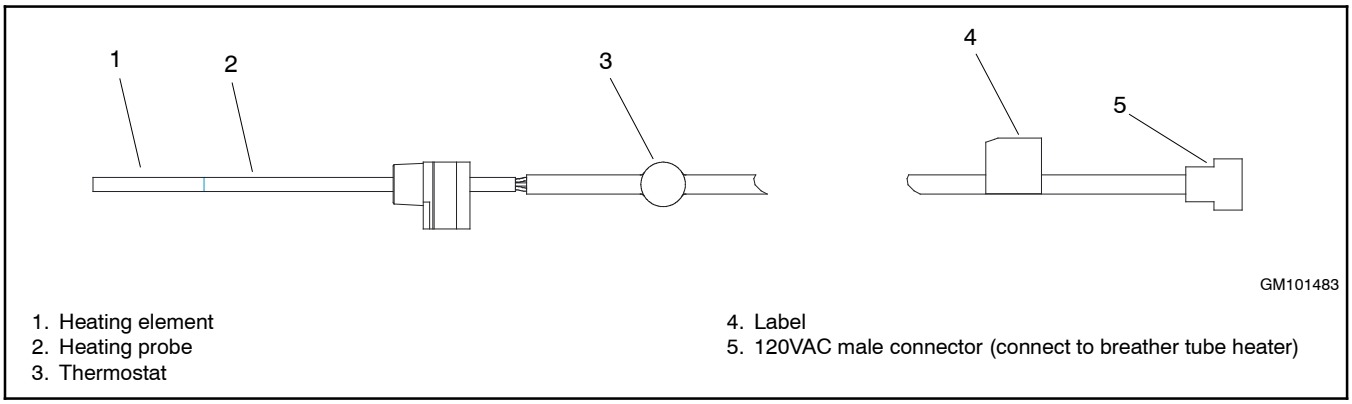
Heater Part Number	GM110895, GM110896
Voltage	120VAC
Thermostat ON	4°C (40°F)
Thermostat OFF	13°C (55°F)

Figure 13 Oil Heater Specifications



1. Heating element
2. Thermostat
3. 120VAC female connector (connect to oil heater)
4. Label
5. 120VAC plug

Figure 14 Breather Tube Heater

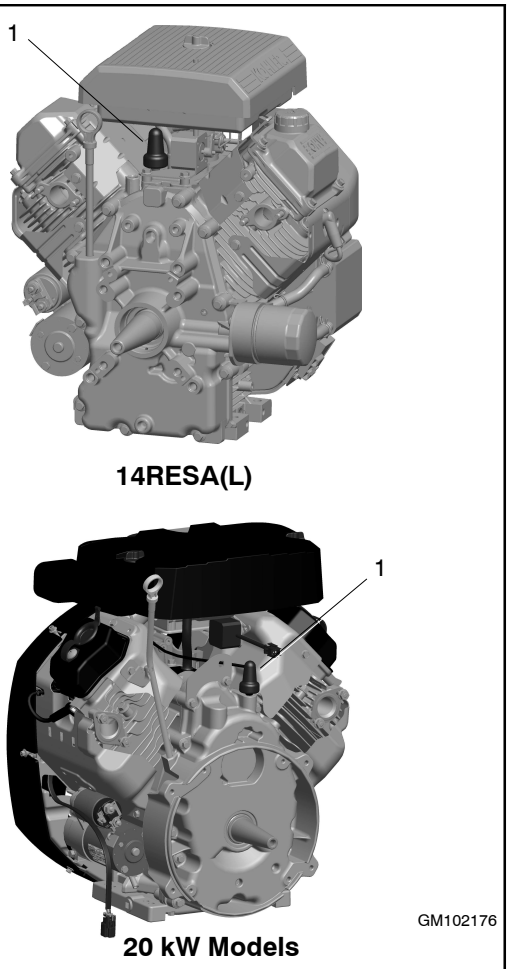


1. Heating element
2. Heating probe
3. Thermostat
4. Label
5. 120VAC male connector (connect to breather tube heater)

Figure 15 Oil Heater

1.8.9 Oil Pressure Sensor Boot Kit

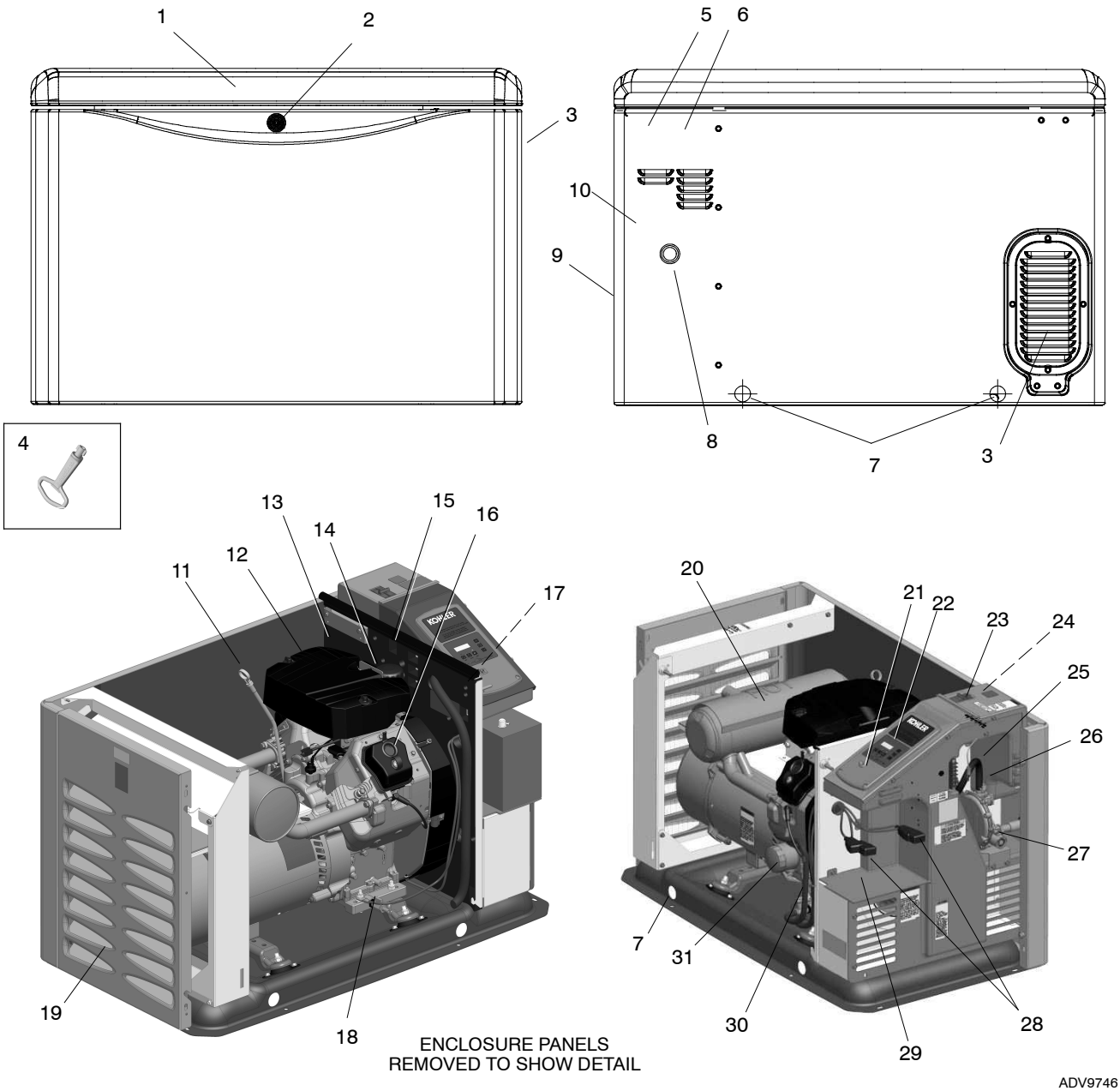
The oil pressure sensor boot protects the oil pressure sensor and its connection from moisture and frost buildup that can cause false low oil level faults. Install the oil pressure sensor boot in locations where the ambient temperature drops below 0°C (32°F). See Figure 16 for illustrations of the installed kit. Follow the instructions provided with the kit to install the boot.



1. Oil pressure sensor boot

Figure 16 Oil Pressure Sensor Boot Location

1.9 Service Views



1. Hinged roof
2. Lock
3. Air intake
4. Enclosure key, provided with generator set
5. High voltage electrical in
6. Optional emergency stop button location
7. Lifting holes
8. Fuel inlet
9. Air intake
10. Low voltage electrical in
11. Oil check (dipstick)
12. Air cleaner
13. Nameplate location
14. Oil filter (20 kW models)
15. Auxiliary winding circuit breaker
16. Oil fill
17. AC receptacles for accessories (not shown)
18. Oil drain valve
19. Exhaust outlet
20. Silencer
21. USB connector (for firmware updates)
22. RDC2 controller
23. Line circuit breaker
24. Field-connection terminal block (behind panel)
25. Digital spark advance ignition (DSAI) lead location (14RCA/L only)
26. Thermostat location
27. Fuel system
28. Battery cables (provided)
29. Engine starting battery location (battery purchased separately)
30. Oil drain hose (shown in storage position)
31. Oil filter (14 kW models)

Figure 1-2 Service Views (20 kW model shown)

2.1 Prestart Checklist

To ensure continued satisfactory operation, perform the following checks or inspections before or at each startup, as designated, and at the intervals specified in the service schedule. In addition, some checks require verification after the unit starts.

Air Cleaner. Check for a clean and installed air cleaner element to prevent unfiltered air from entering the engine.

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. Check the oil level before starting the generator set and at the intervals given in Section 4, Scheduled Maintenance. Maintain the oil level at or near, not over, the full mark on the dipstick.

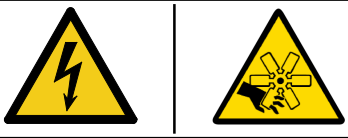
Operating Area. Check for obstructions that could block the flow of cooling air. Keep the air intake area clean. Do not leave rags, tools, or debris on or near the generator set.

2.2 Exercising the Generator Set

Operate the generator set once each week for 20 minutes. See Section 2.4 for information about loaded and unloaded exercise modes. For instructions to set the exerciser, see Section 3.6, Setting the Exerciser.

2.3 Generator Set Operation

⚠ DANGER



Hazardous voltage. Moving parts. Will cause severe injury or death.

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

⚠ 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 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.

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.

⚠ CAUTION

Hot surfaces.

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

2.3.1 Local Starting and Stopping

Start: Press the RUN button to immediately start the generator set.

Stop: Press the OFF button. The engine stops.

Run the generator set with no load for at least 2 minutes to ensure adequate engine cooldown.

2.3.2 Automatic Operation

An automatic transfer switch monitors the utility power and signals the generator set to start when utility power is lost. The ATS then transfers the load to the generator set.

When utility power is restored, the transfer switch transfers the load back to utility, runs the generator set with no load to cool down the engine, and then stops the generator set.

See Sections 2.3.7 and 2.3.8 for more information about automatic operation.

2.3.3 Remote Starting and Stopping

A remote switch connected to terminals 3 and 4 can be used to start and stop the generator set. Close the switch to start and run the generator set. Open the switch to stop the generator set.

Run the generator set with no load for at least 2 minutes to ensure adequate engine cooldown.

2.3.4 Remote emergency Stop Switch

The generator set may be connected to an optional remote emergency stop switch. See Figure 2-1. The remote emergency stop switch may be mounted near the generator set or in a remote location. If the emergency stop button is activated, the controller display will show Emerg Stop Shutdwn.

Emergency Stop Switch Operation

Press the red STOP button to shut down the generator set in an emergency.

Using the emergency stop button bypasses the engine cooldown cycle, stopping the engine immediately. The controller emergency stop lamp lights (if equipped) and the unit shuts down. The generator set cannot be restarted until the emergency stop switch(es) is/are reset.

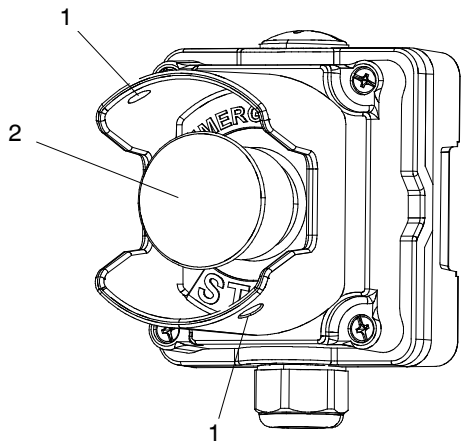
Lockout/Tagout

The emergency stop button can be locked in the STOP position. Insert a lock through two openings in the yellow shroud to prevent the stop button from being pulled out. See Figure 2-1. Remove the lock for normal operation.

A lock is not required in order to keep the switch activated. The switch button will stay depressed until it is pulled out by the operator.

Resetting the Emergency Stop Switch

To reset the E-stop switch, remove the locking device and pull the button out. Reset the controller by pressing the OFF/RESET button.



1. Two openings in the shroud for customer-provided lockout/tagout device
2. Stop button

Figure 2-1 Emergency Stop Switch (optional)

Shutdown Switch

The generator set may be equipped with a Shutdown switch. See Figure 2-2. This switch, also referred to as the Engine Shutdown switch, commands an immediate shutdown and prevents an engine start if the switch is turned to the off (open, O) position. When the shutdown switch is activated, the controller display shows Emerg Stop Shutdwn.

The switch is a mechanical, rocker-style switch. Press O to prevent engine start during generator set service. Press I to allow the engine to start and run.

See Figure 2-2 for switch connections.

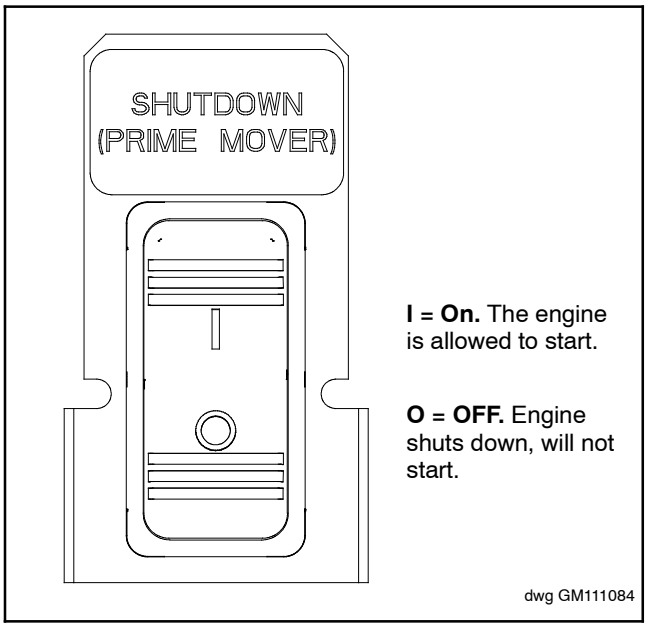


Figure 2-2 Shutdown Switch

2.3.5 Engine Start Crank Cycle

The controller attempts to start the generator set three times (three crank cycles, 15 seconds crank and 15 seconds off). If the generator set does not start in three attempts, the system shuts down on an overcrank fault. See Section 2.5.

Cranking 1, 2, and 3 are displayed during the crank cycle. Pressing the OFF button during the crank cycle stops the cranking. No other buttons are acknowledged during the crank cycle.

20 kW Models (RDC2.4 v1.4.4)

For RDC2.4 controllers with firmware version 1.4.4 or later, the 20 kW models will perform two crank cycles with 3 starting attempts during each cycle. The controller attempts to start the generator set three times (three starting attempts, 15 seconds crank and 15 seconds off). If the generator set does not start in three attempts, the controller pauses for 45 seconds, and then performs another set of 3 starting attempts. If the generator set does not start during these crank cycles, the system shuts down on an overcrank fault. See Section 2.5.

2.3.6 Engine Cooldown

The engine cooldown time delay allows the engine to run after the loads have been removed.

The engine cooldown time delay is set to 5 minutes. The engine stops before the cooldown time delay expires if the temperature drops below the cooled-down temperature level, or if the temperature rises above the high limit during the cooldown cycle.

If a transfer switch other than the Model RXT is used, an additional engine cooldown time delay may be programmed on the transfer switch. To allow the smart engine cooldown on the RDC2 controller to operate most efficiently, set the cooldown time on the transfer switch controller to zero or the minimum time allowed. Refer to the instructions provided with the transfer switch for more information.

2.3.7 Automatic Operation with Model RXT Transfer Switch

The Model RXT transfer switch connects to the RDC2 controller through the ATS interface board on the transfer switch. Also see the Model RXT Transfer Switch Operation/Installation Manual for more information about transfer switch operation.

The controller must be in AUTO mode for automatic transfer switch operation.

Automatic Start

The RDC2 controller receives utility source voltage sensing data from the Model RXT transfer switch.

1. If the utility source voltage falls below an acceptable level, the controller starts the engine start time delay.
2. If the utility source is not restored before the time delay expires, the generator set starts.
3. After the Normal-to-Emergency time delay, the ATS is signaled to transfer the load to the emergency source.

Automatic Stop with Engine Cooldown

1. When the utility source is restored, the Emergency-to-Normal time delay starts.

2. When the Emergency-to-Normal time delay expires, the load is transferred to the utility.

3. The generator set runs through the engine cooldown cycle and then stops.

2.3.8 Automatic Operation with Other Transfer Switches

If a transfer switch other than the Model RXT (such as a Kohler Model RDT) is used, the engine start contacts from the ATS must be connected to engine start leads 3 and 4 on the generator set.

The controller must be in AUTO mode to respond to remote start/stop signals from an ATS or remote switch. Press the AUTO button to put the controller into automatic mode.

Automatic Start

The engine start contacts on the ATS close to signal the generator set to start, and remain closed while the generator set is running.

Automatic Stop

The engine start contacts on the ATS open to signal the generator set to stop.

2.4 Exercise

The RDC2 controller can be set to automatically run the generator set at the same time and day each week. Exercising the generator set weekly or every two weeks is required to keep the engine and alternator in good operating condition.

Three exercise modes are available: unloaded cycle, unloaded full speed, and loaded full speed. See Sections 2.4.2 through 2.4.4 for information about the exercise modes. A loaded exercise can be set at the RDC2 controller only if a Model RXT transfer switch is connected.

Note: With transfer switches other than the Model RXT, it is possible to have two exercise settings (one unloaded exercise set at the generator set controller, and another exercise set at the ATS controller). If the exercise times overlap, the ATS exercise setting takes priority.

If a transfer switch other than the Model RXT is used, refer to the instructions provided with the transfer switch to set a loaded exercise at the ATS, if desired.

2.4.1 Setting the Exerciser

When power is applied to the RDC2 controller (that is, when the battery is connected), you will be prompted to set the date and time, select a language, 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. See Section 3.5 for more detailed instructions to change settings on the RDC2. See Section 3.6 for more detailed instructions to set the exerciser or change the exercise settings.

2.4.2 Unloaded Cycle Exercise with Complete System Diagnostics

An unloaded exercise runs the generator set without signalling the transfer switch to transfer the electrical load from the utility source to the generator set. The Unloaded Cycle exercise with diagnostics is the recommended exercise mode and is the default exercise setting.

The Unloaded Cycle exercise runs the engine for 20 minutes in the cycle shown in Figure 2-3 and described below.

- Runs at reduced speed for 10 minutes to warm up and exercise the engine.

- Ramps up and runs at full speed for 3 minutes. Engine diagnostics are performed during this full-speed portion of the cycle, which provides the best test of engine and alternator power backup capability. Diagnostic tests at full speed can identify potential problems with the power output and alert the operator before an emergency event.

- Ramps down and runs at reduced speed for 5 minutes to cool down the engine before shutting down automatically.

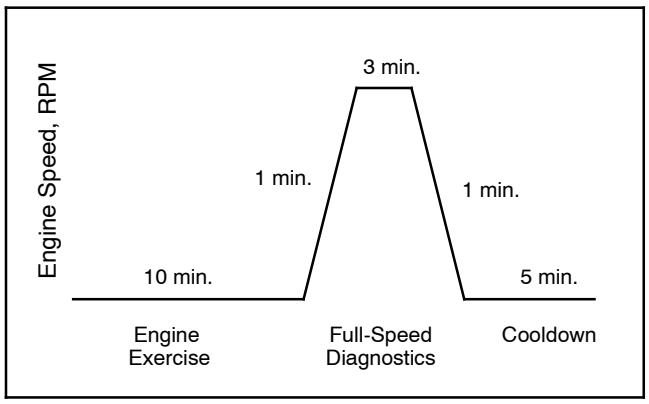


Figure 2-3 Unloaded Exercise Cycle

System Diagnostics

During the unloaded exercise, the controller monitors the following data. The controller display indicates that the generator set is running, unless a fault is detected as described below.

- **ATS connection.** The controller verifies that the Model RXT ATS interface board is connected.
- **Battery voltage.** Battery voltage is checked before exercise to verify engine starting capability. Battery voltage provides a measurement of battery health. If the controller detects low battery voltage, the condition is indicated on the display.
- **Communication integrity tests.** J1939, RBUS, Ethernet, and USB are monitored for messages indicating that the controller and wiring are reliable.
- **Engine speed.** Engine speed is measured at reduced speed and full speed. An overspeed or underspeed condition will result in a fault condition and shutdown.
- **Generator output frequency and voltage.** Operating the generator at full speed allows the RDC2 controller to check the output power for correct voltage, frequency, and stability. When the engine is running at full speed, the controller verifies that the voltage and frequency are within acceptable limits. A fault message is displayed if the voltage or frequency is out of range.
- **Oil pressure.** Oil pressure is verified to ensure proper lubrication of critical engine components. Pressure is monitored at both reduced and full speeds. If the oil pressure is low, the Low Oil Pressure message is displayed and the generator set shuts down.

2.4.3 Unloaded Full-Speed Exercise

The unloaded full-speed exercise runs the generator set at full speed for 20 minutes without transferring the load.

To set an unloaded full-speed exercise, follow the procedure in Figure 3-8 and select Exercise Mode: Unloaded Full.

2.4.4 Loaded Full-Speed Exercise (with RXT only)

A loaded exercise starts the generator set, ramps up to full speed, and then transfers the electrical load from the utility source to the generator set. After 20 minutes, the load is transferred back to the utility source. The engine runs without load for 5 minutes or until cool, and then shuts down automatically.

Note: With a loaded exercise, power to the building is lost for up to 10 seconds during load transfer.

For a loaded exercise controlled by the RDC2 controller, a Model RXT transfer switch must be connected to the generator set. To set a loaded exercise, follow the procedure in Figure 3-8 and select Exercise Type: Loaded.

For a loaded exercise with a transfer switch other than a Kohler® Model RXT, program the exercise at the transfer switch controller. Refer to the transfer switch operation manual for instructions.

2.4.5 Shutdown During Exercise (Advanced Diagnostic)

The following advanced diagnostic operation applies to RDC2 controllers with firmware versions 5.04 and higher.

If the generator set shuts down on a fault during an exercise, the controller will try to restart the engine. If the engine starts, the generator set will run at full speed for two minutes and then stop. The event history will show Advanced Diagnostic Active. The exercise schedule is maintained.

If the engine does not start, the shutdown message will be displayed. Correct the fault condition and reset the fault as described in Section 2.5.

2.4.6 Power Failure During Exercise Cycle

If the utility power is lost during an unloaded exercise, the ATS transfers to the emergency source, the exercise is ended and the control remains in the AUTO mode.

If the utility power is lost during a loaded exercise, the exercise is ended. The ATS remains in the emergency position and the control goes into the AUTO mode.

The generator set continues to run and supply power to the load for the duration of the utility power outage. When Utility power is restored, the ATS will re-transfer to the utility source through normal timing sequences.

2.5 Faults

The RDC2 controller displays fault messages for generator set warnings and shutdowns. Selected fault messages are shown in Figure 2-5. Contact an authorized distributor/dealer for service, if necessary.

2.5.1 Warnings

The controller displays a fault message but the generator set does not shut down on a warning. The controller resets automatically after a warning condition is corrected.

2.5.2 Shutdowns

Under a fault shutdown condition, the generator set shuts down automatically and the controller displays a fault message. The OFF LED flashes. In some cases, the engine cooldown cycle runs before the engine shuts down. See Figure 2-5.

Shutdown switches (such as the low oil pressure switch or high engine temperature switch) on the generator set will automatically reset when the problem is corrected. However, the fault condition at the controller does not clear until the controller is reset.

The generator set cannot be restarted until the fault condition is corrected and the controller is reset. See Section 2.5.5 for instructions to reset the controller after a fault shutdown.

2.5.3 Shutdown During Exercise (Advanced Diagnostic)

If the generator set shuts down on a fault during an exercise, the controller will try to restart the engine. If the engine starts, the generator set will run at full speed for two minutes and then stop. The event history will show Advanced Diagnostic Active. The exercise schedule is maintained.

If the engine does not start, the shutdown message will be displayed. Correct the fault condition and reset the fault as described in Section 2.5.

2.5.4 ATS Communication Errors

When a Model RXT transfer switch is used, an ATS fault indicates that the connection to the interface board on the transfer switch has been lost. Check the connection to the ATS interface board.

2.5.5 Resetting the Controller after a Fault Shutdown

Always identify and correct the cause of a fault shutdown before resetting the controller. Check the fault message displayed on the controller and refer to Figure 2-5 to identify and correct the fault condition before proceeding. Contact an authorized distributor/dealer for service, if necessary.

RDC2 Controller Reset Procedure

Press the OFF button to reset the controller, or follow the procedure below. See Figure 2-4.

1. While the fault message is displayed, press the Select button to go to the Overview menu.
2. Press Select again. The active fault message is displayed.
3. Press Select. Confirm Clear Fault: NO is displayed.
4. Press the Up arrow button. Confirm Clear Fault: YES is displayed.
5. Press the Select button to enter YES and clear the fault.
6. Press the Select button to return to the overview menu. The controller changes to OFF mode.
7. Press AUTO to put the generator set into automatic mode.

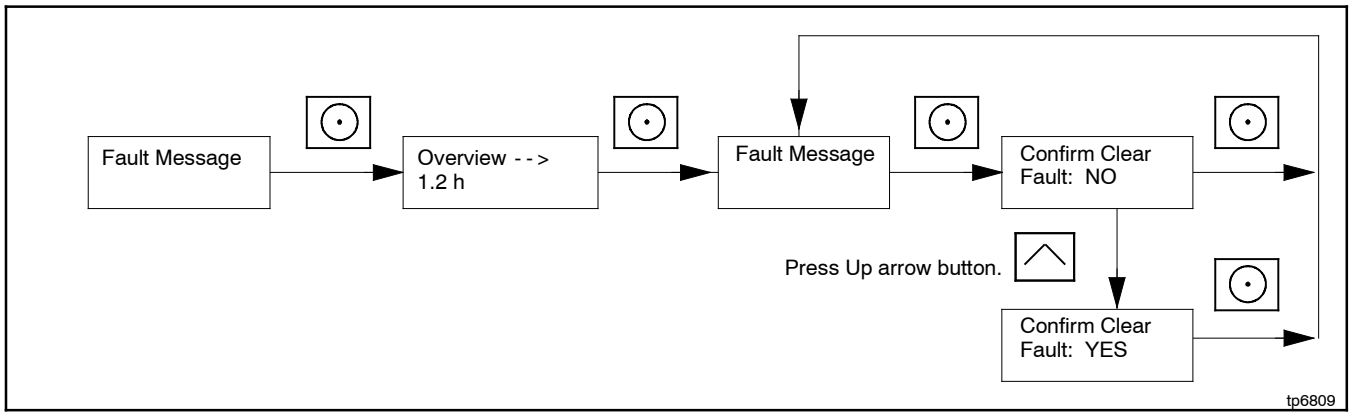


Figure 2-4 Clearing a Fault on the RDC2 Controller

Fault Message	Warning (W) or Shutdown (SD)	Condition	Check
AC Sens Loss	W (1 sec.) SD (3 sec.) *	AC sensing lost. In Auto mode, generator output AC sensing is lost. Detection begins10 seconds after crank disconnect. Warning: after 1 second if no output detected after crank disconnect. Shutdown: after 3 seconds if voltage was present and then lost.	Contact an authorized distributor/dealer for service.
Accy PwrOver Warning	W	Accessory Power Overload. An over current fault (short circuit) on the accessory controller power output.	Contact an authorized distributor/dealer for service.
Advanced Diagnostic	SD	Shutdown during the reduced speed portion of an exercise. The event history will show Advanced Diagnostic Active. The engine then restarts, runs at full speed for 2 minutes, and stops. The controller returns to AUTO mode. The exercise schedule does not change.	If the generator set does not restart and return to AUTO, check for other faults that prevent generator set operation.
ATS ComError	W	ATS communication error. Warning is displayed if ATS interface connection is lost. See Section 2.5.4.	Check communication wiring between transfer switch interface board and generator set.
ATS PhaseRot	W	ATS phase rotation mismatch. Transfer switch phase rotation does not match, ATS will not transfer.	Correct the ATS connection. Refer to the ATS Installation manual, wiring diagrams, and labels on the transfer switch.
Aux Input	SD *	Auxiliary input. An optional customer-connected input is closed. (Digital input from optional PIM.)	Check customer-supplied equipment.
Batt Chg Flt	W	Battery charger fault. Input to PIM from an external battery charger (not the built-in battery charger).	Check external battery charger.
Battery CrLo Warning	W	Engine starting battery voltage falls below 11 VDC for more than 10 seconds. Inhibited during the engine crank cycle. Clears when the battery voltage returns to an acceptable level.	Check the battery rating and condition. Check the battery charger operation. Charge or replace the battery.
Battery High	W	Engine starting battery voltage rises above 16 VDC for more than 10 seconds. Inhibited during the engine crank cycle. Clears when the battery voltage returns to an acceptable level.	Check the battery rating and condition. Check the battery charger operation.
Battery Voltage Low	W	Engine starting battery voltage falls below 12.5 VDC for more than 90 seconds when the engine is not running. Not operative during the engine crank cycle. Clears when the battery voltage returns to an acceptable level.	Check the battery rating and condition. Check the battery charger operation. Charge or replace the battery.
Eng Speed High	SD *	Engine speed exceeds 115% of the normal running speed for more than 0.3 seconds.	Contact an authorized distributor/dealer for service.
Eng Speed Low	SD *	Engine speed drops below 85% of the normal running speed for more than 3 seconds.	Reduce the load. Model 20RCA/20RCAL only: Check enclosure thermostat and reset if tripped. See Section 5.6. Contact an authorized distributor/dealer for service.
Exer Not Sch	W	Exercise not scheduled. No exercise is scheduled on the controller.	See Section 3.6 for instructions to set the exerciser.

* Engine cooldown runs before shutting down.

Fault Message	Warning (W) or Shutdown (SD)	Condition	Check
Frequency High	SD *	Governed frequency exceeds 110% of the system's frequency setpoint for more than 10 seconds. Function becomes active 10 seconds after engine start (10 second inhibit).	Contact an authorized distributor/dealer for service.
Frequency Low	SD *	Governed frequency falls below 90% of the system frequency setting for more than 10 seconds, or 1 Hz below the system frequency setting for more than 60 seconds. Function becomes active 10 seconds after engine start (10 second inhibit).	Reduce the load and restart the generator set. Model 20RCA/20RCAL only: Check enclosure thermostat and reset if tripped. See Section 5.6. Contact an authorized distributor/dealer for service.
Lo Crank Vlt	W	Low cranking voltage. Battery voltage dropped below 3.5 VDC during engine cranking.	Charge or replace the battery.
Locked Rotor	SD	No engine rotation is sensed during cranking. Shuts down 3 seconds after the fault is detected.	Check the battery. Check for loose connections. Contact an authorized distributor/dealer for service.
MainPwrOverL	SD	Main power overload. An over current fault on the 70 controller power output (short circuit).	Contact an authorized distributor/dealer for service.
Not in Auto	W	The generator set is not in Automatic (standby) mode. Remote start and stop commands from a transfer switch or remote switch will be ignored.	Press AUTO to place the generator set in Automatic mode, when appropriate.
Oil Press Low	SD *	The LOP switch indicates low oil pressure for more than 5 seconds. Function becomes active 30 seconds after crank disconnect (30 second inhibit). **Note:** The low oil pressure shutdown does not protect against low oil level. Check the engine oil level regularly as recommended in Section 4.	Check for leaks in the lubrication system. Check the oil level and add oil if the level is low. Check the oil pressure switch and wiring.
Over Crank	SD	Three unsuccessful starting attempts.	Check the fuel supply, spark plug, and battery. Check for loose connections. Contact an authorized distributor/dealer for service.
Spd Sens Flt	SD	Engine speed sensor has failed or engine stalled.	Contact an authorized distributor/dealer for service.
Volts L1-L2 High	SD *	Generator voltage high. Output voltage exceeds 120% of the system nominal voltage for more than 2 seconds.	Contact an authorized distributor/dealer for service.
Volts L1-L2 Low	SD *	Generator voltage low. Output voltage falls below 80% of the nominal system voltage for more than 10 seconds.	Reduce the load and restart the generator set. Model 20RCA/20RCAL only: Check enclosure thermostat and reset if tripped. See Section 5.6. Contact an authorized distributor/dealer for service.
* Engine cooldown runs before shutting down.			

Figure 2-5 Controller Fault Messages

2.5.6 Faults Related to Paralleling

If the PowerSync® Automatic Paralleling Module (APM) is used with two 14 kw or two 20 kW generator sets, additional faults and events related to the paralleling system may be displayed on the controller and/or in OnCue Plus. This section lists those faults and events.

See the installation instructions provided with the APM for additional paralleling information.

Note: Contact an authorized distributor or dealer for paralleling system installation, startup, troubleshooting, or service.

Fault Text	Description	When Active	Warning Delay, sec.	Display Cleared On
Current A High Warning	Over Current	Paralleled	10	Press AUTO or OFF *
Frequency High Warning	Over Frequency	Paralleled	10	Press AUTO or OFF *
Frequency Low Warning	Under Frequency	Paralleled	10	Press AUTO or OFF *
Reactive Power Low Warning	Loss of Field	Paralleled	10	Press AUTO or OFF *
Real Power High Warning	Over Power	Paralleled	10	Press AUTO or OFF *
Real Power Low Warning	Reverse Power	Paralleled	10	Press AUTO or OFF *
Voltage L1-L2 High Warning	Over Voltage	Paralleled	10	Press AUTO or OFF *
Voltage L1-L2 Low Warning	Under Voltage	Paralleled	10	Press AUTO or OFF *
* Pressing OFF will stop the generator set.				

Figure 2-6 Warning Messages (protective relay disconnect)

Fault Text	Description	Possible Causes *
BusDeadLive	The bus is measured to be dead when one of the generators is supposed to be supplying voltage to the bus (closed contactor)	Bus metering V9A and V9B connections to V9 of paralleling protection harness are connected incorrectly.
BusLiveDead	The bus is measured to be live when no generators are connected to it (both contactors open).	Bus metering V9A and V9B connections to V9 of paralleling protection harness connected incorrectly.
CfgModelNum	The two generators that are intended to be paralleled have incompatible model numbers.	Incorrect configuration of one of the generators. Different generator types. The paralleled generator sets must be the same kW model. (i.e. two 14 kW or two 20 kW models.)
CfgSysVolt	The system voltage of the two generators intended to be paralleled is not the same. Because the system does not know which voltage is correct, the generators will not be allowed to start.	One of the two generators is incorrectly configured. Intermittent connections on RBUS network wiring.
ChkngMeter	This generator has paralleled to the other generator and is verifying that the metering is connected and establishing the connection direction.	Status message appears the first time the two generators are paralleled.
ConCheckFail	Failure to Auto-Discover APM connections.	Wires 9A and 9B crossed between the generators. Wires 9A or 9B not connected
ConChecking	Performing APM connection auto-discovery.	This generator has started in RUN, the other generator is in OFF.
ConNotDeterm	APM connection auto-discovery is not complete. This means that the generator does not know which contactor is connected to it.	Generators not yet started in RUN with other generator in OFF. See the APM instruction sheet for instructions to perform the auto-discovery procedure.
ContactorOk	Successful auto-discovery of APM connections.	Auto-discovery was activated by placing other generator in OFF and this generator in RUN.

Fault Text	Description	Possible Causes *
ErraticSig	The power metering on this controller gives a signal that is not consistent with the system configuration. Reversing the power direction does not resolve the problem.	Bad wiring to the CT. Too much tension on wires from the CT to the controller.
LossOfComAPM	The Automatic Paralleling Module has stopped communicating on RBUS. (An APM was detected on the RBUS network but is no longer communicating.)	APM is unplugged. Primary controller is powered down. Check the battery connections. See previous page for more information. Intermittent connections on RBUS network wiring. Check RBUS communication connections.
LossOfComm2	The primary controller has lost communication with the secondary controller. (A secondary controller was detected, then communication was lost.)	RBUS disconnected, secondary controller battery disconnected, updating firmware in secondary controller, or intermittent RBUS connections.
LossOfField	This generator has absorbed more than 25% reactive power (magnetic excitation current) for 20 seconds	Generator voltage on this generator is not calibrated correctly. Generator voltage on other generator is not calibrated correctly. Bus voltage on this generator is not calibrated correctly. Bus voltage on the other generator is not calibrated correctly.
MeteringOk	The generator has verified that the metering is connected correctly and that the direction is consistent with expected power direction.	Status message indicates that the CT is connected to the generator correctly.
MeterUnknown	This generator does not know if the metering is connected or the orientation of the connection. This means that the generators can't share load accurately until this information is known.	System commissioning and startup not yet complete. See the APM instructions.
NoCurrent	The generator has applied load (using the other generator) and has observed no current on the power sensing inputs.	The CT is not connected to the controller. The output leads from the generator do not go through the CT in the correct direction. See the APM instructions.
SyncFailure	The generator has been attempting to synchronize for over 2 minutes without success.	Generator is hunting. Advanced speed control settings need adjustment. Load is changing frequently to disturb the online generator.
* For paralleling system troubleshooting and service, contact an authorized distributor or dealer.		

Figure 2-7 Events Related to Paralleling

Generator Set State	Description
Generator Management Off	This generator has been stopped by generator management because it is not presently needed to supply the load. The generator is available and will start if it is needed again.
ProtectiveRelayTrippedContactor	The contactor has been forced to open to protect one of the generators or the customer's load.
Synchronizing	The generator is actively trying to match frequency, voltage and phase with that of the paralleling bus.
Unloading	The generator is actively trying to transfer load from itself to the other generator.

Figure 2-8 Generator Set States Related to Paralleling

Notes

3.1 RDC2 Generator Set/Transfer Switch Controller

Model RCA and RCAL generator sets are equipped with the RDC2 generator set/transfer switch controller. See Figure 3-1 for controller illustrations.

The RDC2 controls the following power system components:

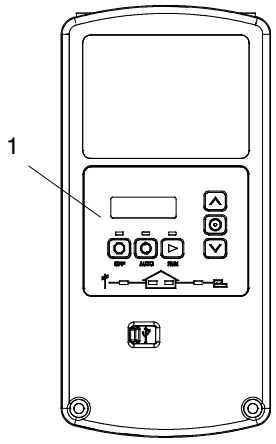
- Model RCA or RCAL generator set
- Model RXT Automatic Transfer Switch (ATS)
- Load management device
- Programmable Interface Module (PIM)

The RDC2 controller features include:

- Two-line x 16 character backlit digital display with adjustable contrast
- OFF, AUTO, and RUN generator set master control buttons
- Generator set status indicating LEDs (OFF, AUTO, RUN)
- Up, Down, and Select buttons for navigation through menus and adjustments
- Power system indicator LEDs to show utility and generator source status, and to show which source (utility or generator) is supplying power to the load (Model RXT automatic transfer switch is required for operation of these LEDs.)

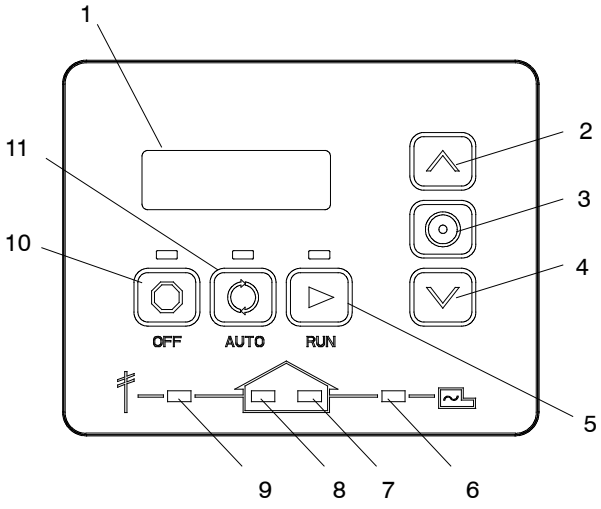
3.2 Controls and Indicators

Figure 3-1 illustrates the RDC2 controller. See Figure 3-2 for details of the controller's user interface.



1. User Interface; see Figure 3-2

Figure 3-1 RDC2 Controls and Indicators



1. 2-line LCD display
2. Up button
3. Select button
4. Down button
5. RUN button and LED
6. Generator power available LED*
7. Building on generator power LED*
8. Building on utility power LED*
9. Utility power available LED*
10. OFF button and LED
11. AUTO button and LED

* These LEDs operate only if a Model RXT automatic transfer switch is connected.

Figure 3-2 RDC2 User Interface

3.2.1 Controller Keypad

The RUN, OFF, and AUTO buttons control the generator set as described in Figure 3-3.

Use the Select, Up arrow, and Down arrow buttons to navigate through the menus and change settings, if necessary. See Section 2.3 for operation instructions.

3.2.2 LED Indicators

LEDs above the RUN, OFF, and AUTO buttons indicate the mode of operation as shown in Figure 3-4.

Power System LEDs indicate the status of the utility power and the generator set, and indicate which source is supplying power to the building (based on the position of the RXT transfer switch). See Figure 3-2 and Figure 3-4.

Note: The power system LEDs operate only if a Model RXT transfer switch is connected.

Button	Button Function
RUN	Starts the generator set. The engine start time delay is ignored.
OFF	Stops the generator set. The cooldown time delay is ignored. During the engine crank cycle, pressing OFF will stop the crank cycle. Press OFF to clear faults and reset the controller.
AUTO	Places the generator set in Automatic (standby) mode.
Down arrow	Use to navigate through menus and change settings. This manual contains instructions to navigate the controller menus and adjust settings on the RDC2 controller.
Select	
Up arrow	

Figure 3-3 RDC2 Controller Pushbutton Operation

LED	LED Operation
RUN	Lights when the generator set has been started locally by pressing the RUN button. Remote start and stop commands are ignored.
OFF	Lights for 2 seconds, then flashes every 2 seconds when the generator set and controller are off. Remote start/stop commands have no effect. The exercise cycle will not run.
	In Auto mode, OFF LED flashes quickly to indicate a fault shutdown. Attention required. Identify and correct the fault condition before resetting the controller.
AUTO	Lights when the generator is in automatic (standby) mode. Generator set will respond to engine start and stop commands from the controller (for example, exercise start and stop commands) or an ATS. Time delays operate as described in Section 2.3.
Utility Power Available *	Lights when utility power is available.
Building on Utility Power *	Lights when the building load is connected to utility power through the RXT transfer switch.
Generator Power Available *	Lights when generator power is available.
Building on Generator Power *	Lights when the building load is connected to generator power through the RXT transfer switch.
* These LEDs operate only if a Model RXT transfer switch is connected.	

Figure 3-4 RDC2 Controller LED Operation

3.2.3 LCD Display

The controller is equipped with a two-line x 16 character backlit digital display with adjustable contrast. When the generator is running, the controller automatically scrolls through the displays shown in Figure 3-5. When the system is in AUTO, the screens shown in Figure 3-6 are displayed.

When a fault or warning condition exists, the controller will show the corresponding message. See Section 2.5 for more information about faults.

Controller menus display power system information, including status information for the engine, generator, and optional RBUS accessories, exercise settings, and event history. Some menus allow changes to the controller settings. See Sections 3.7 through 3.21 for menu diagrams.

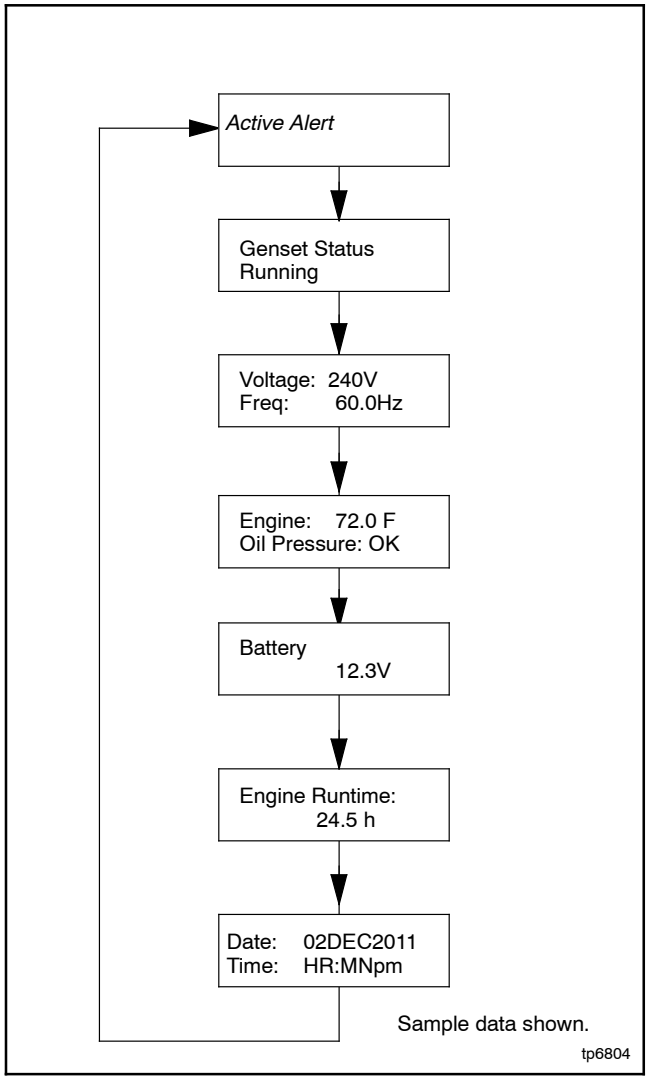


Figure 3-5 Autopaging Displays, Generator Running

The display contrast is adjustable. Navigate to the Genset System menu and step down to the Contrast screen. Press the Select button, and then use the up and down arrow buttons to adjust the contrast. See Section 3.5, Changing Settings, and Section 3.14, Genset System Menu.

The display backlight turns off after about a minute of no activity. The backlight turns on when a button is pressed or when the generator set starts.

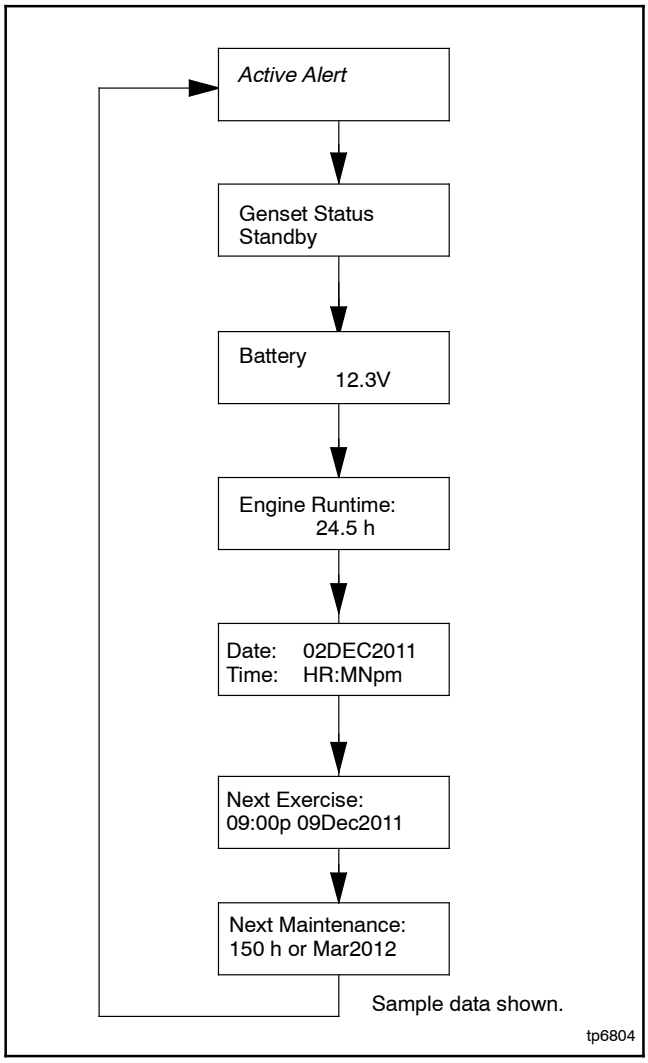


Figure 3-6 Autopaging Displays, Automatic Mode

3.3 Controller Power

The RDC2 controller is powered by the generator set engine starting battery and the built-in battery charger.

Note: To disconnect controller power, disconnect the utility power to the generator set *and* disconnect the battery.

If controller power is disconnected and reconnected, you will be prompted to set the language, time, date, and 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 all settings are saved and the controller returns to the main menu. See Section 3.5 for more detailed instructions to change settings on the RDC2. See Section 3.6 for more detailed instructions to set the exerciser or change the exercise settings.

3.4 Battery Charging

The controller includes a built-in battery charger to maintain the engine starting battery. The RDC2 controller monitors the battery voltage and provides a constant 13.4 ±2% VDC voltage and maximum 2.5 amps to charge the battery.

The installer must connect utility power provided from the building on a breaker-protected circuit for the built-in battery charger as described in the generator Installation Manual.

3.5 Changing Settings

Some settings can be changed from the controller keypad. The controller settings and generator set output are factory-set and should not require field adjustment under normal circumstances. Check and adjust the settings and/or output when:

- The controller has been replaced.
- The voltage requires adjustment for a particular application.
- Troubleshooting generator set problems.

Have controller setup and adjustment performed only by an authorized distributor/dealer or authorized representative.

The following procedure explains how to change settings. See Figure 3-7 for an example using the Date and Time settings.

Note: Use caution when navigating the controller menus. In some menus, pressing the Select button can enable editing of the controller settings. Changing the settings to incorrect values can adversely affect generator set operation or render the unit inoperable.

Procedure to Change Settings

1. Press the Select button to enter the main menu.
2. Press the down arrow button until the desired menu is displayed. The Genset System menu is used for this example. See Figure 3-9.
3. Press the Select button to enter the genset system displays. See Figure 3-7.
4. Press the down arrow button to step through the generator set system settings.
5. To change any of the genset system settings, press the Select button. The selected setting flashes.
6. Press the up or down arrow buttons to increase or decrease the setting.
7. When the desired setting is shown, press Select. The value stops flashing. If there are additional adjustable settings on the screen, the next setting flashes. For example, in the date menu, the day, month, and year can be adjusted.
8. Repeat steps 6 and 7 for each setting on the screen.
9. Press the down arrow to step to the next screen.
10. To exit, press the down arrow button until Return is displayed. Press the Select button to exit the menu.
11. Press the AUTO or OFF button to exit the main menu.

Note: If no buttons are pushed, the controller exits the menus and returns to the generator set status display after 5 minutes.

Changing Settings on the RDC2 Controller

1. Press the Select button to enter the main menu.

Press:  **Display:**

```
Overview - - >
1.2 h
```

2. Press the down arrow button until the desired menu is displayed. See Figure 3-9. Date and Time are used for this example.

Press:  **Display:**

```
Date      - - >
and Time
```

3. Press the Select button to enter the Date and Time menu.

Press:  **Display:**

```
Date:
05Dec2011
```

4. To change the date and time settings, press the Select button again. The year will flash.

Press:  **Display:**

```
Date:
05Dec2011
```

5. Press the up or down arrow buttons to change the year.

Press:  **OR**  **Display:**

```
Date:
05Dec2012
```

6. When the correct year is shown, press the Select button. The year is saved and the next setting (month) flashes.

Press:  **Display:**

```
Date:
05Dec2012
```

7. Repeat steps 5 and 6, using the arrow and select buttons to set the month and the date.

8. When the correct date is shown, press the Select button. The saved date is shown.

Press:  **Display:**

```
Date:
03Jan2012
```

9. Press the down arrow button to step to the next menu.

Press:  **Display:**

```
Time:
01:49pm
```

10. Repeat steps 5 and 6, using the arrow and select buttons to set and save the time.

Note: To change from am to pm, press the up arrow key to increase the hour until the correct hour and pm is displayed.

11. In the time format menu, press Select and then press the up or down arrow button to change the format, 12 hr. or 24 hr. Press Select to save the displayed format.

12. Press the down arrow button. Return is displayed.

Press:  **Display:**

```
<- - Return
```

13. Press Select to return to the Date and Time menu.

Press:  **Display:**

```
Date      - - >
and Time
```

14. Press the Up or Down arrow buttons to step to a different menu.

15. Press Auto to signal the controller to exit the menus and return to the generator set status display.

Press:  AUTO **Display:**

```
Genset State
Standby
```

Note: If no buttons are pressed, the controller returns to the status display after 5 minutes.

Figure 3-7 Changing Settings

3.6 Setting the Exerciser

Set the exerciser to automatically run the generator set for 20 minutes every week or every two weeks.

3.6.1 Setting the Exerciser at Controller Power-up

When battery power is connected to the controller, you will be prompted to set the language, 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. See Section 3.5 for more detailed instructions to change settings on the RDC2.

If the battery is disconnected and reconnected during generator set maintenance or service, the time, date, and exercise settings will need to be re-entered.

3.6.2 Changing the Exercise Settings

This section explains how to change the exercise settings after the initial setup.

Follow the procedure below and see the flowchart in Figure 3-8 to set the exercise time and date, mode, and frequency.

Procedure to Set the Exerciser

1. Press the AUTO button on the controller.
2. Press the Select button to go to the main menu. See Figure 3-9.
3. Press the down arrow button to step to the Genset System menu.
4. Press the Select button to enter the Genset system menu. See Figure 3-8.
5. Use the down arrow button to step to the Next Exercise menu. If the exerciser is not set, No Exercise Scheduled will be displayed.
6. Press and HOLD the Select button to enable editing.
7. Press the Select button. The setting flashes to show that it can be changed. For example, HR flashes to show that the hour can be changed.
8. Press the Up or Down arrow buttons to change the setting.
9. Press the Select button to save the setting and move to the next. For example, save HR setting and move to MN.
10. Repeat steps 5 through 9 to change the next item on the line until the desired settings are displayed.
11. Press Select to save after all settings have been selected. Settings will stop flashing.
12. If the generator set is connected to a Kohler® Model RXT transfer switch, the exercise can be changed to a loaded exercise. Set the Exercise Mode to Unloaded Cycle, Unloaded Full, or Loaded Full (RXT ATS required) as shown in Figure 3-8. Unloaded Cycle is recommended. See Sections 2.4.2 through 2.4.4 for information about the exercise modes.
13. Set the exercise frequency (weekly or every two weeks). Weekly exercises are recommended.
14. Press the down arrow button to step to the Return menu. Press the Select button to return to the main menu.

After a scheduled exercise run, the next exercise time and date will be updated automatically based on the Exercise Frequency setting.

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

Exerciser Reset

To reset the exerciser to run at a different day and/or time or to change the exercise mode, follow the procedure in Section 3.6.2 to change the exerciser settings.

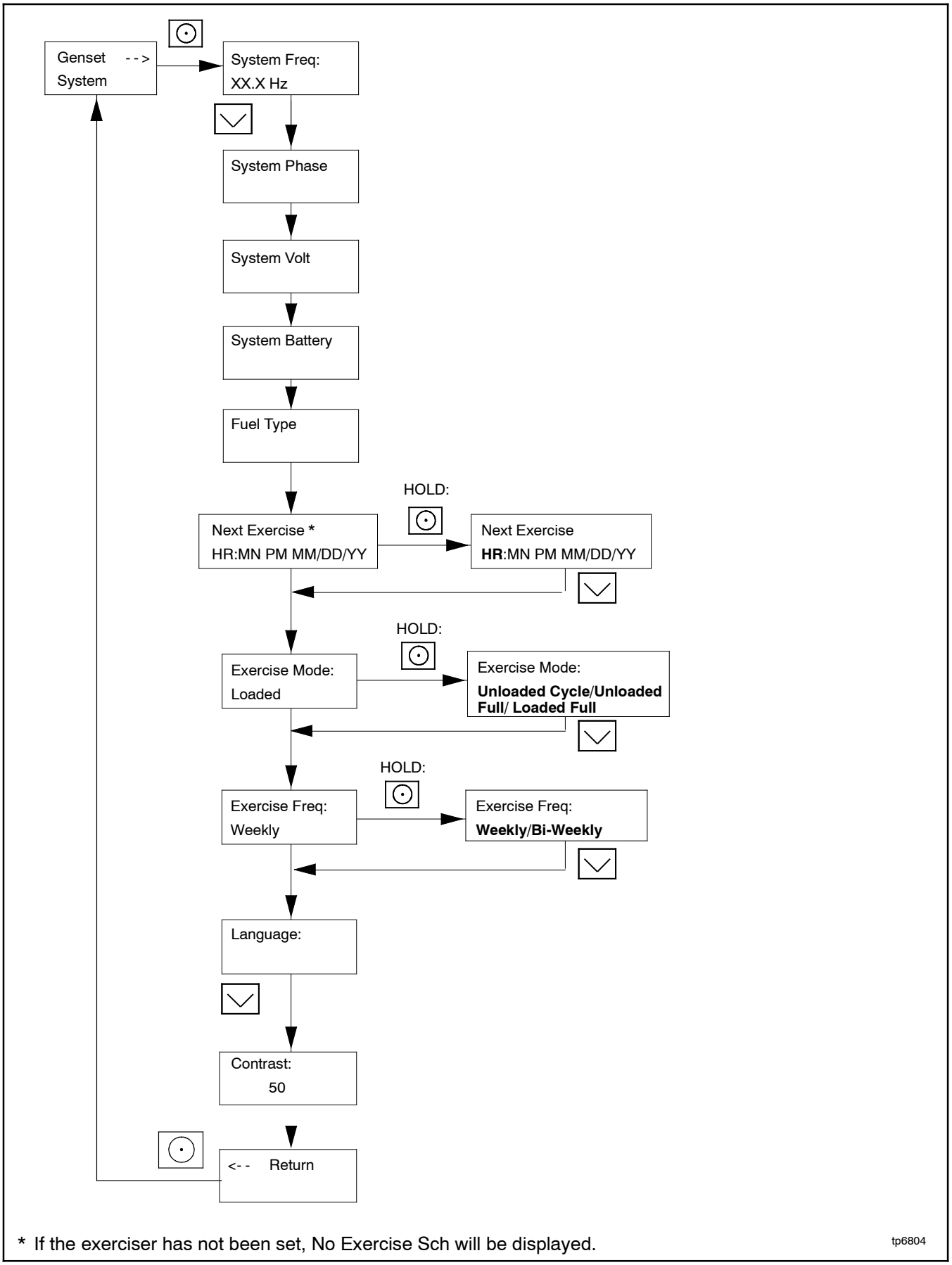


Figure 3-8 Procedure to Set the Exerciser on the RDC2 Controller

3.7 RDC2 Controller Menus

Controller menus display power system information, including status information for the engine, generator, and optional RBUS accessories, exercise settings, and event history. Some menus allow changes to the controller settings. Status information, including the engine runtime, cannot be changed by the operator.

Diagrams in the following sections show how to navigate through the menus. The diagrams show sample settings. Settings for your application may vary.

Note: Use caution when navigating the controller menus. In some menus, pressing the Select button can enable editing of the controller settings. Changing the settings to incorrect values can adversely affect generator set operation or render the unit inoperable.

If a setting on the controller display is flashing, edit mode has been enabled. Press the OFF or AUTO button to exit the edit mode.

3.8 Main Menu

Press the Select button once to bring up the main menu. Overview is displayed. See Figure 3-9. Press the down arrow button to step to the next menu, Engine Metering. Use the UP and DOWN arrow buttons to step up and down through the menus shown in Figure 3-9.

The controller will exit the main menu after 5 minutes if no buttons are pressed. To exit the main menu immediately, press the controller's OFF or AUTO button.

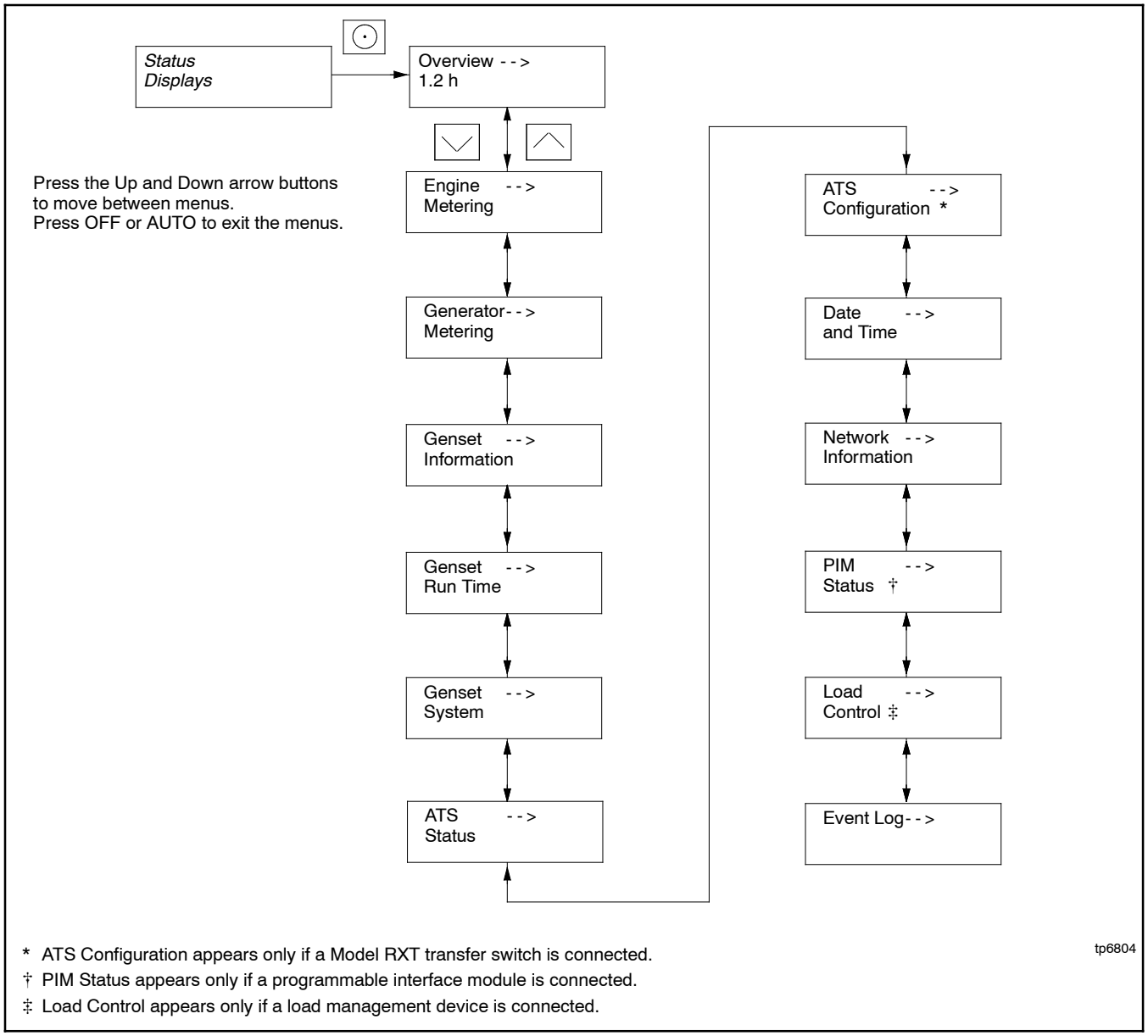


Figure 3-9 RDC2 Main Menu

3.9 Overview Menu

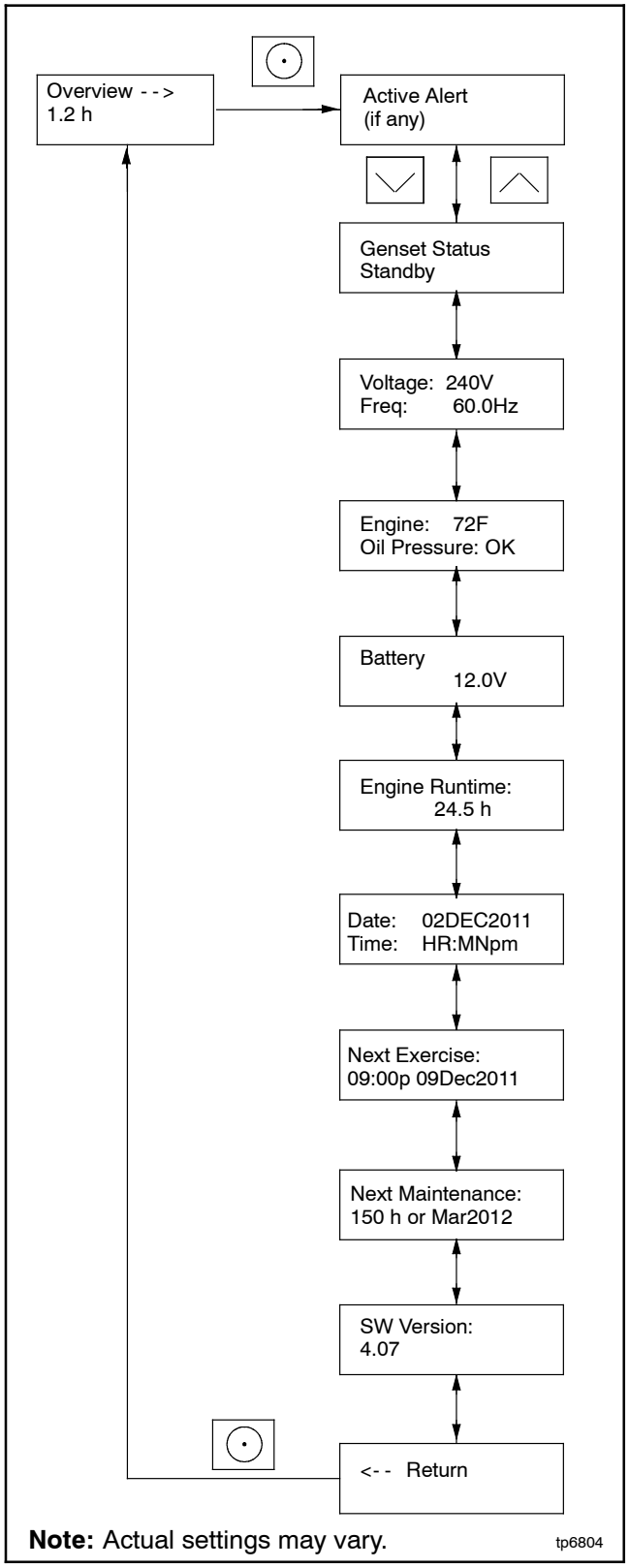


Figure 3-10 Overview Menu

3.10 Engine Metering Menu

The engine metering menu displays engine status information as shown in Figure 3-11. This menu displays status information only. No settings can be changed from this menu.

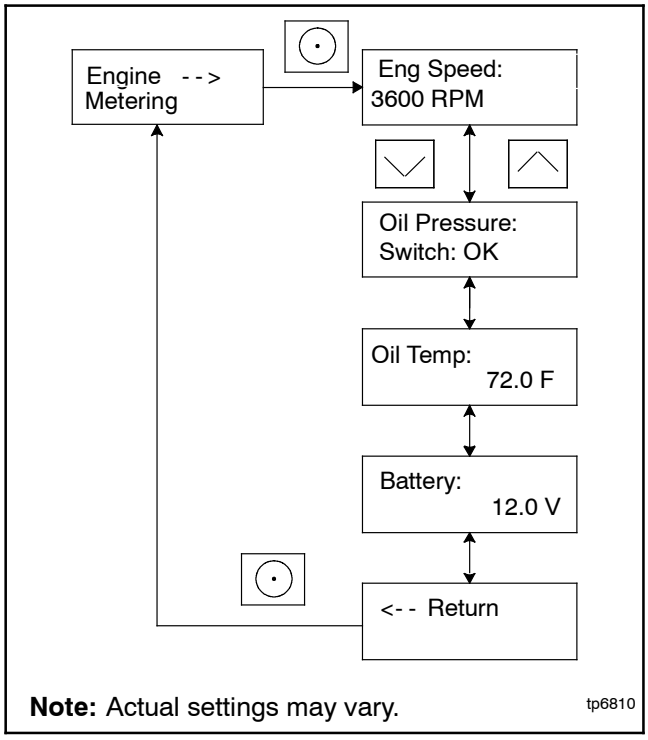


Figure 3-11 Engine Metering Menu

3.11 Generator Metering Menu

The generator metering menu displays the generator voltage and frequency. See Figure 3-12.

Voltage Calibration

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

The voltage calibration mode can be entered from the Generator Metering menu. Contact a Kohler-authorized distributor/dealerdealer for service.

The Reset Calibration menu allows you to set the voltage reading back to the original value after calibration, if necessary. See Figure 3-12.

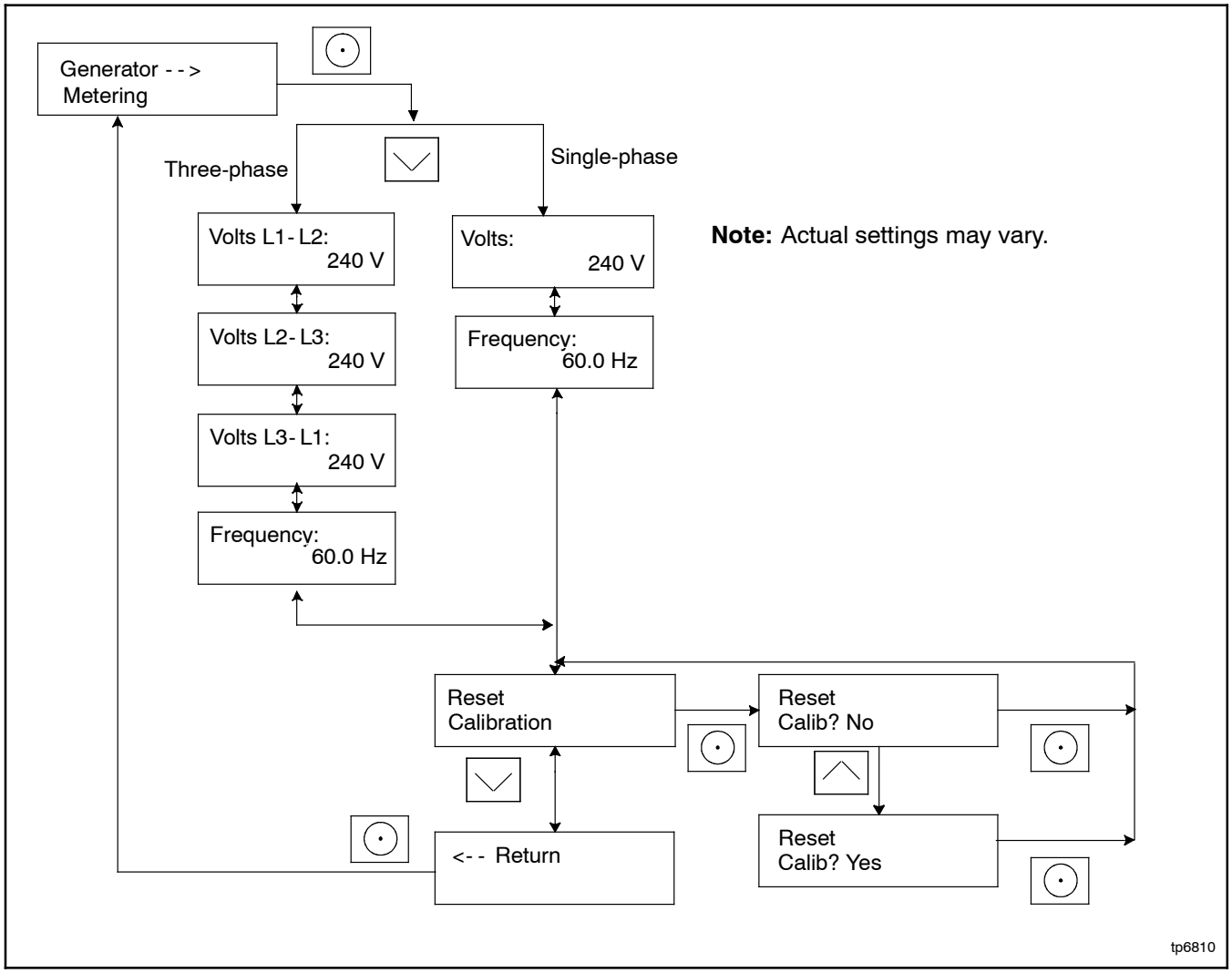


Figure 3-12 Generator Metering Menu

3.12 Generator Set Information Menu

The generator set model number and serial numbers are displayed. No changes are allowed from this menu.

Model and serial numbers are factory set and should not require changes in the field, except in the event that the controller is being replaced. A personal computer running Kohler SiteTech software is required to enter the generator set model number and serial numbers on a replacement controller. Contact an authorized Kohler distributor/dealer for service.

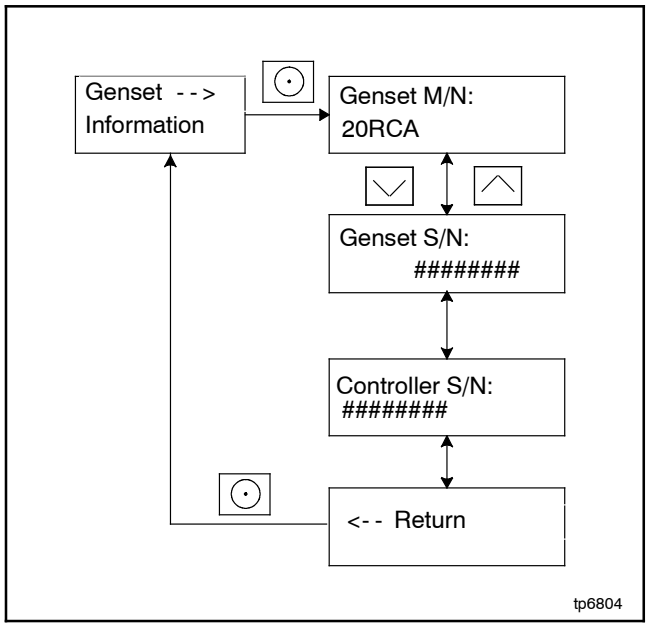


Figure 3-13 Generator Set Information Menu

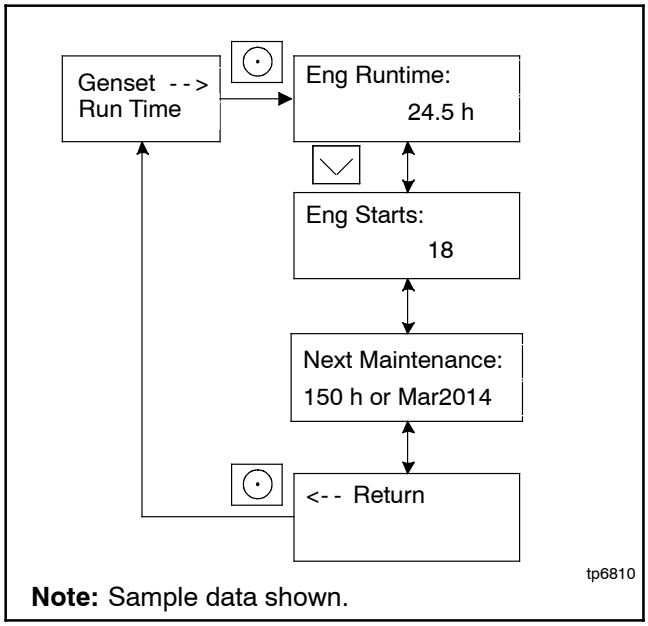
3.13 Genset Run Time Menu

The data shown in Figure 3-14 are displayed. No changes are allowed from this menu.

Eng Runtime displays the total number of hours that the generator set engine has run. The runtime is not resettable.

The Next Maintenance menu shows the number of hours of generator set operation until maintenance is required. The estimated date for the next scheduled maintenance is also displayed. The maintenance reminder intervals are based on the engine manufacturer's recommendation for changing the oil. Refer to Section 4, Scheduled Maintenance, for maintenance instructions.

After changing the oil and performing other recommended maintenance, go to the Overview menu to reset the maintenance timer. See Section 4.2.5 for instructions to reset the maintenance timer.



Note: Sample data shown.

Figure 3-14 Generator Set Run Time Menu

3.14 Genset System Menu

The genset system menu displays the system information shown in Figure 3-15. Generator sets are factory set and should not require changes to the system settings in the field.

A Kohler authorized distributor or dealer can adjust these settings, if necessary. If the generator set is reconnected to a different voltage or the system settings require adjustment for some other reason, see Section 3.5 for instructions to enable editing and change the system settings.

Note: Use caution when navigating the controller menus. In some menus, pressing the Select button can enable editing of the controller settings. Changing the settings to incorrect values can adversely affect generator set operation or render the unit inoperable.

Voltage Regulator (VR) Voltage Adj

The generator set voltage is factory set and typically does not require adjustment in the field. If voltage adjustment is required, contact a Kohler authorized distributor or dealer for service. Refer to the generator set Installation Manual for instructions to adjust the voltage.

Fuel Type

The fuel type, LP or natural gas, is shown. Do not change the fuel type in this menu unless the generator's fuel system has been converted by an authorized distributor or dealer.

Setting the Exerciser

Use the Genset System menus to set the generator set exerciser. Refer to Section 2.4 for instructions to set the exerciser and for more information about exercising the generator set.

After a scheduled exercise run, the Next Exercise time and date will be updated automatically based on the Exercise Frequency setting.

Language

Controllers can be set for the following languages: English, French, Spanish, Dutch, or German.

Adjusting the Display Contrast

To adjust the display contrast, use the down arrow button to step to the Contrast menu. Press the Select button, and then use the up and down arrow buttons to adjust the contrast. Press the Select button to save the contrast setting.

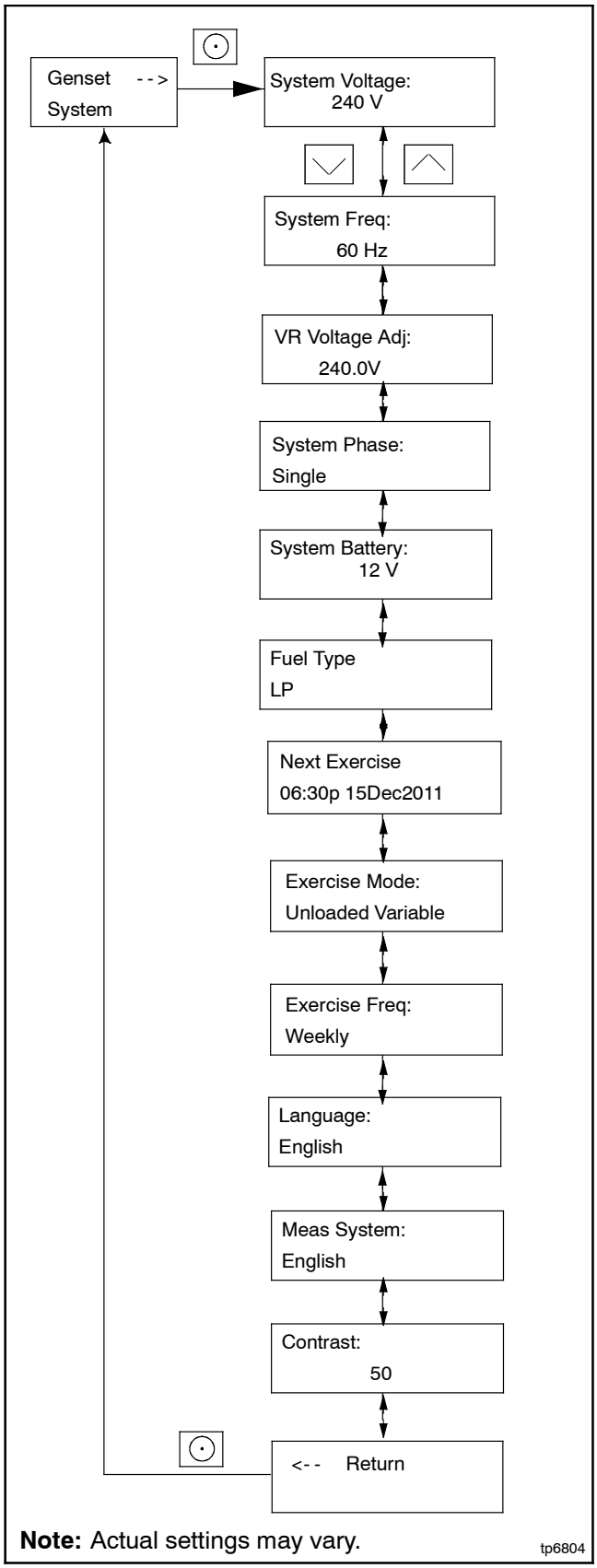


Figure 3-15 Genset System Menu

3.15 ATS Status Menu

ATS menus appear if a Model RXT transfer switch is connected to the generator set. If no transfer switch is connected, or another model ATS is connected to the engine start connections, Remote ATS is displayed on the ATS Status screen.

The ATS Status menu displays Model RXT transfer switch and source information.

The voltage shown in these menus can be calibrated. Follow the safety precautions at the beginning of this manuals. Use a voltmeter to measure the line-to-line voltage and follow the instructions in Figure 3-16 to calibrate the voltage readings.

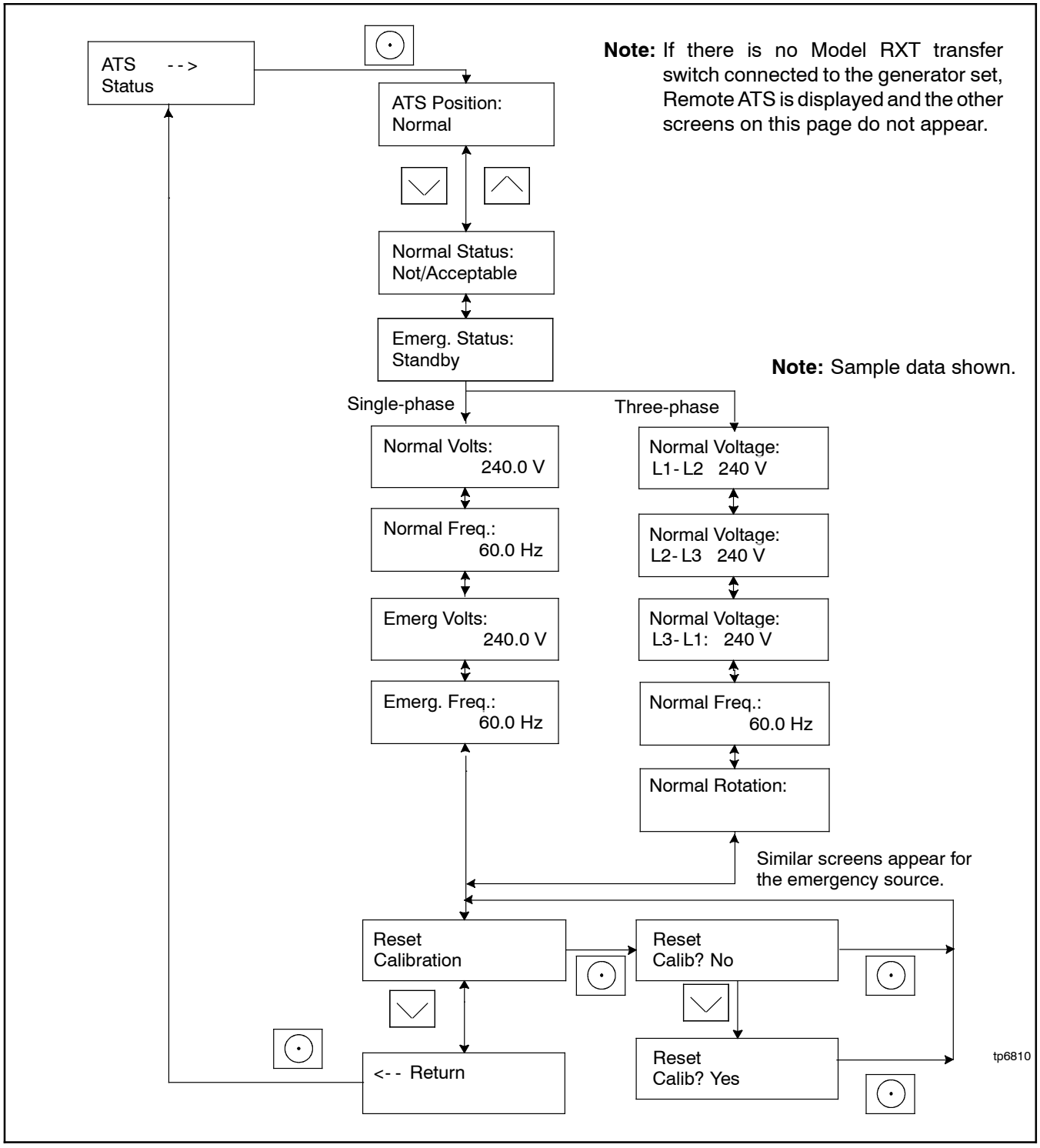


Figure 3-16 ATS Status Menu, with Calibration

3.16 ATS Configuration Menu

Note: The ATS Configuration menu appears only if a Model RXT transfer switch is connected.

Use the ATS Configuration submenu to check the Model RXT transfer switch system settings and time delays, and change the settings, if necessary.

Changing ATS Configuration Settings

To enable editing, press the select button. The value flashes to indicate that it can be changed. Press the up and down arrow buttons to change the value. Press the Select button to save the value shown.

Use the up and down arrow buttons to move to the next value to be changed. Repeat the adjustment process until all values are correct.

Press the down arrow until Return is displayed. Press the select button to return to the main menu.

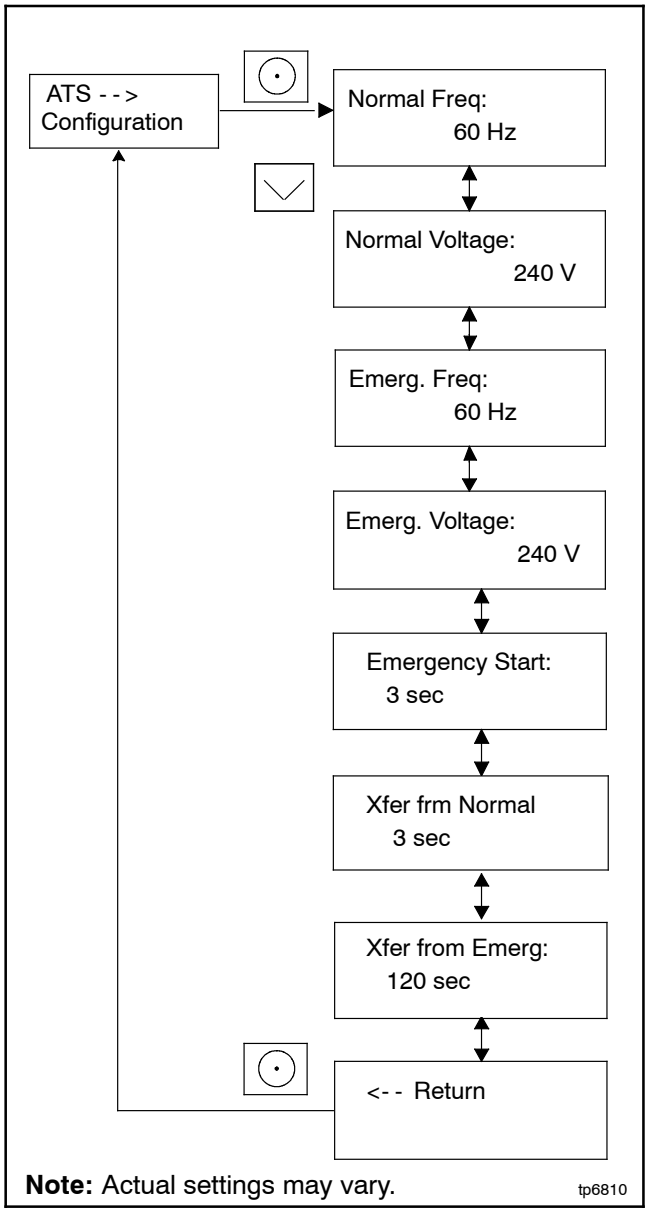


Figure 3-17 ATS Configuration Menu

3.17 Date and Time Menu

The date and time will typically be set at controller power- up. To change the date, time, or time format (12 hour or 24 hour), use the Date and Time menu. See Figure 3-18.

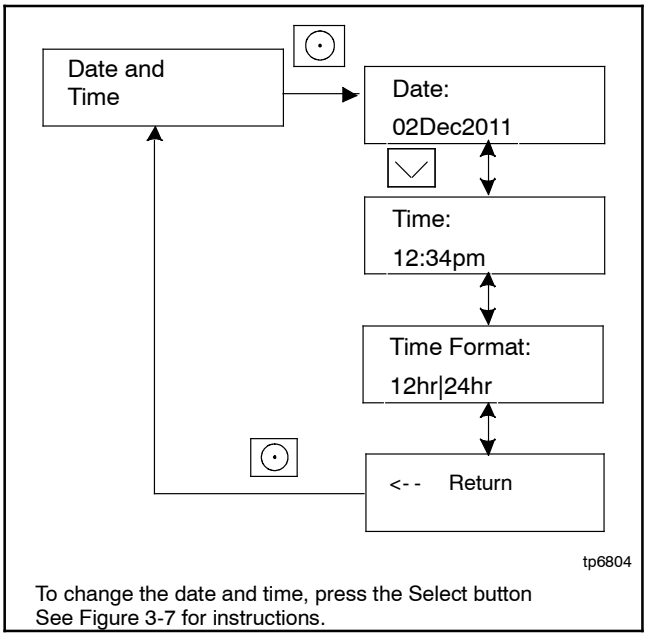


Figure 3-18 Date and Time Menu

3.18 Networking Information Menus

Use the networking menus to view and adjust communication settings for systems with remote RBUS devices such as a PIM or load shed kit, and for systems that use the Kohler OnCue® Plus Generator Management System.

RBUS is a proprietary RS-485 communications protocol.

The Networking Information menu leads to submenus for network and RBUS communication settings.

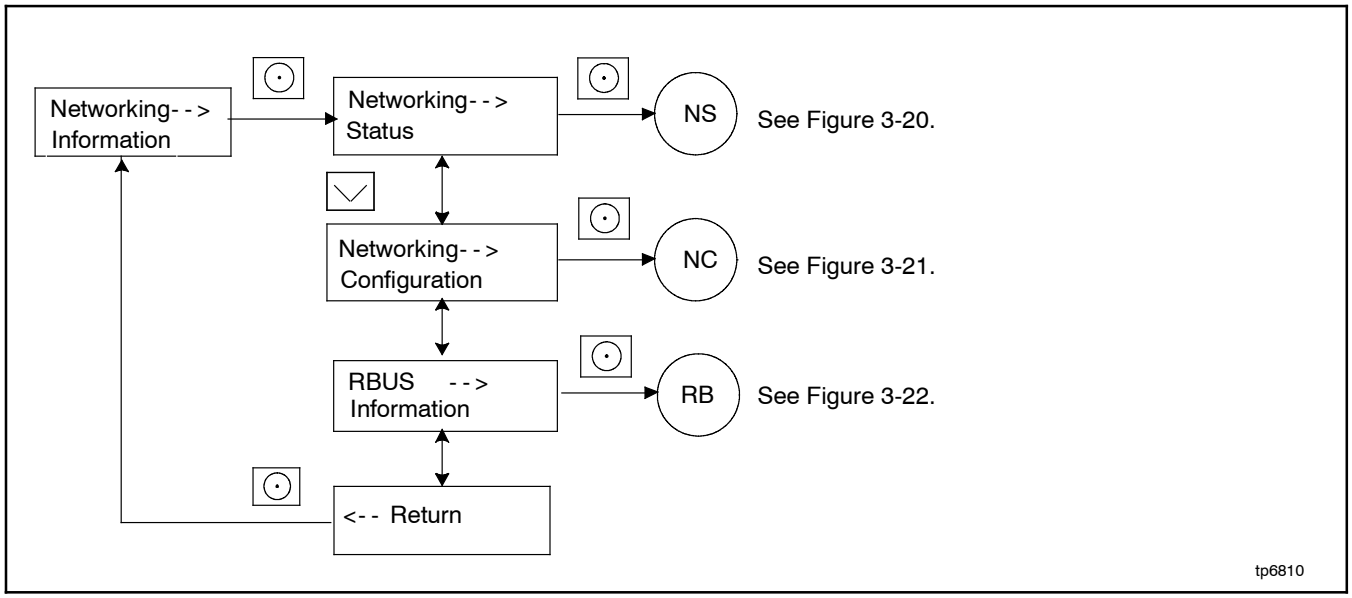


Figure 3-19 Networking Information Menu

3.18.1 Networking Status Submenu

The Networking Status submenu contains settings for OnCue®. Changes to these settings are not typically required.

If DHCP is enabled, IP parameters are not displayed. If DHCP is disabled (i.e., if a static IP address is used), the IP parameters are displayed.

To enable or disable DHCP and change the IP settings, go to the Networking Configuration menu. See Section 3.18.2.

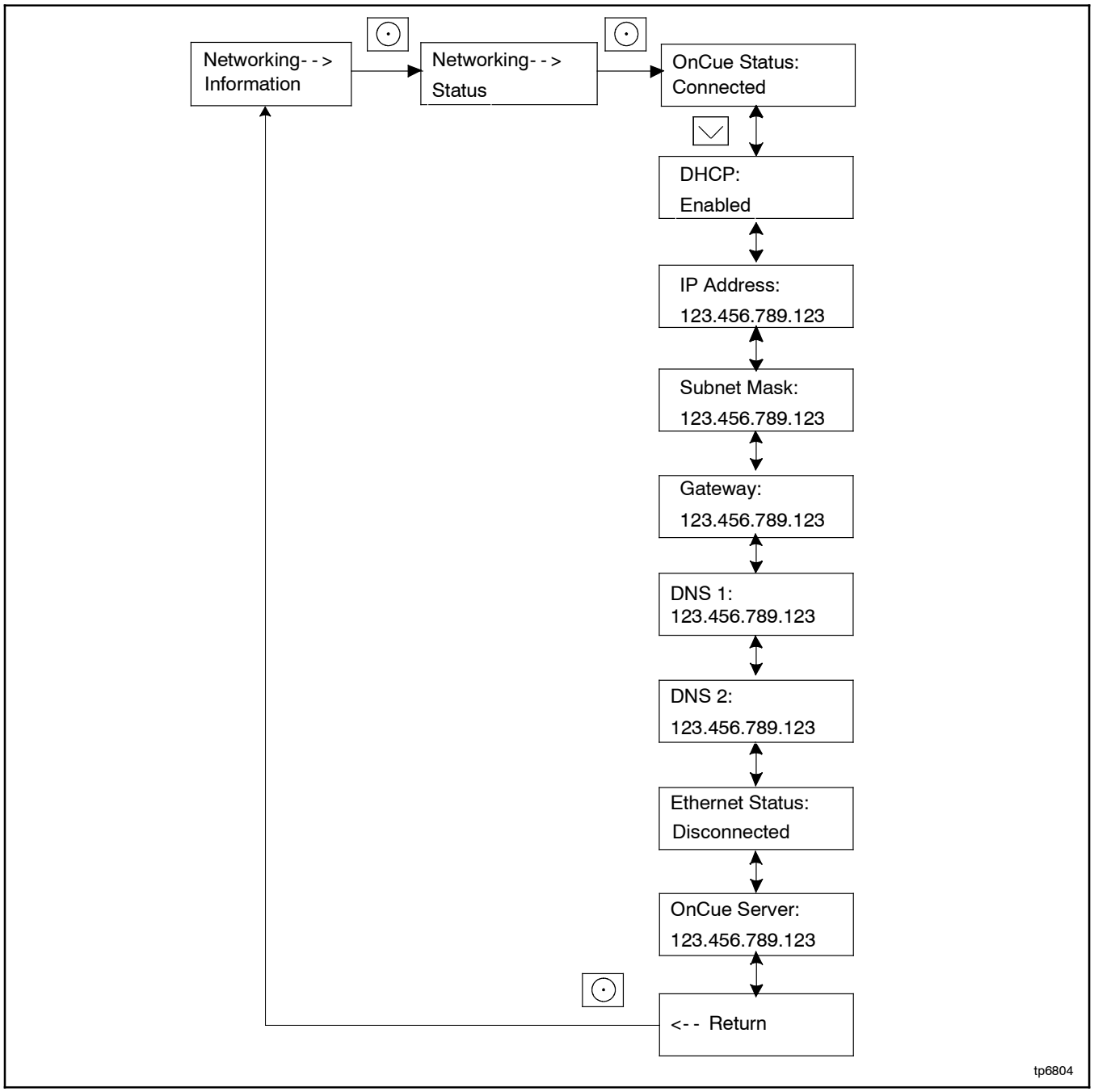


Figure 3-20 Network Status Submenu

3.18.2 Networking Configuration Submenu (OnCue Password)

The Networking Configuration menu includes settings used for communication with the Kohler OnCue® Plus Generator Management System.

Password

Note: Use the OnCue password shown on the controller display for OnCue or OnCue Plus applications.

For the initial OnCue Plus setup, you will be required to reset the OnCue password on the RDC2 controller, and then enter it into the OnCue Plus application. To reset the password, follow the instructions in Figure 3-21.

Note: The password is displayed for only 10 seconds. Be sure to write down the password and serial number.

A new password is generated each time the reset password procedure is performed. If the password is reset after the OnCue Plus system has been set up, the connection will be lost. Disconnect the battery power to the controller, wait a minute, then reconnect power.

DHCP Submenu

For most applications, the Dynamic Host Configuration Protocol (DHCP) is enabled and the IP settings cannot be changed from the controller keypad. If DHCP is enabled, IP parameters are not displayed.

If DHCP is disabled (i.e., if a static IP address is required), then the IP parameters can be modified. For applications that require a static IP address, press and hold the select button to enable editing, press the down arrow to disable DHCP, and then step to the next parameters and enter the information. See Figure 3-21.

If an error occurs while setting a parameter, an error message is displayed and then the controller exits the edit mode. Previous settings are preserved.

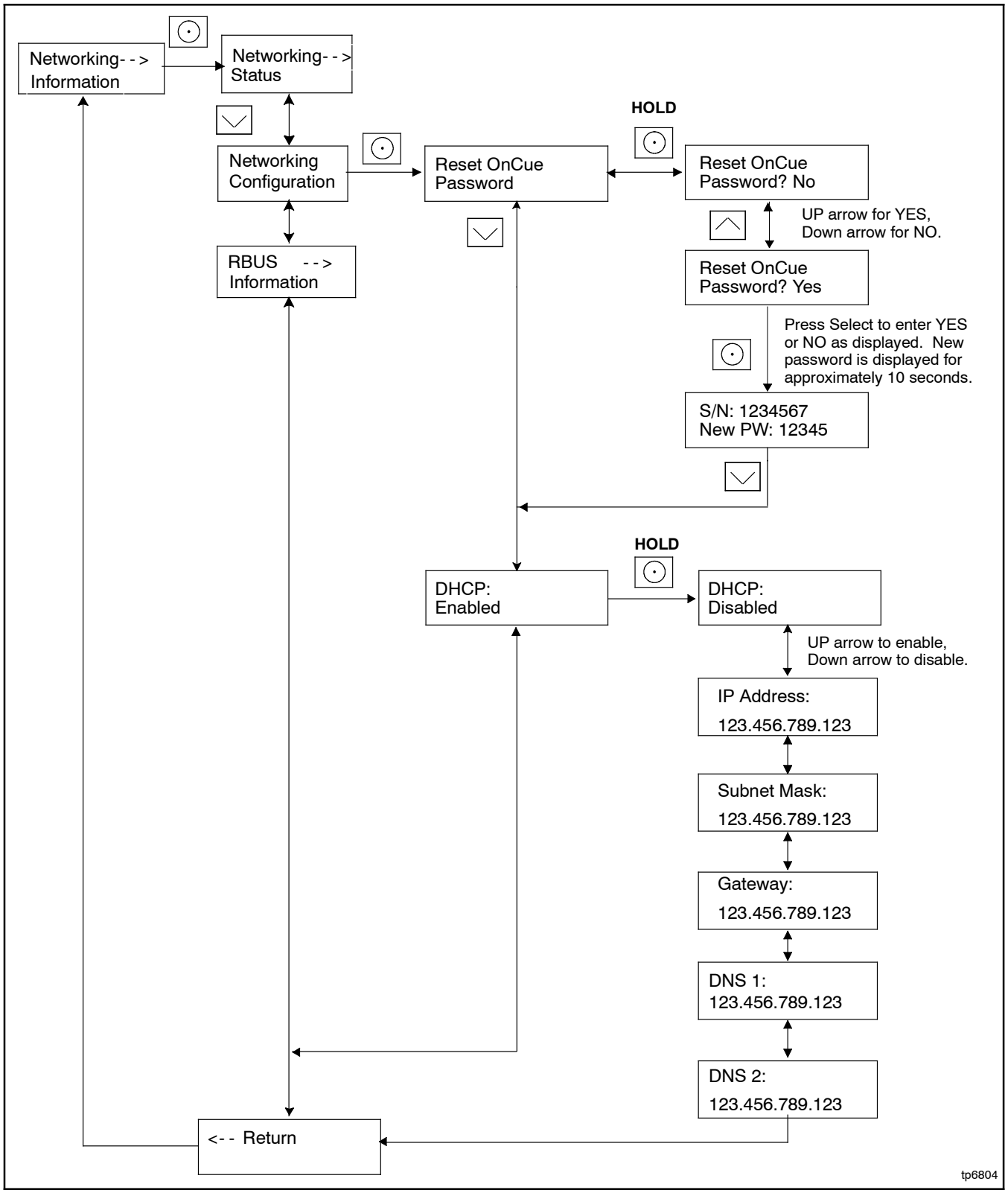


Figure 3-21 Networking Configuration Submenu

3.18.3 RBUS Information

The RBUS Information menu contains settings for remote modules that communicate with the RDC2 controller using RBUS protocol. This includes the following optional modules:

- Model RXT transfer switch
- Combined interface/load managment board on the RXT transfer switch
- Programmable Interface Module (PIM)
- Load shed kit
- PowerSync® Automatic Paralleling Module (APM)

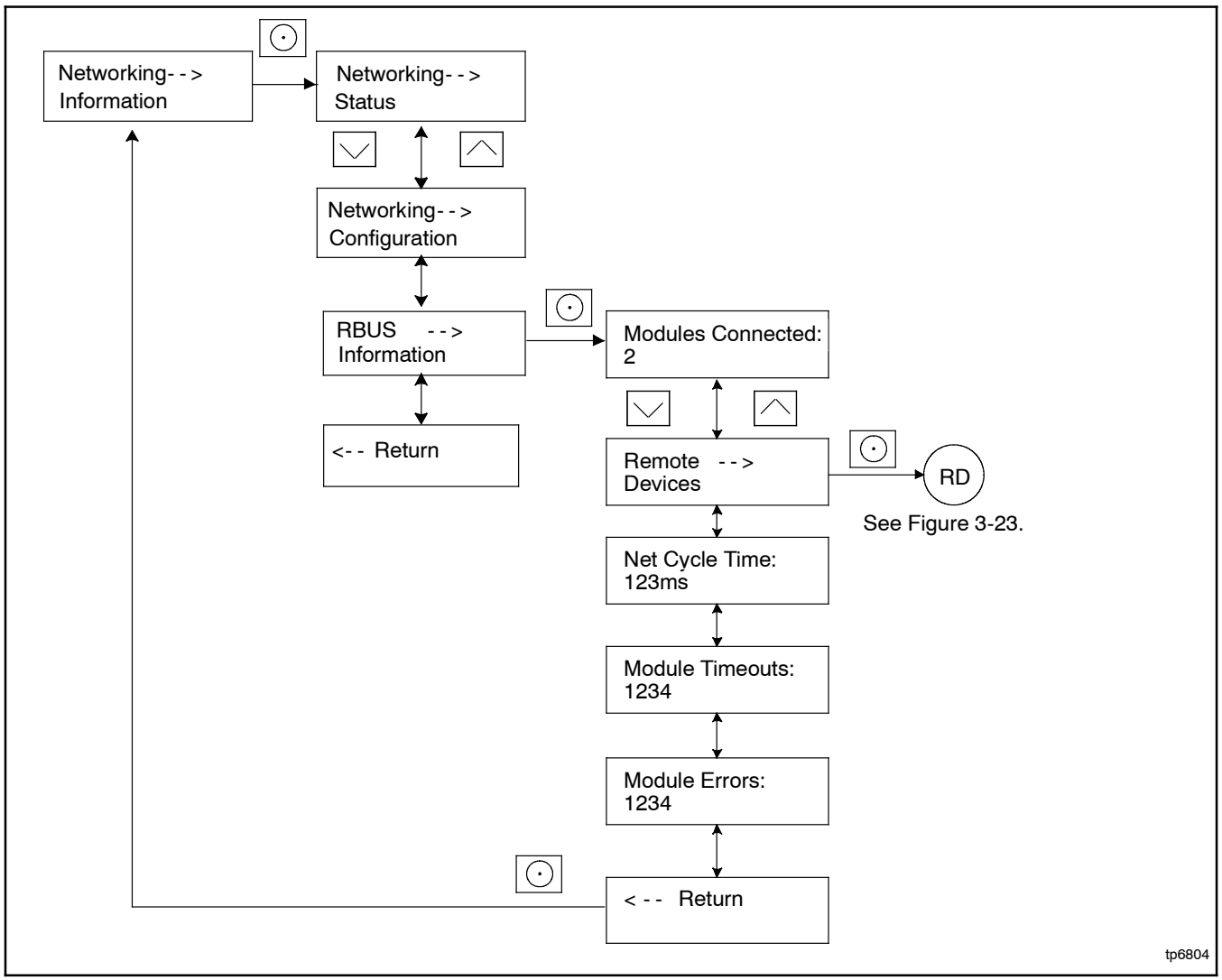


Figure 3-22 RBUS Information Submenu

3.18.4 Remote Devices Submenu

Check the status of remote devices communicating through RBUS. Device types can include:

- Model RXT ATS
- Programmable Interface Module (PIM)
- Load shed kit or combined interface/load management board on a Model RXT transfer switch
- PowerSync® Automatic Paralleling Module (APM)

The serial number for the RBUS module is shown on the circuit board inside the module enclosure.

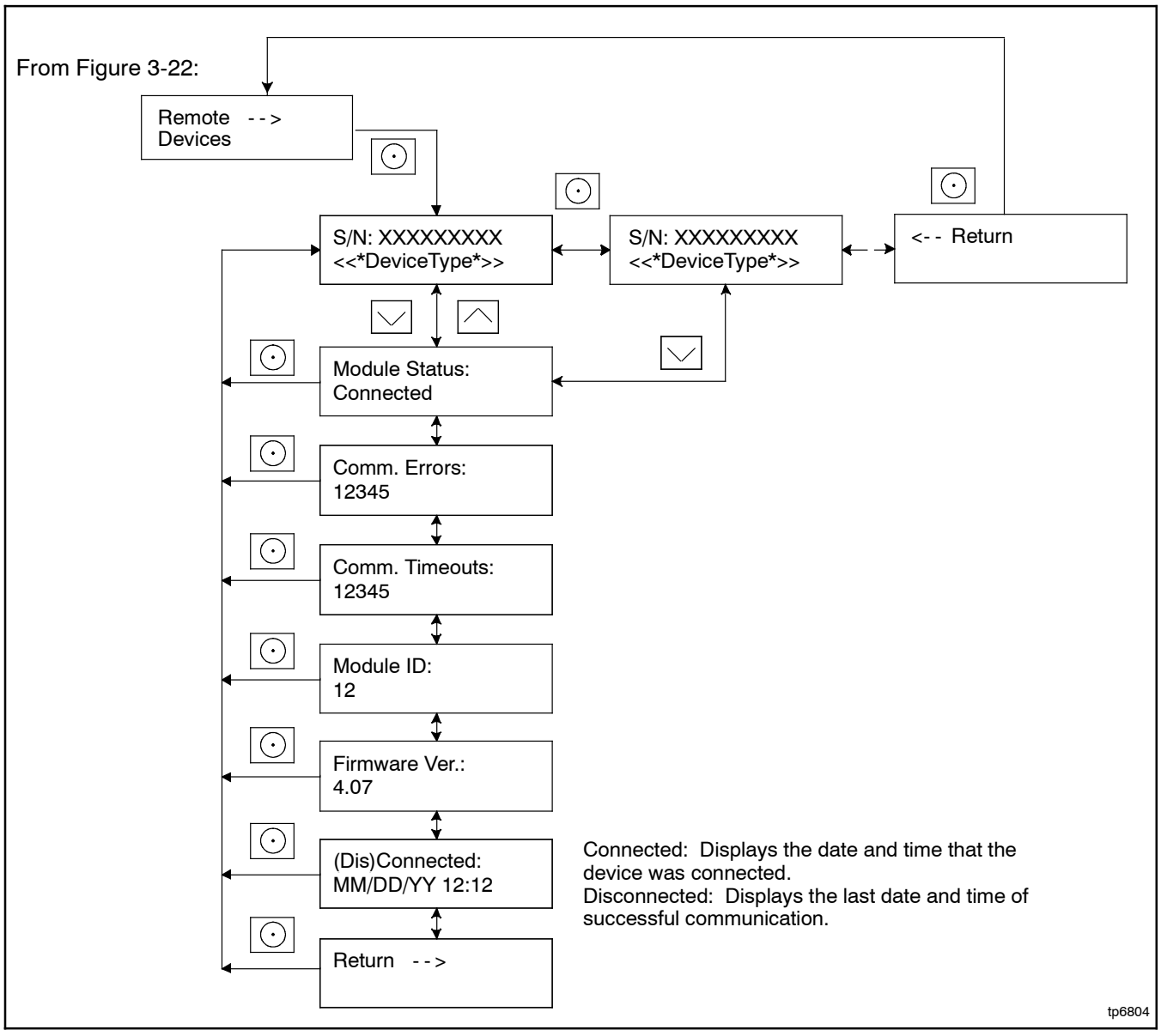


Figure 3-23 Remote Devices Submenu

3.19 Programmable Interface Module (PIM) Status Menu

The PIM status menu displays the status of inputs and outputs connected to the programmable interface module (PIM). this menu appears only if a PIM is connected. This is a status display menu only. Input and output settings cannot be changed from the RDC2 controller's user interface.

A personal computer running Kohler SiteTech™ software is required to change the input and output settings. Contact an authorized distributor or dealer for service.

The Kohler® OnCue® Plus Generator Management System can be used to turn outputs on and off. See the OnCue Plus Operation Manual for instructions.

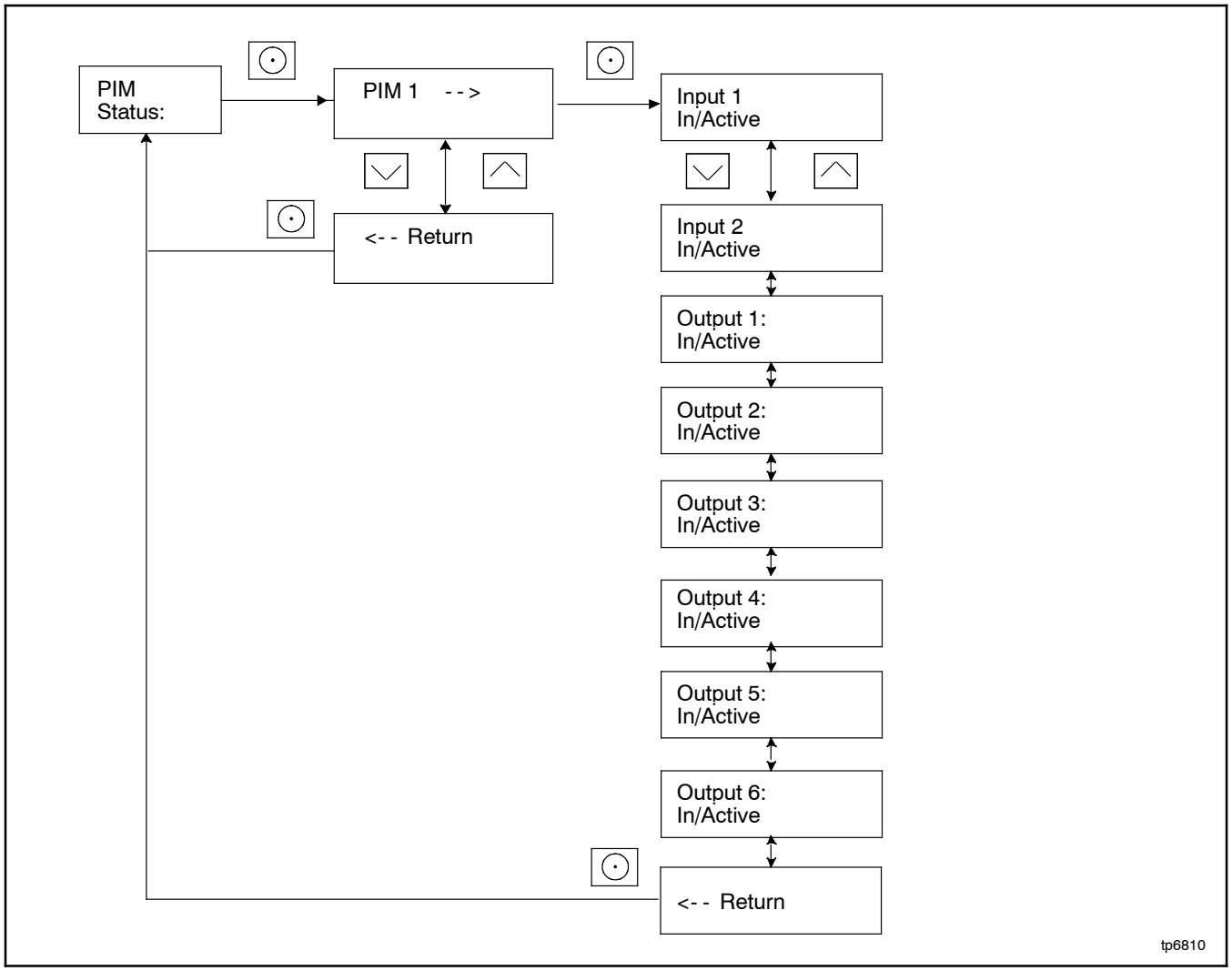


Figure 3-24 Programmable Interface Module (PIM) Status Menu

3.20 Load Control Menus

The Load Control menu displays the status of the load management device inputs and outputs, and allows a test of the load control output relays. This menu appears only if a load management device (load shed kit or Model RXT transfer switch with the combined interface/load management board) is connected.

Generator current is displayed as a percent of the maximum generator capacity. The load control module adds and sheds loads based on the generator current.

The test function cycles the relays in the order of their priority. For detailed information, refer to the instructions provided with the load shed kit. For the RXT combined interface/load management board, refer to the RXT automatic transfer switch Operation and Installation Manual.

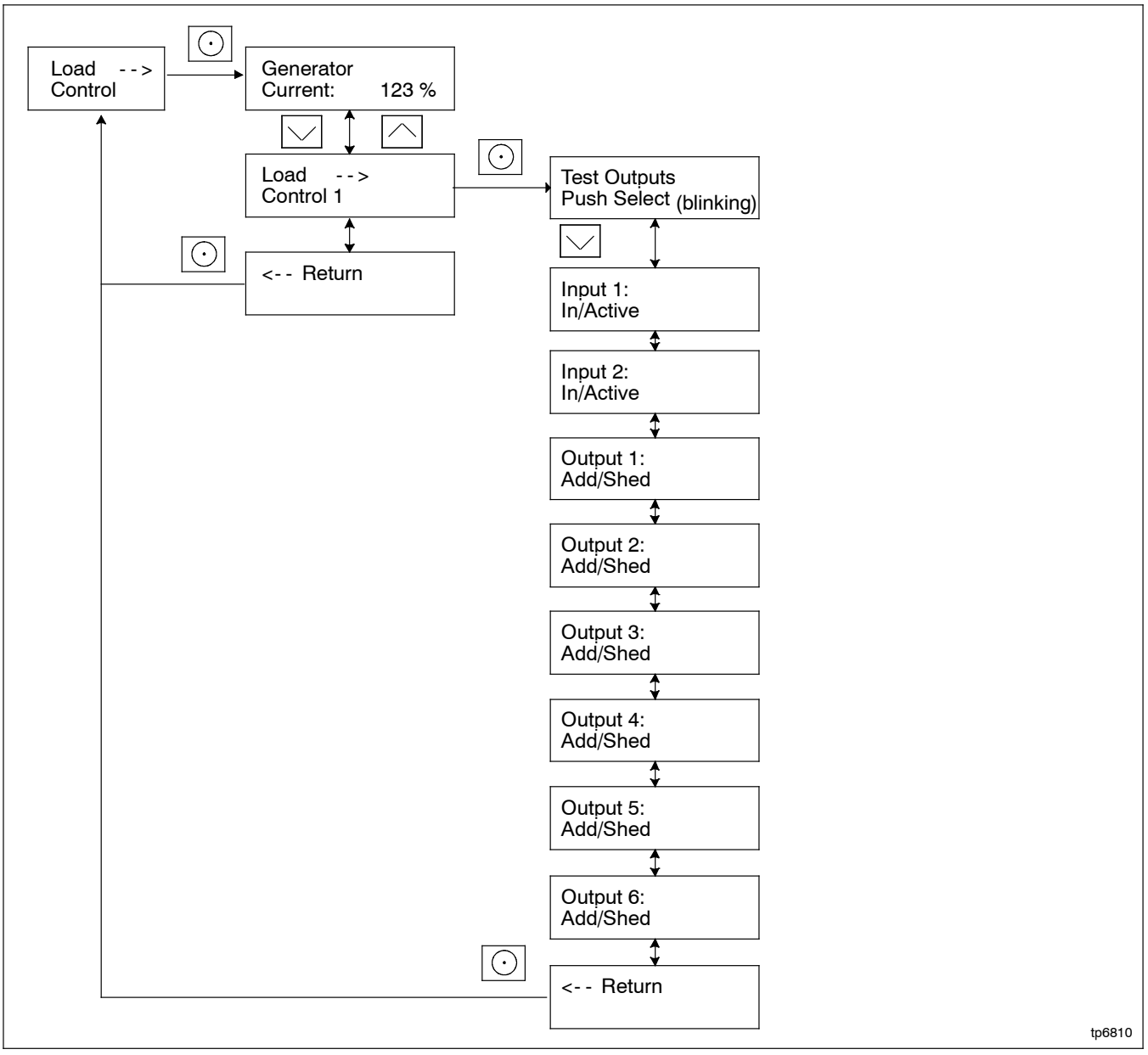


Figure 3-25 Load Control Status Menu

3.21 Event Log

The event log displays up to 1000 controller faults and notices, starting with the most recent event. Events are numbered 1- 1000, with 1 being the most recent. Each event is displayed with the date and time of the event, the number of the event, a code to indicate whether the event was a warning (W), shutdown (S), or informational notice (I), the engine hours at the time of the event, and the event description.

The time and date for notices (I) are not stored in the controller.

Procedure to View Event History

1. Press Select to enter the main menu.
2. Press the down arrow to step down to the event log.
3. Press Select to display the most recent event.
4. Press the down arrow to step to the next event.
5. Use the up and down arrow buttons to view events.
6. Press the Select button to exit the event log.

To stop viewing the event history before the last event, press the select button to return to the main menu.

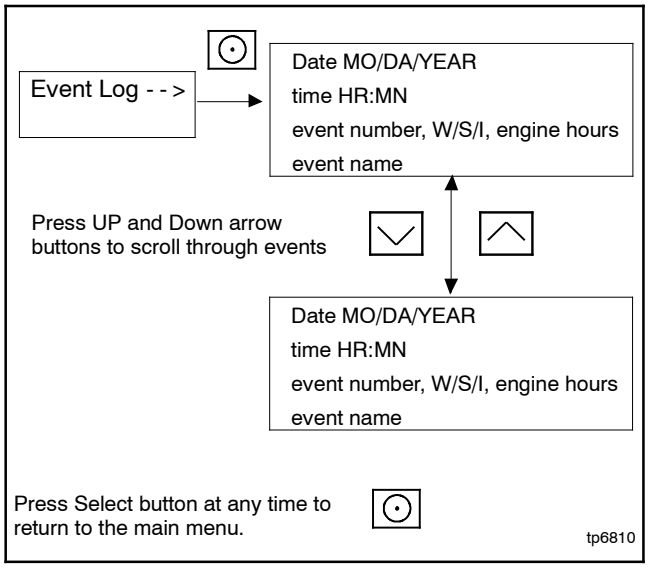


Figure 3-26 Event Log

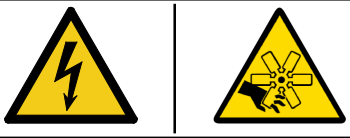
⚠ WARNING

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.

⚠ DANGER



Hazardous voltage. Moving parts.
Will cause severe injury or death.

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

⚠ 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.

4.1 Scheduled Maintenance

Refer to the following service schedules and the runtime hours displayed on the controller to schedule routine maintenance. Intervals are shown in hours of operation and/or time intervals (i.e. weekly, monthly, quarterly, etc.) Have an authorized distributor/dealer service the generator set at the designated intervals in the service schedule for the life of the generator set. Service units subject to extreme weather, long operating hours, or dusty or dirty conditions more frequently.

Contact an authorized distributor/dealer for parts.

4.1.1 Service Schedule, 14 kW Models

System Component or Procedure	See Section	Procedure					Frequency
		Visually Inspect	Check	Change	Clean	Test	
Fuel							
Flexible lines and connections		X		R			Quarterly
Main tank supply level			X				Weekly
Fuel piping		X					Yearly
Lubrication	4.2						
Oil level		X	X				Every 8 hours of engine operation
Crankcase breather hose		X					Yearly or 500 hours
Change oil				X			Yearly or 100 hours
Replace filter				X			Yearly or 200 hours
Cooling	4.5						
Air ducts, louvers			X		X		Yearly
Exhaust Line	4.6						
Leakage		X	X				Weekly
Insulation, fire hazards		X					Yearly
Obstructions or combustible materials near exhaust outlet		X					Weekly
DC Electrical System	4.7						
Check battery charger operation, charge rate		X					Monthly
Remove corrosion, clean and dry battery and rack		X			X		Yearly
Clean and tighten battery terminals and inspect boots		X	X				Yearly
Battery electrolyte level and specific gravity *			X				Yearly
AC Electrical System							
Tighten control and power wiring connections			X				Yearly
Remote control system, if equipped						X	Monthly
Visible wear or damage		X					Quarterly
Wire abrasions where subject to motion		X	X				Six Months
Wire-cable insulation condition		X					3 Years or 500 hours
Engine and Mounting							
Visible wear or damage		X					Weekly
Air cleaner service †	4.4		150	300			Yearly or hours shown
Spark plugs	4.3			300			
Replace stepper motor coupling and bushing				D			500 hours
Generator							
Visible wear or damage		X					Quarterly
Exercise generator set						X	Weekly
Brushes and collector ring		D			D		Yearly or 300 hours
Measure and record resistance readings of windings with insulation tester (Megger®, with SCR assembly or rectifier and load leads disconnected) *						D	3 Years
General Condition of Equipment							
Evidence of vibration, leakage, excessive noise, temperature, or deterioration		X	X		X		Weekly
Interior of sound enclosure		X			X		Quarterly

* Not necessary for maintenance-free batteries.

† Service more frequently under extremely dusty/dirty conditions.

Megger® is a registered trademark of Biddle Instruments.

X Action
D Authorized distributor/dealer only
R Replace as necessary

4.1.2 Service Schedule, 20 kW Models

System Component or Procedure	See Section	Procedure					Frequency
		Visually Inspect	Check	Change	Clean	Test	
Fuel							
Flexible lines and connections		X		R			Quarterly
Main tank supply level			X				Weekly
Fuel piping		X					Yearly
Lubrication	4.2						
Oil level			X				Every 8 hours of engine operation
Change oil				X			Yearly or 150 hours
Replace filter				X			Yearly or 150 hours
Crankcase breather hose		X					Yearly or 500 hours
Oil cooler		X			X		Yearly or 150 hours
Cooling	4.5						
Air ducts, louvers			X		X		Yearly
Exhaust System	4.6						
Leakage		X	X				Weekly
Insulation, fire hazards		X					Yearly
Obstructions or combustible materials near exhaust outlet		X					Weekly
DC Electrical System	4.7						
Check battery charger operation, charge rate		X					Monthly
Remove corrosion, clean and dry battery and rack		X			X		Yearly
Clean and tighten battery terminals and inspect boots		X	X				Yearly
Battery electrolyte level and specific gravity *			X				Yearly
AC Electrical System							
Tighten control and power wiring connections			X				Yearly
Remote control system, if equipped						X	Monthly
Visible wear or damage		X					Quarterly
Wire abrasions where subject to motion		X	X				Six Months
Wire-cable insulation condition		X					3 Years or 500 hours
Engine and Mounting							
Visible wear or damage		X					Weekly
Air cleaner service †	4.4		150	300			Yearly or hours shown
Spark plugs	4.3		150	300			
Replace stepper motor coupling and bushing				D			500 hours
Generator							
Visible wear or damage		X					Quarterly
Exercise generator set						W	Weekly
Brushes and collector ring		D			D		Yearly or 300 hours
Measure and record resistance readings of windings with insulation tester (Megger®, with SCR assembly or rectifier and load leads disconnected)						D	3 Years
General Condition of Equipment							
Evidence of vibration, leakage, deterioration, unusual or excessive noise or temperature		X	X		X		Weekly
Interior of sound enclosure		X			X		Quarterly

* Not necessary for maintenance-free batteries.

† Service more frequently under extremely dusty/dirty conditions.

Megger® is a registered trademark of Biddle Instruments.

X Action

D Authorized distributor/dealer only

R Replace as necessary

4.2 Lubrication System

See the service schedules in Section 4.1 for oil change and oil filter replacement intervals. See the service views in Section 1.9 for the oil drain, oil check, oil fill, and oil filter locations.

⚠ 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.

⚠ WARNING

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

Do not work on the generator set until it cools.

4.2.1 Low Oil Pressure Shutdown

The low oil pressure (LOP) shutdown feature protects the engine against internal damage if the oil pressure drops below a minimum pressure because of oil pump failure or other malfunction.

Note: The LOP shutdown feature does not protect against damage caused by operating when the oil level is low; it is not a low oil level shutdown. Check the oil level regularly, and add oil as needed.

4.2.2 Oil Check

The generator set is shipped with oil. Before operating the generator set, check the engine oil in the crankcase.

To check the oil level, shut down the generator set and wait several minutes. Remove the dipstick and wipe the end clean, reinsert, and remove. See Figure 4-1. Maintain the oil level between the Add and Full marks on the dipstick. Add 5W-30 or 10W-30 synthetic oil when the oil level is low.

Check the oil level before each use. For extended operation, check the oil level every 8 hours. Do not check the oil level when the generator set is running.

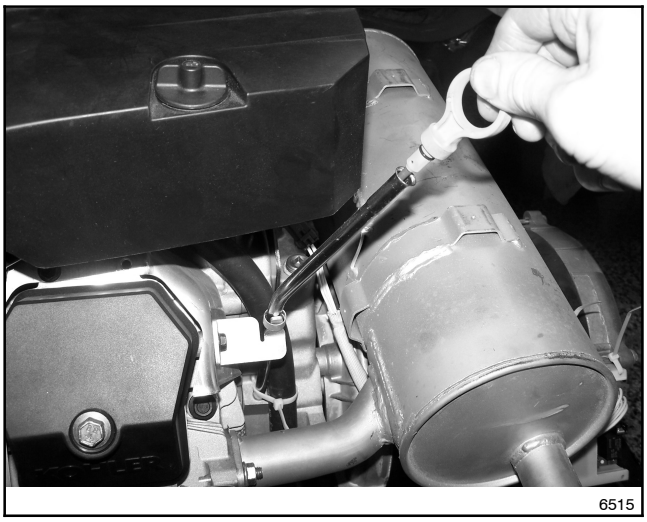


Figure 4-1 Oil Check (typical)

4.2.3 Engine Oil Recommendation

Use 5W-30 or 10W-30 API (American Petroleum Institute) Service Class SG, SH, or SJ synthetic oil. Synthetic oil oxidizes and thickens less than other oils and leaves the engine intake valves and pistons cleaner.

4.2.4 Oil Change Procedure

Note: Dispose of all waste materials (engine oil, fuel, filter, etc.) in an environmentally safe manner.

Drain the oil while it is still warm.

1. **Drain the oil.**

   a. Press the OFF button on the generator set controller.

   b. Disconnect the utility power to the generator set.

   c. Disconnect the generator set engine starting battery, negative (-) lead first.

   d. Remove the end panels from the enclosure by lifting the panels up and out. Then lift off the service-side panel to access the oil drain valve and hose.

   e. Clean the area around the dipstick and oil fill cap.

   f. Remove the oil drain hose from its retaining clip. Remove the cap from the oil drain hose and lower the hose into an oil collection container.

   g. Open the oil drain valve on the engine.

   h. Remove the dipstick and oil fill cap. Allow time for the engine oil to drain completely.

   i. Close the oil drain valve. Replace the cap on the oil drain hose. Replace the oil drain hose in its retaining clip.

   j. Replace the dipstick.

2. **Replace the oil filter.**

   a. Clean the area around the oil filter.

   b. Loosen the oil filter by rotating it counterclockwise with an oil filter wrench. On 20 kW models, allow the oil to drain from the filter. Then remove the oil filter.

   c. Clean the gasket sealing surface of the oil filter adapter.

   d. Apply a light coat of clean oil to the rubber seal of the new oil filter.

   e. Install the new oil filter following the instructions provided with the filter.

3. **Fill with oil.**

Note: When the oil is drained, some oil remains in the engine. The amount of oil needed to refill the engine may be less than the capacity shown in Figure 4-2. Use the dipstick shown in Figure 4-1 to check the oil level during the fill. Do not fill past the full mark on the dipstick.

Note: See Section 4.2.3 for the recommended oil type.

Generator Set Model	Oil Capacity, L (qt.)
14 kW	1.8 (1.9)
20 kW	1.9 (2.0)

Figure 4-2 Engine Oil Capacity

   a. Add oil through the oil fill port; see Figure 4-3.

   b. Use the dipstick to check the oil level before starting to add the final quart of oil. Fill the engine to the F mark on the dipstick.

   c. Reinstall the dipstick and the oil fill cap.

Note: 20 kW model shown; 14 kW model is similar

1. Dipstick
2. Oil cooler located under shroud (20 kW only)
3. Oil fill location

Figure 4-3 Oil Fill Components

d. Reconnect the generator set engine starting battery, negative (-) lead last.

e. Reconnect the utility power to the generator set.

f. Press the RUN button on the generator set controller. The generator set will start.

g. Run the generator set for a minute to allow the oil pressure to reach operating range.

h. Stop the generator set, wait 1 minute, and then recheck the oil level. Add oil to bring the level up to the F mark on the dipstick.

4. **Check for leaks.**

   a. Check for oil leaks.

   b. Fix leaks and recheck the oil level.

   c. Reinstall the housing side panel.

5. **Reset the maintenance timer on the controller.**

4.2.5 Resetting the Maintenance Timer

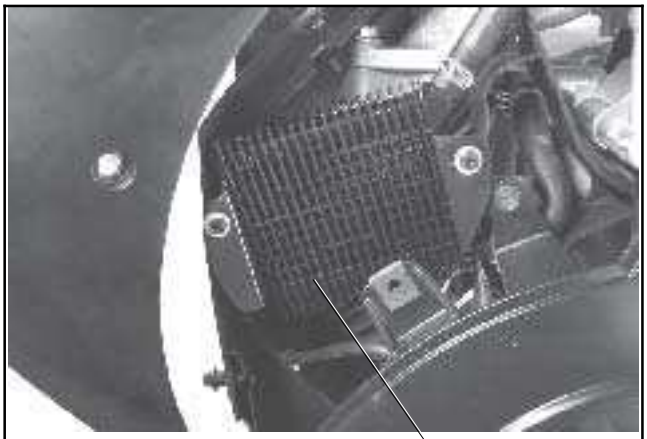
1. From the Overview menu, step down to the Genset Run Time menu.
2. Press the Select button and then step down to the Next Maintenance screen.
3. Press the Select button.
4. Press the Up arrow button so that “Reset Maint Timer? Yes” is displayed.
5. Press the Select button. **After about two minutes,** the new maintenance interval and date are displayed.

4.2.6 Oil Cooler (20RCA/RCAL only)

Inspect and clean the oil cooler at the intervals indicated in the service schedule. The oil cooler must be kept free of debris.

See Figure 4-3 and Figure 4-4 for the oil cooler location. The oil cooler is located under the No. 2 cylinder shroud. Remove the top mounting screw and loosen the two side screws, then lift off the cylinder shroud.

Clean the outside of the oil cooler fins with a brush or with compressed air.



Note: See Figure 4-3 for location.

1. Oil cooler

62 590 01

Figure 4-4 Oil Cooler

4.3 Spark Plugs

⚠ 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.

⚠ WARNING

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

Do not work on the generator set until it cools.

Reset the spark plug gap or replace the plugs with new plugs as necessary.

1. Clean the area around the base of the spark plug to keep dirt and debris out of the engine.

2. Remove the spark plug and check its condition. Replace the spark plug if it is worn or if its reuse is questionable.

3. Check the spark plug gap using a wire feeler gauge. See Figure 4-5 for the recommended spark plug gap. Adjust the gap by carefully bending the ground electrode. See Figure 4-6 and Figure 4-7.

4. Reinstall the spark plug into the cylinder head. Torque the spark plug to 24.4- 29.8 Nm (18- 22 ft. lb.)

Generator Set Model	Spark Plug Gap
14 and 20 kW models	0.76 mm (0.030 in.)

Figure 4-5 Spark Plug Gap

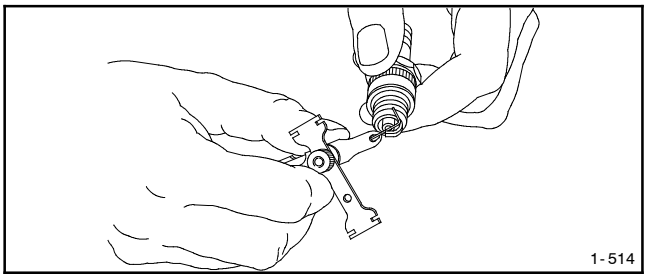


Figure 4-6 Checking the Spark Plug Gap

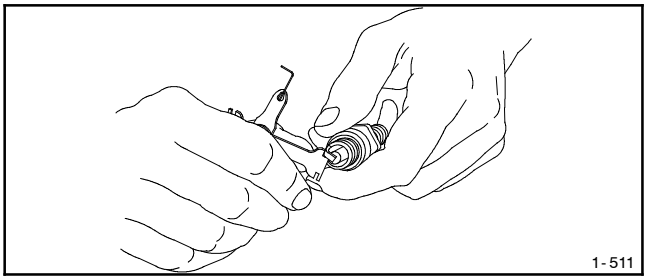


Figure 4-7 Adjusting the Spark Plug Gap

4.4 Air Cleaner Service

⚠ WARNING

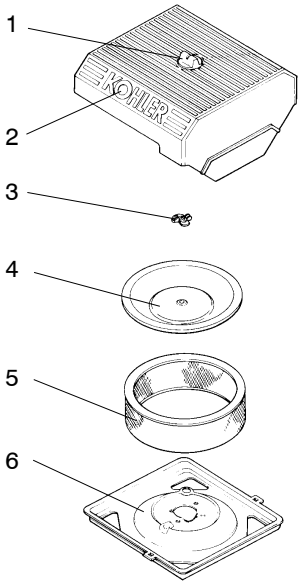
Risk of fire.
Can cause severe injury or death.

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.

4.4.1 Air Cleaner, 14 kW Models

The engine has a replaceable high-density paper air cleaner element. See Figure 4-8.



1. Cover knob
2. Air cleaner cover
3. Element cover nut
4. Element cover
5. Air cleaner element
6. Air cleaner base

Figure 4-8 Air Cleaner Components

Check for a buildup of dirt and debris around the air cleaner system. Keep this area clean. Also check for loose or damaged components. Replace all bent or damaged air cleaner components.

Note: Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

Air Cleaner Service

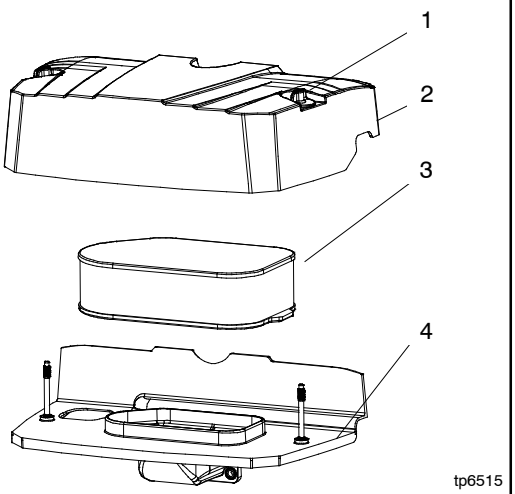
Use the following procedure to replace the paper element at the intervals specified in the service schedule. Replace the paper element more often under extremely dusty or dirty conditions.

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. Loosen the cover retaining knob and remove the cover.
5. Remove the element cover nut, element cover, and the paper element.

   Note: Do not wash the paper element or clean it with pressurized air, as this will damage the element.
6. Replace the element if it is dirty, bent, or damaged.
7. Check the air cleaner base. Make sure it is secure and not bent or damaged. Also check the element cover for damage and fit. Replace all damaged air cleaner components. Remove any loose dirt or debris from the air cleaner base. Wipe the base carefully so that no dirt drops into the intake throat. Check the condition of the rubber seal on the air cleaner stud and replace the seal if necessary.
8. Reinstall the paper element, element cover, element cover nut, and the air cleaner cover. Secure the cover with the cover retaining knob.
9. Reconnect the utility power to the generator set.
10. Reconnect the generator set engine starting battery, negative (-) lead last.

4.4.2 Air Cleaner, 20 kW Models

The engine is equipped with a replaceable, high density paper air cleaner element. See Figure 4-9.



1. Knobs (qty.2)
2. Cover
3. Paper element
4. Base

Figure 4-9 Air Cleaner Components

Check the air cleaner daily or before starting the engine. Check for a buildup of dirt and debris around the air cleaner system. Keep this area clean. Also check for loose or damaged components. Replace all bent or damaged air cleaner components.

Note: Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

Air Cleaner Service

Replace the paper element at the intervals indicated in the service schedule. See Section 4.1.2 for the service schedule. See Figure 4-9 for the air cleaner components.

1. Loosen the two cover retaining knobs and remove the cover.
2. Remove the paper element.
3. Do not wash the paper element or use pressurized air, as this will damage the element. Replace a dirty, bent, or damaged element. Handle new elements carefully; do not use if the sealing surfaces are bent or damaged.
4. When servicing the air cleaner, check the air cleaner base. Make sure it is secured and not bent or damaged. Also, check the element cover for damage or improper fit. Replace all damaged air cleaner components.

Note: If any loose dirt or debris fell on the air cleaner base when the element was removed, carefully remove it and wipe the base clean. Be careful that none of it drops into the intake throat.

5. Reinstall the paper element onto the air cleaner base. Make sure the element is flat and properly seated.
6. Install the air cleaner cover and secure with the two retaining knobs.
7. When element replacement is necessary, order genuine Kohler parts.

4.5 Cooling System

The engine fan draws cooling air through the openings in the sides and end near the battery. The alternator fan draws cooling air through openings on the side walls of the enclosure. The cooling air mixes with the engine exhaust and is discharged at the exhaust outlet. See the service view in Section 1.9 for air intake and exhaust locations. To prevent generator set damage caused by overheating, keep the housing cooling inlets and outlets clean and unobstructed at all times.

Note: Do not block the generator set cooling air inlets or mount other equipment above them. Overheating and severe generator damage may occur.

4.6 Exhaust System

⚠ WARNING

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

The exhaust system must be leakproof and routinely inspected.

Remove all combustible materials from the exhaust location. Combustible materials include building materials as well as natural surroundings. Keep dry field grass, foliage, and combustible landscaping material a minimum of 1.2 m (4 ft.) from the exhaust outlet.

Periodically inspect the exhaust system components for cracks, leaks, and corrosion.

- Check for corroded or broken metal parts and replace them as needed.
- Check that the exhaust outlet is clear.

4.7 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.

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.

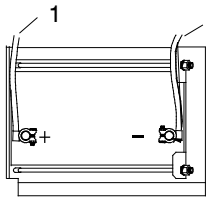
Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled 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.

Refer to this section for general battery information and maintenance. Also consult the battery manufacturer's instructions for battery maintenance.

All generator set models use a negative ground with a 12-volt engine electrical system. Consult the generator set nameplate for the engine electrical system voltage. Consult the generator spec sheet for battery size and capacity recommendations for replacement purposes. Wiring diagrams provide battery connection information. See Figure 4-10 for typical battery connections.



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

Figure 4-10 12-Volt Engine Electrical System Single Starter Motor, Typical Battery Connection

4.7.1 Cleaning the Battery

Clean the battery and cables and tighten battery terminals using the service schedule recommendations. To prevent corrosion, maintain tight, dry electrical connections at the battery terminals. To remove corrosion from battery terminals, disconnect the cables from the battery and scrub the terminals with a wire brush. Clean the battery and cables with a solution of baking soda and water. After cleaning, flush the battery and cables with clean water and wipe them with a dry, lint-free cloth.

After reconnecting the battery cables, coat the battery terminals with petroleum jelly, silicone grease, or other nonconductive grease.

4.7.2 Checking Electrolyte Level

Check the electrolyte level of batteries with filler caps monthly. Remove filler caps and verify that electrolyte level reaches bottom of filler holes. Refill as necessary with distilled water. DO NOT add fresh electrolyte. Tighten all filler caps. If water is added during freezing temperatures, run the generator set for 20- 30 minutes to mix the electrolyte and water to prevent battery damage from freezing.

4.7.3 Checking Specific Gravity

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell. While holding the hydrometer vertically, read the number on the glass bulb at the top of the electrolyte level or the number adjacent to the pointer. If the hydrometer used does not have a correction table, use the correction factors in Figure 4-13. Determine specific gravity and electrolyte temperature of battery cells. Locate temperature in Figure 4-13 and adjust the specific gravity by the amount shown.

The battery is fully charged if the specific gravity is 1.260 at an electrolyte temperature of 80°F (26.7°C). The difference between specific gravities of each cell should not exceed ±0.01. Charge the battery if the specific gravity is below 1.215 at an electrolyte temperature of 80°F (26.7°C). See Figure 4-11.

Specific Gravity, Corrected to 80°F (26.7°C)	Battery Condition
Below 1.215	Needs charging
1.260	Fully charged

Figure 4-11 Specific Gravity Interpretation

Some battery testers have four or five beads in the test tube. Draw electrolyte into the tube as performed with the battery hydrometer described previously. Use the manufacturer's instructions. Figure 4-12 interprets typical test results.

Number of Floating Beads	Battery Condition
5	Overcharged
4	Fully charged
3	Good charge
1 or 2	Low charge
0	Dead battery

Figure 4-12 Bead-Type Test Interpretation

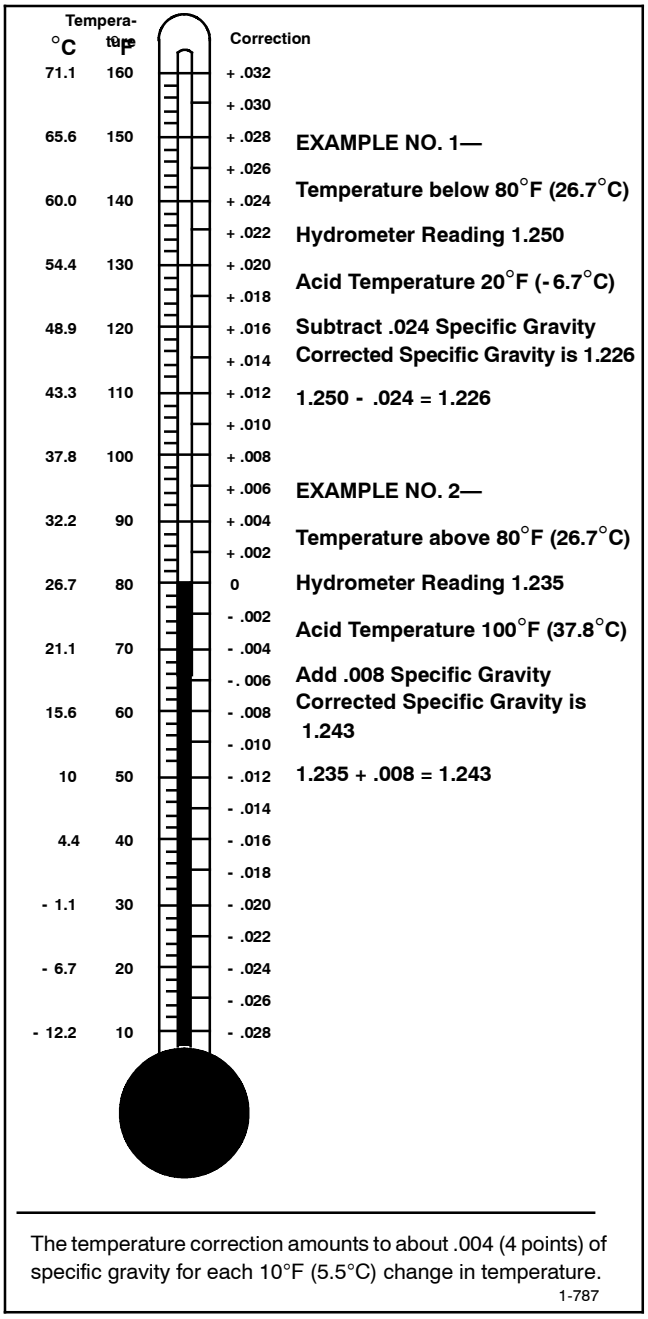


Figure 4-13 Specific Gravity Temperature Correction

4.8 Storage Procedure

Perform the following storage procedure before removing the generator set from service for three months or longer. Follow the engine manufacturer's recommendations for storage, if available.

Note: Run the generator set monthly whenever possible.

4.8.1 Lubricating System

1. Operate the generator set until it reaches operating temperature, or about 15 minutes.
2. Stop the generator set.
3. While the engine is still warm, drain the engine lubrication oil from the engine crankcase.
4. Refill engine crankcase with oil. See Section 4.2.3 for oil recommendations.
5. Run the generator set for a few minutes to distribute the clean oil.
6. Stop the generator set.

4.8.2 Fuel System

1. Start the generator set.
2. With the generator set running, shut off the gas supply.
3. Run the generator set until the engine stops.
4. Press the OFF button on the generator set controller.

4.8.3 Cylinder Lubrication

1. Remove the spark plugs.
2. Pour one tablespoon of engine oil into each spark plug hole. Install the spark plugs and *ground* the spark plug leads. *Do not connect the leads to the plugs.*
3. Crank the engine two or three revolutions to lubricate the cylinders.

4.8.4 Exterior Preparation

1. Clean the exterior surface of the generator set.
2. Seal all openings in the engine with nonabsorbent adhesive tape.
3. Mask all areas to be used for electrical contact.
4. Spread a light film of oil over unpainted metallic surfaces to prevent rust and corrosion.

4.8.5 Battery

Perform battery storage last.

1. Press the OFF button on the generator set controller.
2. Disconnect the battery, negative (-) lead first.
3. Clean the battery.
4. Place the battery in a warm, dry location.
5. Connect the battery to a float/equalize battery charger, or charge the battery monthly using a trickle charger. Follow the battery charger manufacturer's recommendations.

Notes

5.1 Introduction

Use the troubleshooting charts in this section to diagnose and correct common problems. First check for simple causes such as a dead engine starting battery, loose connections, or an open circuit breaker. The charts include a list of common problems, possible causes of the problem, and recommended corrective actions.

If the procedures in this manual do not explain how to correct the problem, contact an authorized distributor/dealer. Maintain a record of repairs and adjustments performed on the equipment. Use the record to help describe the problem and repairs or adjustments made to equipment.

5.2 Fault Messages

The controller displays fault messages to aid in troubleshooting. Selected fault messages and recommended checks are listed in Figure 2-5.

Identify and correct the cause of the fault condition. Then reset the controller after a fault shutdown. See Section 2.5.5.

5.3 Circuit Protection

If the generator set circuit breaker trips repeatedly, contact an authorized distributor/ dealer for service.

5.3.1 Controller Internal Circuit Protection

The controller is equipped with internal circuit protection. A fault message, Accy PwrOver Warning or MainPwrOverL Shutdown, is displayed if this internal protection is activated. Press OFF to reset. Contact an authorized Kohler distributor/dealer for service.

5.3.2 Line Circuit Breaker

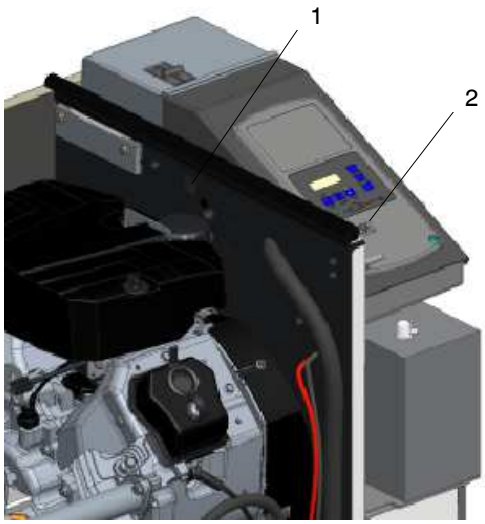
The line circuit breaker interrupts the generator output in the event of a fault in the wiring between the generator and the load. If the circuit breaker trips, reduce the load and switch the breaker back to the ON position.

5.4 USB Port and Auxiliary Winding Mini-Breaker

The USB port is located under a small rubber cover as shown in Figure 5-1. The alternator winding circuit breaker is located on the engine side of the bulkhead as shown in Figure 5-1.

A personal computer (laptop) with Kohler® SiteTech™ software can be used to view the event history and adjust controller settings. Use a USB cable with a mini-B connector to connect the controller's USB port to your PC.

See TP-6701, SiteTech™ Software Operation Manual, for software operation instructions.



1. Mini-breaker location (access through engine compartment)
2. USB port on RDC2 controller

Figure 5-1 USB Port and Mini-Breaker Locations

5.5 Stop Switches

The generator set may be equipped with an optional emergency stop switch or an engine shutdown switch. Verify that it is safe to start the generator set and apply power to the load before deactivating these switches. See Section 2.3.4.

5.6 Thermostat

⚠ 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.

⚠ WARNING

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

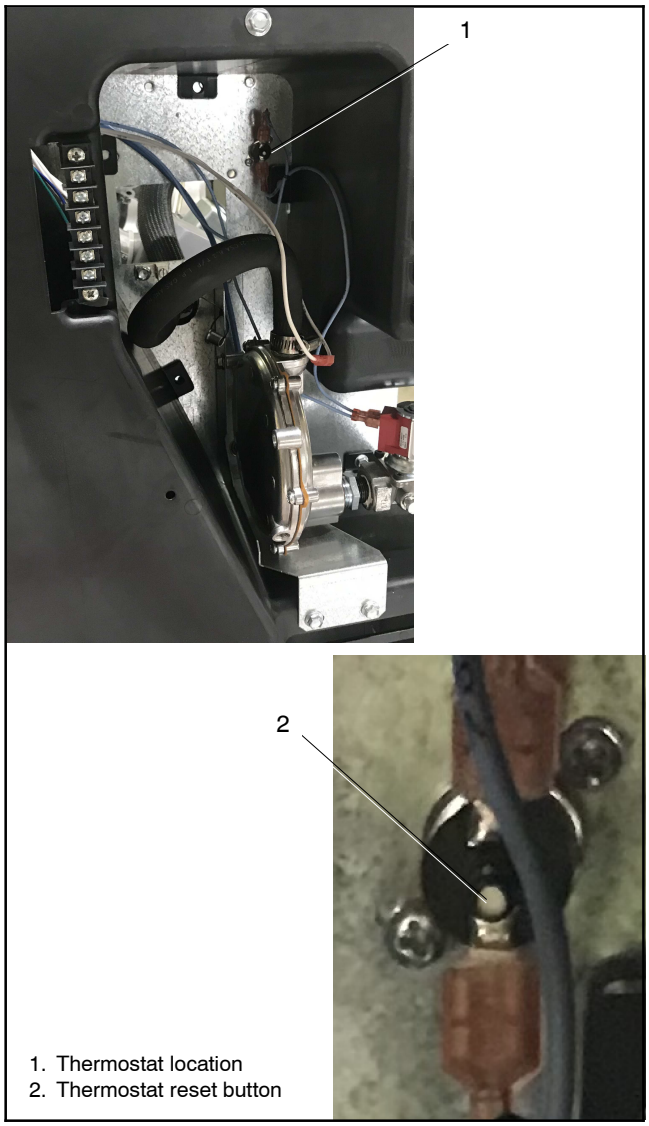
Do not work on the generator set until it cools.

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.

The generator sets include a resettable thermostat. See Figure 5-2 for the thermostat location in the air intake area, near the fuel system. The thermostat detects excess heat inside the enclosure. If the thermostat trips, the generator will shut down and the controller will display a fault (underspeed, underfrequency, or undervoltage). Check for blocked air inlets and exhaust outlets. Then follow these steps to reset the thermostat.

Procedure to Reset the Thermostat

1. Disconnect the utility power to the generator by opening (turning OFF) the corresponding circuit breaker at the building's distribution panel.
2. Open the enclosure roof and secure it with the roof stay on the left side of the enclosure.
3. Remove the air intake panel. See Figure 5-2.
4. Press the button on the thermostat to reset it.
5. Replace the air intake panel.
6. Reconnect utility power to the generator set by closing the circuit breaker in the distribution panel.
7. Reset the fault on the controller. Refer to Section 2.5 for instructions, if necessary.



1. Thermostat location
2. Thermostat reset button

Figure 5-2 Thermostat

5.7 Troubleshooting

Figure 5-3 contains generator set troubleshooting, diagnostic, and repair information. Check for loose connections before replacing parts.

Troubleshooting Table		
Problem	**Possible Cause**	**Corrective Action**
Controller display backlight is off.	Backlight turns off after about 1 minute with no activity.	Backlight will turn on when a button is pressed or the generator set starts.
Controller display is off.	Low or no battery voltage.	Check connections. Check generator set battery. See Figure 5-3.
The generator set does not crank.	Battery weak or dead.	Recharge or replace the battery. Make sure that the AC power to the generator set controller is backed up by the generator set.
	Battery connections reversed or poor.	Check the connections.
	Emergency stop switch switch activated.	Verify that it is safe to start the engine and apply load. Then reset the stop switch or engine shutdown switch.
	Fault shutdown.	Check the controller display for fault messages. See Section 2.5. Correct the fault condition and reset the controller.
	Generator set in the OFF mode.	Press the RUN button to start the engine or press AUTO to allow remote starting.
	Generator thermostat tripped.	Check for obstructed air inlets and outlets. Reset the thermostat. See Section 5.6.
The generator set cranks but does not start, starts hard, lacks power, or operates erratically.	Air cleaner clogged.	Clean and/or replace the air cleaner.
	Battery weak or dead.	Recharge or replace the battery.
	Battery connection poor.	Clean and tighten the battery connections.
	Spark plug wire connection loose.	Check the spark plug wires.
	Low oil pressure shutdown.	Check for oil leaks. Check the oil level and add oil if necessary.
	Fuel pressure insufficient.	Check the fuel supply and valves.
	Engine malfunction.	Contact an authorized distributor/dealer.
No AC output.	Line circuit breaker in the OFF position.	Place the circuit breaker in the ON position.
	Line circuit breaker tripping because of overload.	Reduce the load on the generator set by unplugging non-essential appliances.
	Line circuit breaker tripping because of short circuit.	Contact an authorized distributor/dealer for service.
	Auxiliary winding circuit breaker tripped.	Reset the circuit breaker (located in controller's service access area). Contact an authorized distributor/dealer for service if breaker trips repeatedly.
Low output or excessive drop in voltage.	Generator set overloaded.	Reduce the load by unplugging non-essential appliances.

Troubleshooting Table		
Problem	**Possible Cause**	**Corrective Action**
Generator set stops suddenly.	Low oil pressure shutdown.	Check for oil leaks. Check the oil level and add oil if necessary.
	No fuel.	Check fuel valves and fuel supply. Model 20RCA/20RCAL only: Check enclosure thermostat and reset if tripped. See Section 5.6. Check and clear air inlets and exhaust outlets.
	Overcrank shutdown.	Reset the controller. If the overcrank fault occurs again, contact an authorized distributor/dealer.
	Auxiliary winding circuit breaker tripped.	Reset the auxiliary winding circuit breaker. Contact an authorized distributor/dealer for service if breaker trips repeatedly.
	Emergency stop switch switch activated.	Verify that it is safe to start the engine and apply load. Then reset the stop switch or engine shutdown switch.
	Fault shutdown.	Check the controller display for fault messages. See Section 2.5. Correct the fault condition and reset the controller.
	Generator set in the OFF mode.	Press the RUN button to start the engine or press AUTO to allow remote starting.
	Remote stop command received from a remote switch, ATS, or OnCue®Plus.	Check the remote switch position. Check OnCue®Plus.
	Generator thermostat tripped.	Check for obstructed air inlets and outlets. Reset the thermostat. See Section 5.6.
	Engine malfunction.	Contact an authorized distributor/dealer.

Figure 5-3 General Troubleshooting

Appendix A Abbreviations

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

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

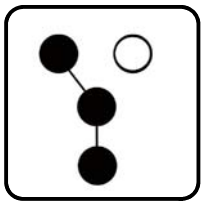
kg/cm^2	kilograms per square centimeter
kgm	kilogram-meter
kg/m^3	kilograms per cubic meter
kHz	kilohertz
kJ	kilojoule
km	kilometer
kOhm, kΩ	kilo-ohm
kPa	kilopascal
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt ampere
kVAR	kilovolt ampere reactive
kW	kilowatt
kWh	kilowatt-hour
kWm	kilowatt mechanical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

TP-7092 2/21a

KOHLER CO., Kohler, Wisconsin 53044
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales/service outlet in the
US and Canada, phone 1-800-544-2444
KOHLERPower.com

Operation and Installation

Automatic Transfer Switch



Model:

RDT

100–400 Amp Automatic Transfer Switches
100 and 200 Amp Automatic Transfer Switches with Load Centers
200 and 400 Amp Service Entrance Rated Transfer Switches

Electrical Controls:
MPAC™ 500

ISO 9001
KOHLER POWER SYSTEMS
NATIONALLY REGISTERED

KOHLER®
Power Systems

TP-6345 9/13j

Product Identification Information

Product identification numbers determine service parts. Record the product identification numbers in the spaces below immediately after unpacking the products so that the numbers are readily available for future reference. Record field-installed kit numbers after installing the kits.

Transfer Switch Identification Numbers

Record the product identification numbers from the transfer switch nameplate.

Model Designation _____

Serial Number _____

Accessory Number	Accessory Description

Table of Contents

Table of Contents, continued

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***.

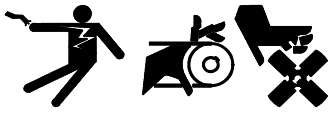
NOTICE

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.

Hazardous Voltage/ Moving Parts

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

⚠ 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.

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.

Making line or auxiliary connections. Hazardous voltage can cause severe injury or death. To prevent electrical shock deenergize the normal power source before making any line or auxiliary connections.

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

⚠ 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.

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

Notice

NOTICE

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

NOTICE

Foreign material contamination. Cover the transfer switch during installation to keep dirt, grit, metal drill chips, and other debris out of the components. Cover the solenoid mechanism during installation. After installation, use the manual operating handle to cycle the contactor to verify that it operates freely. Do not use a screwdriver to force the contactor mechanism.

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

This manual provides operation and installation instructions for Kohler Model RDT automatic transfer switches with MPAC® 500 electrical controls.

Information in this publication represents data available at the time of print. Kohler Co. reserves the right to change this literature 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. Keep this manual with the equipment for future reference.

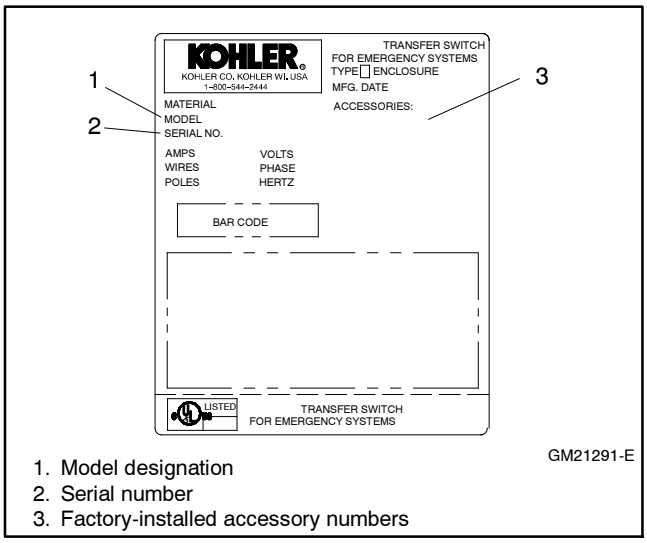
The equipment service requirements are very important to safe and efficient operation. Inspect parts often and perform required service at the prescribed intervals. Obtain service from an authorized service distributor/ dealer to keep equipment in top condition.

Nameplate

A nameplate attached to the inside of the enclosure cover includes a model designation, a serial number, ratings, and other information about the transfer switch. See Figure 1.

Check the transfer switch model number from the transfer switch nameplate and verify that it matches the model shown on the front cover of this manual before proceeding with installation.

Copy the model designation, serial number, and accessory information from the nameplate to the spaces provided in the Product Identification Information section located inside the front cover of this manual for use when requesting service or parts. Copy the model designation into the spaces in the Model Code chart and use the chart to interpret the model designation.

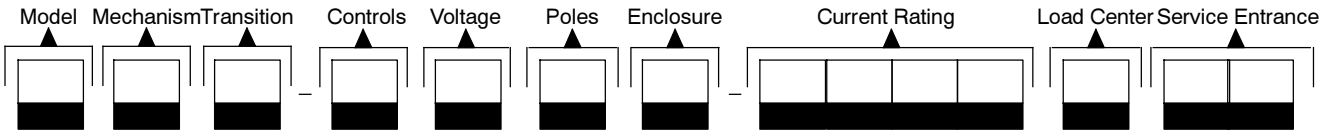


1. Model designation
2. Serial number
3. Factory-installed accessory numbers

Figure 1 Typical Transfer Switch Nameplate

Model Code

Record the transfer switch model designation in the boxes below. The transfer switch model designation defines characteristics and ratings as explained in the accompanying chart.



Kohler® Model Designation Key

This chart explains the Kohler® transfer switch model designation system. The sample model designation shown is for a Model R service entrance rated automatic transfer switch that uses a standard-transition contactor with MPAC® 500 electrical controls rated at 240 volts/60 Hz, 2 poles, 3 wires, and solid neutral in a NEMA 3R enclosure with a current rating of 200 amperes and no load center.

SAMPLE MODEL DESIGNATION

RDT-CFNC-0200ASE

Model
R: Model R automatic transfer switch

Mechanism
D: Specific-breaker rated

Transition
T: Standard transition

Electrical Controls
C: MPAC™ 500 (Microprocessor ATS Control)

Voltage/Frequency
D: 220 Volts/50 Hz
F: 240 Volts/60 Hz

Number of Poles/Wires
N: 2-pole, 3-wire, solid neutral

Enclosure
A: NEMA 1 (steel) *
C: NEMA 3R (aluminum)

Current Rating: Numbers indicate the current rating of the switch in amperes:
0100: 100 amps 0200: 200 amps 0400: 400 amps

Load Center
A: Without load center
B: With load center (not available on 400 amp models)

Service Entrance:
SE: Service entrance model (200 and 400 amp models available)
Blank: Not rated for service entrance

* NEMA 1 only: 100 and 200 amp models without load centers can be recess-mounted between wall studs. Optional wall-mount bezel is available.

Service Assistance

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

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

Headquarters Europe, Middle East, Africa (EMEA)
Kohler Power Systems
3 rue de Brennus
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

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

Notes

1.1 Transfer Switch Description

An automatic transfer switch (ATS) transfers electrical loads from a normal source of electrical power to an emergency source when the normal source voltage or frequency falls below an acceptable level. The normal source is typically utility power. The emergency source is usually a generator set.

When the normal source fails, the ATS signals the emergency source generator set to start. When the emergency source reaches acceptable levels and stabilizes, the ATS transfers the electrical load to the emergency source.

The ATS continuously monitors the normal source and transfers the load back when the normal source returns and stabilizes. After transferring the load back to the normal source, the ATS removes the generator start signal, allowing the generator set to shut down.

Figure 1-1 shows a typical installation block diagram.

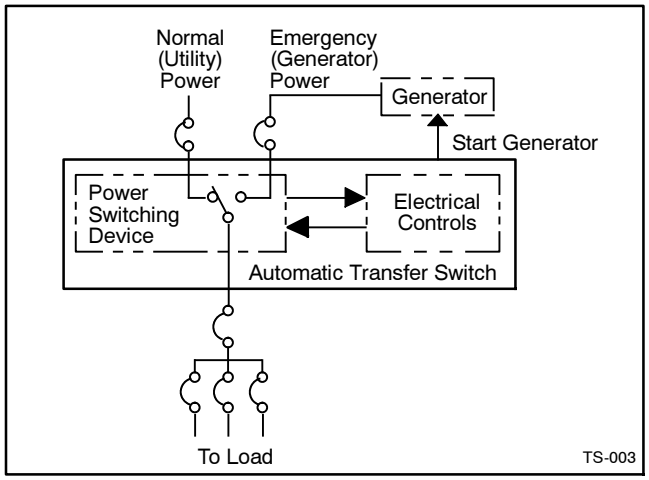


Figure 1-1 Typical ATS Block Diagram

1.2 Load Centers

Model RDT 100 and 200 amp transfer switches are available with or without built-in load centers. Models without load centers require the installation of a separate load panel.

Loads. The transfer switch can be connected to supply all of the electrical loads in the home, or only the essential loads such as the furnace, refrigerator, well pump, and selected light circuits. Identify the essential circuits that must be supplied during a power outage. Verify that the generator set and transfer switch are adequately rated to supply all of the selected loads.

Circuit breakers. Because the size and number of circuit breakers required will vary with each application, circuit breakers are not provided with the transfer switch load center.

Determine the circuits that will be connected to the transfer switch (essential loads). Identify the breakers for those circuits in the main distribution panel.

The ATS load center requires Square D type QO breakers. Up to 8 type QOT tandem breakers can be used on 100 amp models. If the main distribution panel uses the same type of breakers, the breakers can be moved from the main panel to the load center. Otherwise, obtain new Square D type QO circuit breakers. For each circuit, the rating of the load center circuit breaker must match the rating of the existing breaker in the main panel.

Verify that the total rating for all of the breakers used in the load center does not exceed the rating of the transfer switch.

1.3 Service Entrance Models

Service entrance models use a circuit breaker to provide the service disconnect for the utility source.

The SE model is equipped with a 15-amp, single-pole circuit breaker for the generator set battery charger.

A circuit breaker for the generator set engine heater is available as an optional accessoryfor the 200 amp SE model. The engine heater circuit is standard on the 400 amp SE model.

A surge suppressor for the utility source and an enclosure space heater are also available as optional accessories.

Notes

2.1 Introduction

Kohler transfer switches are shipped factory-wired, factory-tested, and ready for installation. Have the equipment installed only by trained and qualified personnel, and verify that the installation complies with applicable codes and standards. Protect the switch against damage before and during installation.

2.2 Receipt of Unit

2.2.1 Inspection

At the time of delivery, inspect the packaging and the transfer switch for signs of shipping damage. Unpack the transfer switch as soon as possible and inspect the exterior and interior for shipping damage. If damage and/or rough handling is evident, immediately file a damage claim with the transportation company.

2.2.2 Storage

Store the transfer switch in its protective packing until final installation. Protect the transfer switch at all times from moisture, construction grit, and metal chips. Avoid storage in cold or damp areas where moisture could condense on the unit. See Figure 2-1 for acceptable storage temperatures.

2.2.3 Lifting

⚠ 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.

See Figure 2-2 or the dimensional drawing for the weight of the transfer switch. Use a spreader bar to lift the transfer switch. Attach the bar only to the enclosure's mounting holes or lifting brackets; do not lift the unit any other way. Close and latch the enclosure door before moving the unit.

2.2.4 Unpacking

Allow the equipment to warm to room temperature for at least 24 hours before unpacking to prevent condensation on the electrical apparatus. Use care when unpacking to avoid damaging transfer switch components. Use a vacuum cleaner or a dry cloth to remove dirt and packing material that may have accumulated in the transfer switch or any of its components.

Note: Do not use compressed air to clean the switch. Cleaning with compressed air can cause debris to lodge in the components and damage the switch.

Item	Specification
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Operating Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	5% to 95% noncondensing
Altitude	0 to 3050 m (10000 ft.) without derating

Figure 2-1 Environmental Specifications

Enclosure Type	Amps	Load Center	Shipping Weight kg	(lb.)
NEMA 1 (steel)	100	None	10	(22)
	100	16 spaces	19.5	(43)
	200	None	11	(24)
	200	24 spaces	20.4	(45)
NEMA 3R (aluminum)	100	None	8.2	(18)
	100	16 spaces	15	(32)
	200	None	9.1	(20)
	200	24 spaces	16	(35)
	200 SE †	None	17	(37)
	200 SE †	42 spaces	32	(70)
	400	None	54	(120)
	400 SE †	None	59	(130)
† SE = Service entrance model				

Figure 2-2 Transfer Switch Weights

2.3 Installation

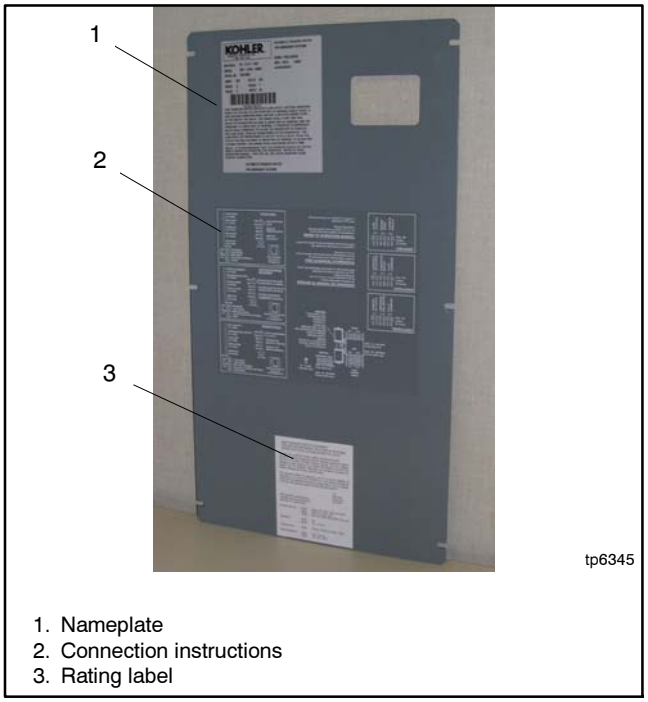
NOTICE

Foreign material contamination. Cover the transfer switch during installation to keep dirt, grit, metal drill chips, and other debris out of the components. Cover the solenoid mechanism during installation. After installation, use the manual operating handle to cycle the contactor to verify that it operates freely. Do not use a screwdriver to force the contactor mechanism.

NOTICE

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

Check the system voltage and frequency. Compare the voltage and frequency shown on the transfer switch nameplate to the source voltage and frequency. See Figure 2-3. Do not install the transfer switch if the voltage and frequency are different from the normal (utility) source voltage and frequency or the emergency source voltage and frequency shown on the generator set nameplate.



1. Nameplate
2. Connection instructions
3. Rating label

Figure 2-3 Enclosure Door or Inner Panel

Plan the installation. Use the dimensions given on the enclosure dimension (ADV) drawings in Section 7. Select a mounting site that complies with local electrical code restrictions for the enclosure type. Mount the transfer switch as close to the load and power sources as possible. Allow adequate space to open the enclosure and service the switch.

Wall mounting. Mount the transfer switch to a wall or other rigid vertical supporting structure. Use the template provided with 100 and 200 amp switches to locate the mounting holes in the wall. Level the template before marking and drilling the holes. For 400 amp switches, refer to the dimension drawing in Section 7 for hole locations.

Cover or remove the transfer switch's internal components to protect them from drill chips or debris during installation. Use a vacuum cleaner to remove debris from the enclosure. Tighten the mounting screws to 2.9 Nm (26 in. lb.) when reinstalling the components.

Note: Do not use compressed air to clean the switch. Cleaning with compressed air can cause debris to lodge in the components and cause damage.

Clearance holes through the back of each enclosure are provided for mounting. Use shims to plumb the enclosure.

NEMA 3R enclosures. To remove the enclosure's front panel, support the panel while removing the screws. Pull the bottom of the panel out and down until the top clears the enclosure. Remove the inner panel to access the transfer switch components.

100 and 200 amp NEMA 3R enclosures have locking tabs at the bottom of the enclosure and the door. While the enclosure is open, turn the locking tab out so that the door can be locked with a padlock after installation is complete.

Note: The mounting holes on NEMA 3R enclosures have gaskets to seal out moisture. Use washers with the mounting screws to protect the gaskets.

Recessed mounting. All 100 amp NEMA 1 enclosures and 200 amp NEMA 1 enclosures without the load center can be recess-mounted between 16 in. O.C. wall studs.

Remove the ATS components from inside the enclosure to protect them from drill chips and debris. Drill four mounting holes in one side of the enclosure. Mark and drill matching mounting holes in the wall stud. The enclosures are 330.2 mm (13 in.) wide. Add a stud to provide support on both sides of the transfer switch, if desired.

Mount the transfer switch enclosure. Use a vacuum cleaner to remove debris from the enclosure. Reinstall the internal components and tighten the mounting screws to 2.9 Nm (26 in. lb.).

Bezel. The optional bezel can be used with recess-mounted units. After mounting the transfer switch, mount the bezel around the transfer switch using the six self-tapping screws included with the kit. Drywall anchors may be needed for screws that do not go into studs.

2.4 Manual Operation Check

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

Check the manual operation before energizing the transfer switch. Verify that the contactor operates smoothly without binding. Do not place the transfer switch into service if the contactor does not operate smoothly.

After checking the manual operation, place the contactor in the Normal (utility) position.

Manual Operation, 100 and 200 Amp Switches

Note: Never manually operate the transfer switch when the power is connected. Disconnect both power sources before manually operating the switch.

1. Move the handle up to place the transfer switch in the Normal Source position and down to place the contactor in the Emergency Source position. See Figure 2-4.

2. Move the handle up to place the transfer switch in the Normal Source position for normal operation.

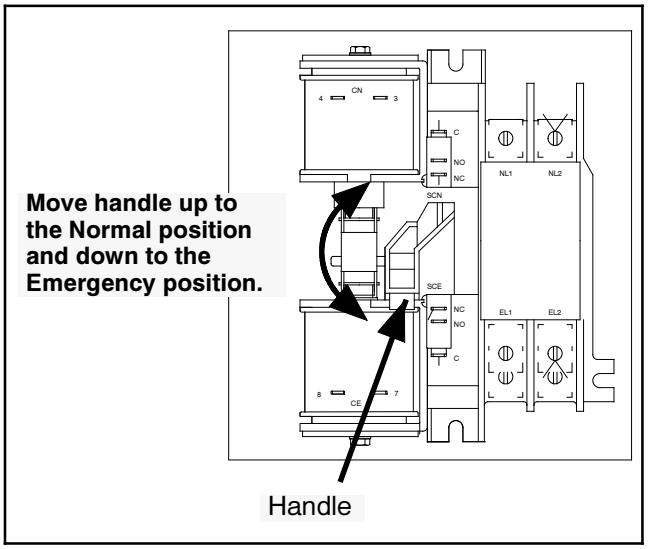


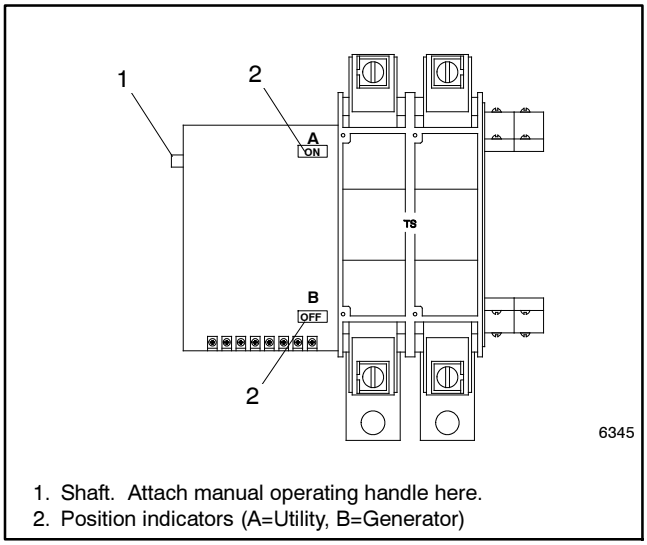
Figure 2-4 Manual Operation, 100 and 200 Amp Switches

Manual Operation, 400 Amp Switches

Note: Never manually operate the transfer switch when the power is connected. Disconnect both power sources before manually operating the switch.

1. Check the contactor position, indicated by the A and B position indicators. See Figure 2-5. One position indicator will display ON to indicate the source position. A is utility power and B is the generator set.

2. Slide the manual operating handle (provided with the switch) over the shaft on the left side of the switch. See Figure 2-5 and Figure 2-6.



1. Shaft. Attach manual operating handle here.
2. Position indicators (A=Utility, B=Generator)

Figure 2-5 400 Amp Contactor

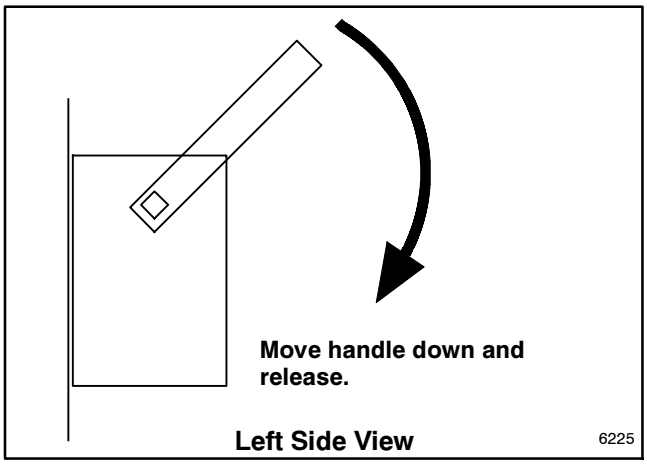


Figure 2-6 Manual Operation, 400 Amp

3. Move the manual operation handle down and then release the handle. Verify that the desired source position indicator displays ON.

4. Place the transfer switch in position A (utility).

5. Remove the manual operation handle and store it in a convenient location.

2.5 Electrical Wiring

The connection drawings in Figure 2-8 and Figure 2-9 show examples of essential load and whole-house configurations. Figure 2-10 and Figure 2-11 show service entrance model connections.

All wiring must comply with applicable national, state, and local electrical codes. Use separate conduit for AC power wiring and low-voltage DC, control, and communication system wiring.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

Refer to the connection diagrams on the transfer switch enclosure door (see Figure 2-3) and the wiring diagrams in Section 7 during installation.

Making line or auxiliary connections. Hazardous voltage can cause severe injury or death. To prevent electrical shock deenergize the normal power source before making any line or auxiliary connections.

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 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.

2.5.1 Load Center Circuit Breakers

The ATS load center uses Square D type QO breakers. Up to 8 type QOT tandem breakers can also be used. In an essential load application, the breakers can be moved from the main panel to the load center if the main distribution panel uses the same type of breakers. Otherwise, obtain and install new Square D type QO circuit breakers. The rating of the load center circuit breaker must match the rating of the existing breaker in the main panel for each circuit. If circuit breakers are removed from the load panel, install cover plates over the vacant positions. Cover plates can be obtained from a local Square D supplier.

Verify that the total rating for all breakers used in the load center does not exceed the rating of the transfer switch.

2.5.2 AC Power Connections

Determine the cable size. Refer to Figure 2-7 to determine the cable size required for the transfer switch. Make sure the lugs provided are suitable for use with the cables being installed.

Cable Sizes				
AL/CU UL-Listed Solderless Screw-Type Terminals for External Power Connections				
Switch Size, Amps	Range of Wire Sizes, Cu/Al			
	Normal and Emergency (per phase)	Load (per phase)	Neutral	Ground
100	(1) #14 to 1/0 AWG	(1) #14 to 1/0 AWG	(3) #12 to 250 KCMIL (Cu) or (3) #10 to 250 KCMIL (Al)	(9) #14 to #4 AWG
100 B	(1) #14 to 1/0 AWG	(1) #14 to 1/0 AWG	(1) #6 to 2/0 AWG	(9) #14 to #4 AWG
200	(1) #6 AWG to 250 KCMIL	(1) #6 AWG to 250 KCMIL	(3) #12 to 250 KCMIL (Cu) or (3) #10 to 250 KCMIL (Al)	(9) #14 to #4 AWG
200 B	(1) #6 AWG to 250 KCMIL	(1) #6 AWG to 250 KCMIL	(1) #4 AWG to 250 KCMIL	(9) #14 to #4 AWG
200 BSE	(1) #4 AWG to 250 KCMIL	(1) #4 AWG to 250 KCMIL	(3) #12 to 250 KCMIL (Cu) or (3) #10 to 250 KCMIL (Al)	(4) #14 to #1/0 AWG
200 SE	(1) #4 AWG to 300 KCMIL	(1) #6 AWG to 250 KCMIL	(3) #12 to 250 KCMIL (Cu) or (3) #10 to 250 KCMIL (Al)	(3) #14 to #1/0 AWG
400	(2) #1/0 AWG to 250 KCMIL or (1) #4 AWG to 600 KCMIL	(2) #1/0 AWG to 250 KCMIL or (1) #4 AWG to 600 KCMIL	(6) #1/0 AWG to 250 KCMIL or (3) #4 AWG to 600 KCMIL	(3) #6 to 3/0 AWG
400 SE	(2) #1/0 AWG to 250 KCMIL	(2) #1/0 AWG to 250 KCMIL or (1) #4 AWG to 600 KCMIL	(6) #1/0 AWG to 250 KCMIL or (3) #4 AWG to 600 KCMIL	(3) #6 to 3/0 AWG
B = Load center model SE = Service entrance model				

Figure 2-7 Cable Sizes

Conduit. Use the knock-outs provided in the enclosure for cables. Use separate conduit for AC power wiring and low-voltage DC, control, and communication system wiring. Watertight conduit hubs may be required for outdoor use.

For the SE model conduit hub, thread sealant must be applied to screw threads if screws are removed or replaced.

Select the proper cable clamp or use other approved methods for securing the cable or conduit to the enclosure.

Connect the source and load cables. Clean cables with a wire brush to remove surface oxides before connecting them to the terminals. Apply joint compound to the connections of any aluminum conductors.

Refer to the connection diagrams on the transfer switch enclosure door (see Figure 2-3) and the wiring diagrams in Section 7.

Connect the Normal source (typically the utility power) to the lugs labeled NA and NB. Connect the Emergency source (typically the generator set) to the lugs labeled EA and EB.

For service entrance models, connect the utility source to the lugs on the normal source disconnect circuit breaker as shown in the service entrance switch wiring diagram in Section 7.

On models without built-in load centers, connect the load to the lugs labeled LA and LB.

On models with built-in load centers, the LA and LB lugs are factory-wired to the load center. Connect the load leads to the circuits in the load center and tighten the connections. Check the labels on the breakers for the tightening torques.

Connect the neutral from the main panel to the neutral lug in the ATS enclosure.

Note: The neutral connection is required for transfer switch operation.

Ground the system according to NEC and local codes.

Verify that all connections are consistent with drawings before tightening the lugs. Tighten all cable lug connections to the torque values shown on the label on the switch. Carefully wipe off any excess joint compound after tightening the terminal lugs.

2.5.3 Neutral Bonding Jumper, Service Entrance Models

Service entrance transfer switches are shipped with the neutral-to-ground jumper connected. For non-service entrance applications, disconnect the neutral-to-ground bonding jumper. See the transfer switch dimension drawing.

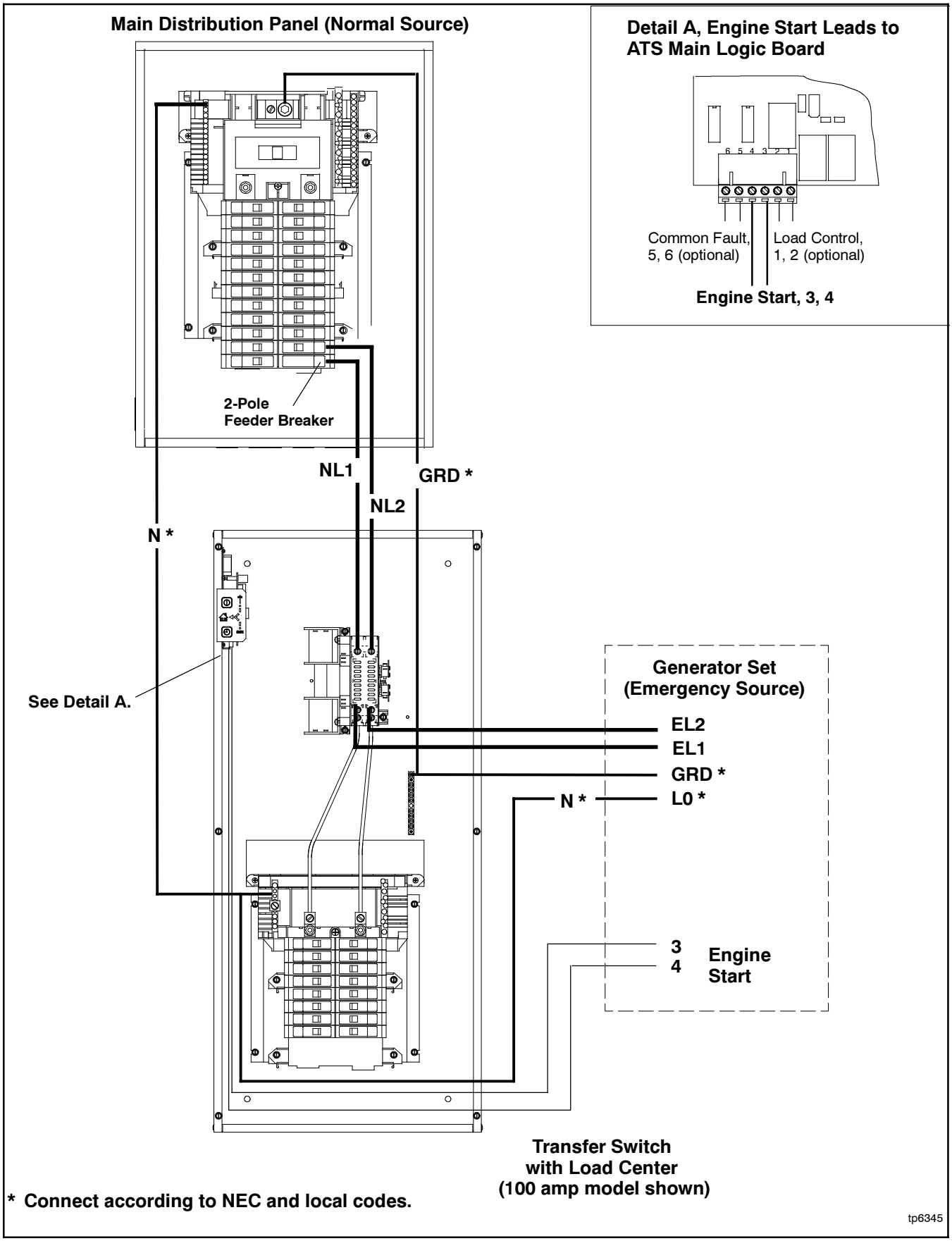


Figure 2-8 Connection Diagram, Load Center Models, Essential Loads Configuration

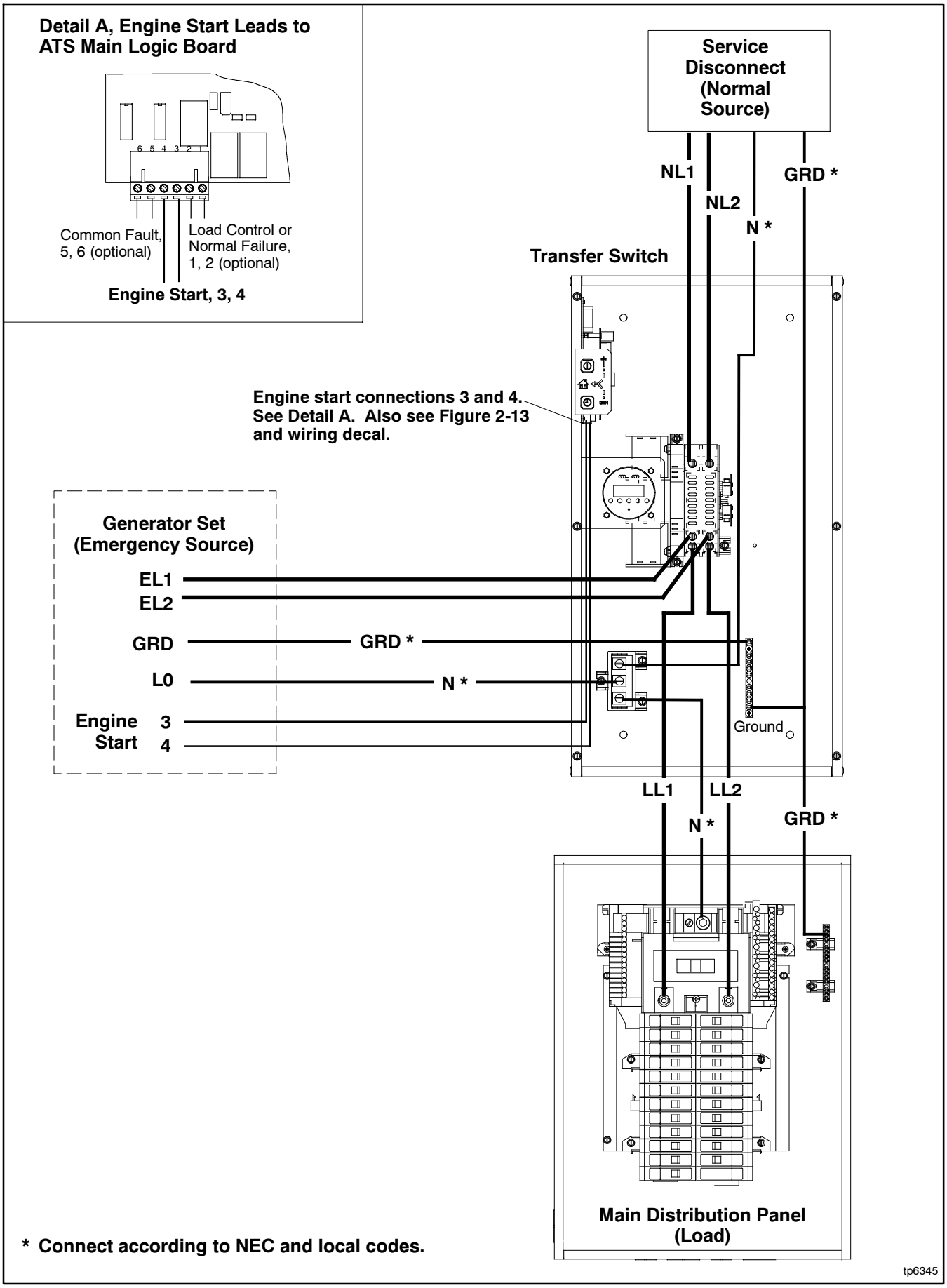


Figure 2-9 Connection Diagram, Transfer Switch without Load Center, Whole-House Configuration

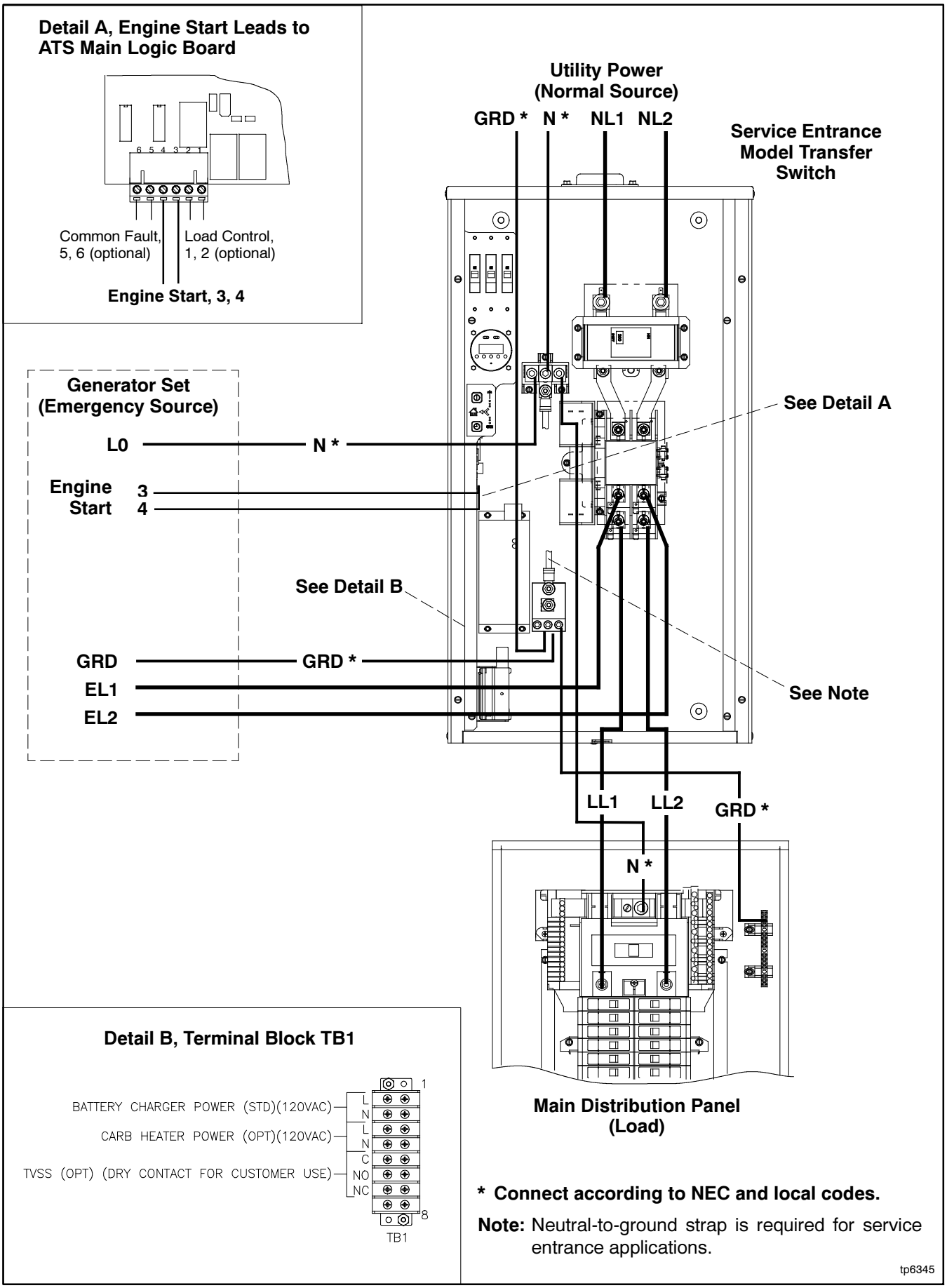
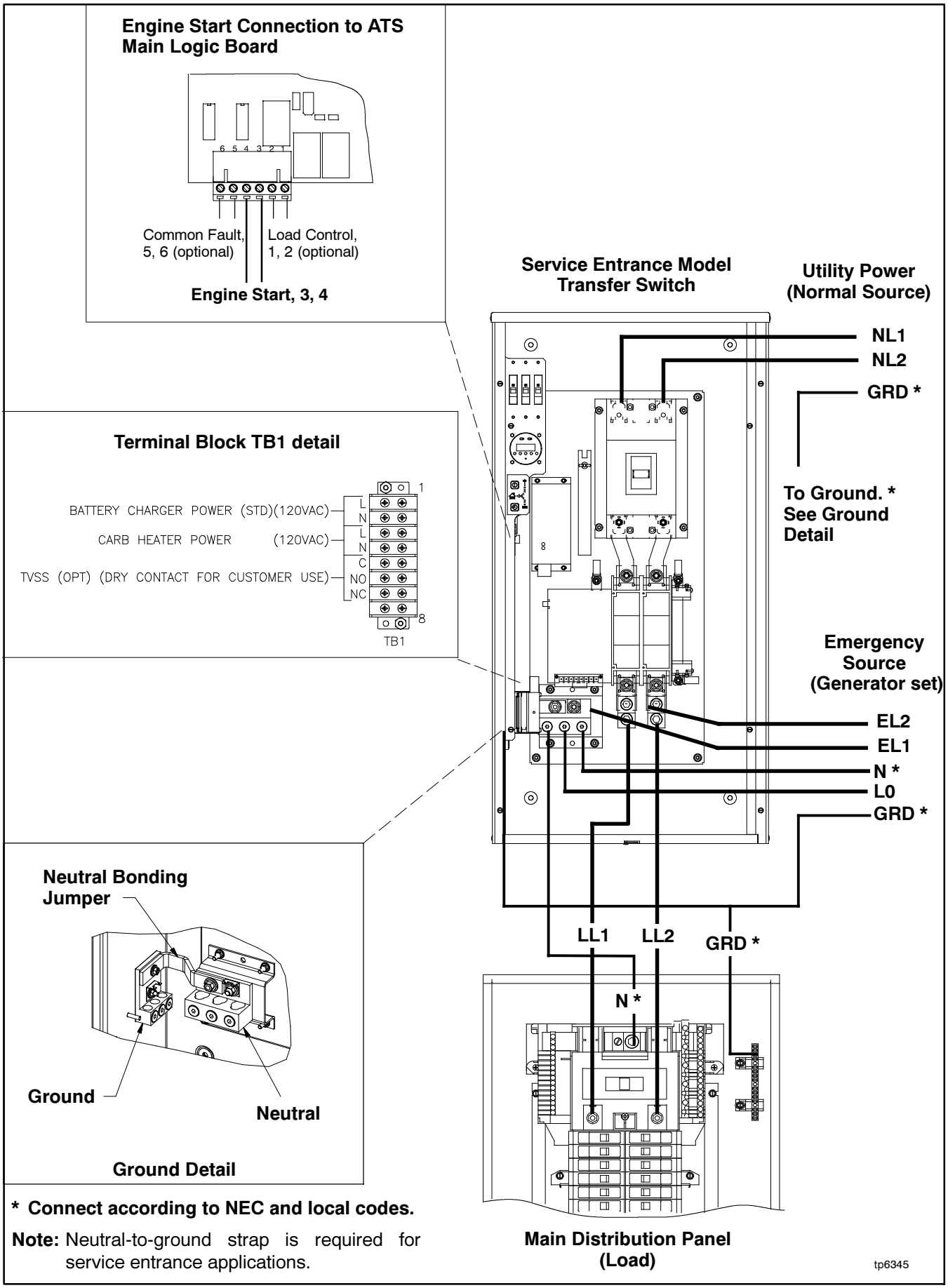


Figure 2-10 Connection Diagram, 200 Amp Service Entrance Model Transfer Switch



*** Connect according to NEC and local codes.**

Note: Neutral-to-ground strap is required for service entrance applications.

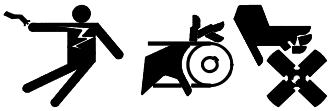
Figure 2-11 Connection Diagram, 400 Amp Service Entrance Model Transfer Switch

2.6 Controller Connections

See Figure 2-12 and the wiring diagrams in Section 7 for controller connections.

2.6.1 Engine Start Connections

⚠ WARNING



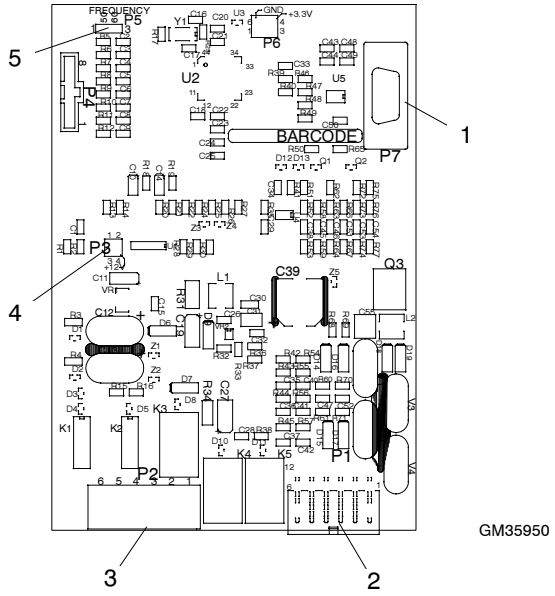
Accidental starting.
Can cause severe injury or death.

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.

Connect the engine start leads from the generator set to terminals 3 and 4 on the green 6-pin connector labeled P2 on the controller's main logic board. See Figure 2-12 for the location of the engine start contacts and V for connection details. See Figure 2-15 for contact ratings and wire size information.

Note: Be sure to connect the engine start leads to the *green* connector on the *main logic board*. The optional accessory board has a similar black 6-pin connector that is used for other input and output connections.



1. RS-232 connection (used to load controller application code)
2. Contactor harness connection P1
3. Customer connection terminal P2 (green):
   Load control or normal failure output
   Engine start
   Common fault output
4. Accessory board connector P3
5. Frequency shunt (jumper) P5

Figure 2-12 Controller Board Connections

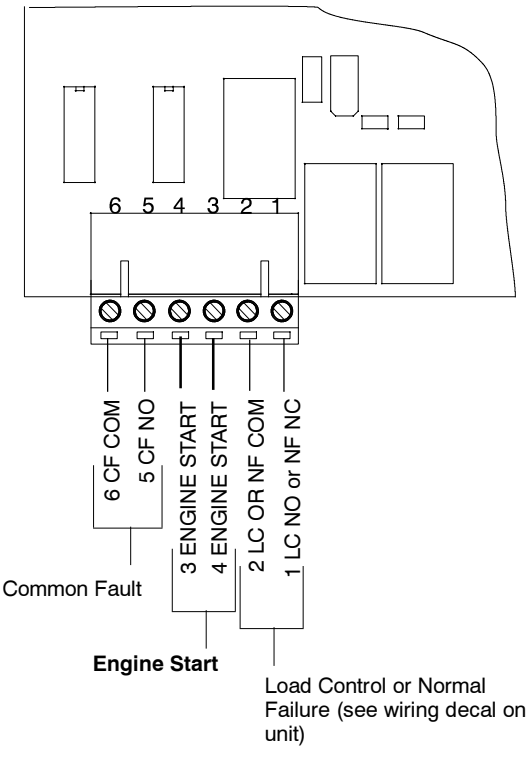


Figure 2-13 Engine Start Connection Detail

2.6.2 Optional Controller Connections

The green 6-pin connector P2 on the controller's main logic board provides connection points for optional common fault and load control or normal failure circuits. See Figure 2-12 for the connector location and Figure 2-13 for connection details. See Figure 2-15 for contact ratings, connection, and wire size information.

Load Control Contact. Normally open (NO) contact provided on most models; see the wiring decal on the unit. Provides a delayed contact closure to allow startup of selected loads 5 minutes after transfer to the emergency power source (generator set). Use this contact to delay startup of equipment with large motor-starting loads such as air conditioners.

The optional accessory board allows you to change the load control time delay to 10 minutes. See Section 4.1.

Normal Failure Contact. Normally-closed (NC) contact provided on models equipped with controller board GM41597 only; see the wiring diagram decal on the unit. This contact opens when the normal source is available and closes when the normal source is lost.

Common Fault Contact. The normally open contact closes and latches on the following conditions:

- Failure to transfer
- Position-indicating auxiliary contact fault
- Failure to acquire emergency source

Connect customer-supplied equipment such as an indicator lamp or alarm horn to the common fault connections on connector P2. See Section 3.3 for fault information.

The faults must be reset to open this contact after a fault condition. See Section 3.4 for instructions to reset faults.

2.6.3 Frequency Selection

The transfer switch frequency is set by a programming shunt (jumper) on P5 on the main logic board. See Figure 2-12 for the jumper location. Position the jumper as indicated in Figure 2-14 for 50 or 60 Hz.

Frequency	P5 Jumper Position
50 Hz	P5-1 to P5-2
60 Hz	P5-2 to P5-3

Figure 2-14 Frequency Jumper Positions

Description	Terminals	Contact Rating	Wire Size	Tightening Torque	Max. Distance
Load Control	P2-1 and P2-2	10 A @ 120 VAC Normally open (NO)	#12–24 AWG	0.8 Nm (7 in. lb.)	213 m (700 ft.)
Normal Failure (control board GM41597 only)	P2-1 and P2-2	10 A @ 120 VAC Normally closed (NC)	#12–24 AWG	0.8 Nm (7 in. lb.)	213 m (700 ft.)
Engine Start	P2-3 and P2-4	0.5 A @ 125 VAC; 2 A @ 30 VDC Normally closed (NC)	#12–24 AWG	0.8 Nm (7 in. lb.)	213 m (700 ft.)
Common Fault	P2-5 and P2-6	0.5 A @ 125 VAC; 2 A @ 30 VDC Normally open (NO), latches closed	#12–24 AWG	0.8 Nm (7 in. lb.)	213 m (700 ft.)

Figure 2-15 Controller Main Logic Board Customer Connections (P2)

2.7 Accessory Connections

Factory-installed accessories may require power, input, and output connections. Refer to the following sections and Section 4 for instructions to connect optional accessories. Check settings on optional accessories as described in the following sections.

2.7.1 Auxiliary Contacts (Optional)

Optional auxiliary contacts provide one set of contacts that close when the transfer switch is in the Normal position and one set of contacts that close when the transfer switch is in the Emergency position. Use 1/4 in. fast-on connectors to connect the auxiliary contacts to customer-supplied alarms, remote indicators, or other devices. See Figure 2-16 for the contact rating.

The auxiliary contacts are located on the right side of the contactor. See Figure 2-18.

The 400 amp models are equipped with one set of auxiliary contacts as standard equipment.

Description	Contact Rating
Auxiliary Contacts	15 A @ 277 VAC Form C

Figure 2-16 Auxiliary Contact Rating

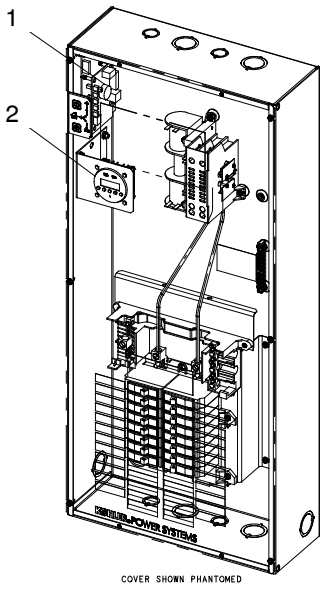
2.7.2 Accessory Board

If the accessory board is installed, check the DIP switches and time delay settings and set them to the desired values. See Section 4.1.

A remote start/stop (remote test) switch and an external exerciser can be connected to the accessory board. See Section 4.1.3 for input and output connection instructions.

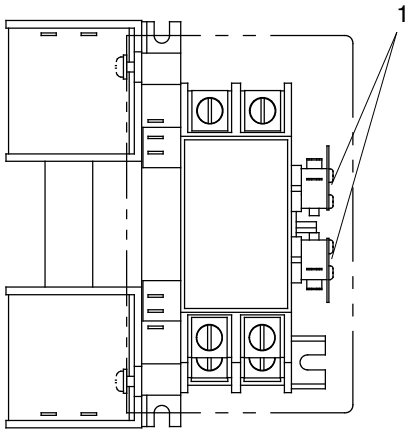
2.7.3 External Alarm Module (EAM)

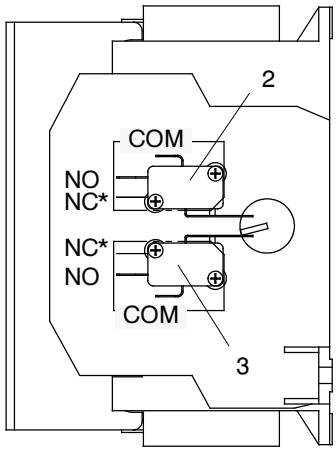
Use category 5 network cable to connect the optional EAM (if used) to the accessory board. See Section 4.2. The accessory board is required for connection and operation of the EAM.



1. Accessory board (optional)
2. Programmable exerciser (optional)

Figure 2-17 Optional Accessory Locations, Typical





* NC contact provided on some switches

1. Auxiliary contacts
2. Normal
3. Emergency

Figure 2-18 Optional Auxiliary Contacts, Typical

2.7.4 SE Model Battery Charger Circuit Breaker Connection

The SE model transfer switch has a 15-amp single-pole circuit breaker for the generator set battery charger. The circuit breaker (CB1) is factory-wired to the accessory connection terminal block TB1. Connect the battery charger power connection to the accessory connection terminal block. For connections, see Figure 2-19 or the wiring diagrams in Section 7, Diagrams and Drawings. See Figure 2-20 for the terminal block location.

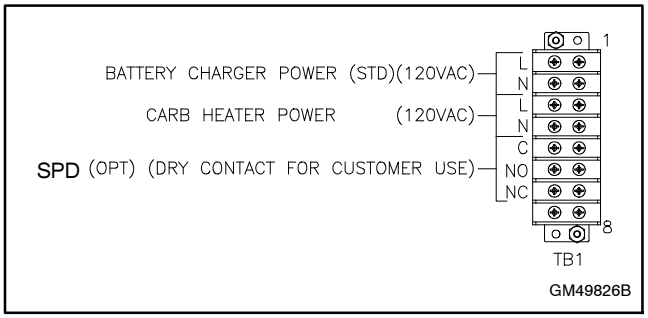
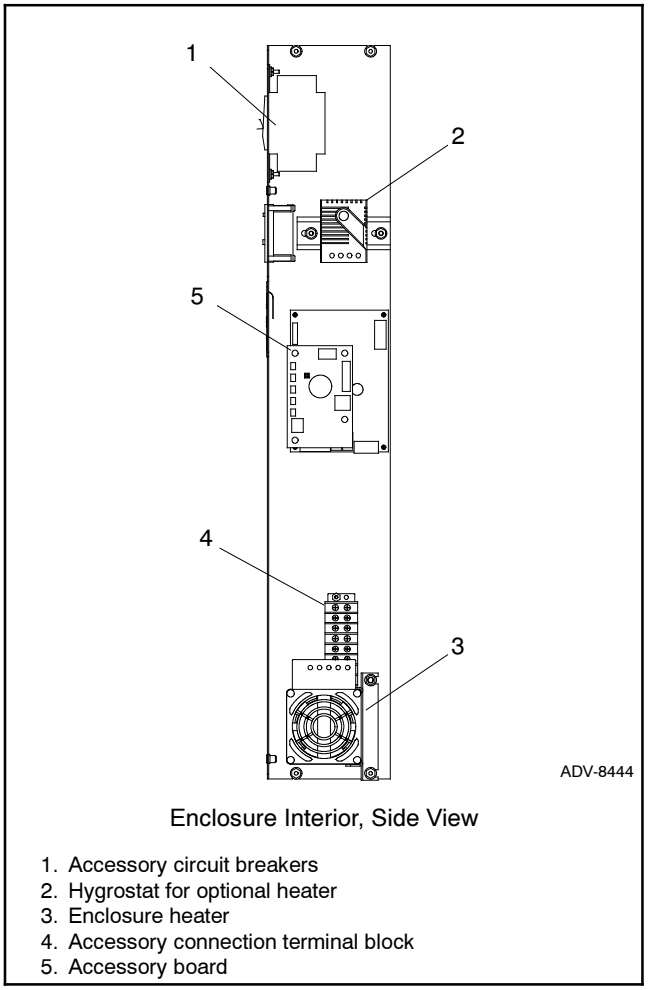


Figure 2-19 Accessory Connection Terminal Block, SE Model Only



Enclosure Interior, Side View

1. Accessory circuit breakers
2. Hygrostat for optional heater
3. Enclosure heater
4. Accessory connection terminal block
5. Accessory board

Figure 2-20 SE Model Accessory Locations, Typical

2.7.5 SE Model Accessory Connections

See Figure 2-20 or the dimension drawings in Section 7 for the locations of optional accessories.

The following connections can be made to accessory connection terminal block TB1. See Figure 2-20 for the terminal block location.

Engine Heater. Engine heater circuit breaker CB2 is a 15-amp single-pole circuit breaker. CB2 is optional on 200 Amp SE models and standard on 400 Amp SE models.

If the generator set is equipped with a carburetor heater, connect the heater power to engine heater circuit breaker CB2 through terminal block TB1. See Figure 2-20 for the terminal block location. For connections, see Figure 2-19 or the transfer switch wiring diagram in Section 7, Diagrams and Drawings.

SPD Remote Indicator. An indicator for the optional surge protective device (SPD) can also be connected to the accessory connection terminal block. The SPD provides for remote monitoring via a normally open (NO) or normally closed (NC) circuit. The contact changes state when the SPD module needs replacement.

Connect customer-provided indicators or alarms to the SPD auxiliary contact terminals (Normal and Emergency) on terminal block TB1 to provide remote indication when the SPD needs to be replaced. See Figure 2-21 for the contact rating. See Figure 2-19 or the service entrance transfer switch wiring diagram in Section 7, Diagrams and Drawings, for connections.

Description	Contact Rating
SPD Remote Indication Contact	2 A @ 250 VAC

Figure 2-21 Contact Rating

Enclosure Space Heater. The enclosure space heater, if installed, is factory-wired to circuit breaker CB3 through terminal block TB1. Check the temperature and humidity settings on the space heater control. See Section 4.4.3 for recommended settings.

2.8 Operation Test

Use the procedure below to run the transfer switch's test sequence. Loaded or unloaded test sequences can be run. The test sequence starts the generator set, and, for a loaded test, transfers the load to the emergency source. When the test ends, the transfer switch transfers the load back to the normal source and removes the engine start signal.

Refer to Section 3.5 for a description of the transfer switch sequence of operation.

Note: If the generator set fails during a test, the ATS will immediately attempt to transfer to the normal (utility) source.

Note: Install the front panel(s) or close and lock the enclosure door before starting the test procedure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

Test Procedure

1. Check the controller LED indicators to verify that the Utility Source Available and Utility Source Position indicators are lit. See Figure 3-1.

2. Verify that the generator set master switch is in the AUTO position.

3. Run a loaded or unloaded test as described below:

   a. **Loaded Test:** Press and hold the TEST button on the controller for 6 seconds to start a loaded test. The GEN Source and Position LEDs flash to indicate that the ATS controller is set up to transfer the load during the test.

   b. **Unloaded Test:** To start the generator set without transferring the load, hold the TEST button for 3 to 5 seconds. The GEN Position LED flashes to indicate an unloaded test.

4. Verify that the generator set engine starts and the GEN Available LED flashes.

5. For a loaded test, the switch transfers the load to the emergency source (generator set). Verify that the Utility Source Position LED goes out and the GEN Position LED lights.

6. Press and hold the Test button for 2 seconds to end the test.

7. The switch transfers the load to the normal (utility) source. Verify that the GEN Position LED goes out and the Utility Position LED lights.

   Note: The retransfer time delay does not operate during the test sequence.

8. After the engine cooldown time delay, the generator set shuts down.

   Note: The generator set may have an additional engine cooldown time delay that causes the engine to run after the transfer switch engine start signal is removed.

2.9 Exerciser Setup

The generator set must be in automatic mode for exerciser operation. Refer to the generator set operation manual for instructions to put the generator set in AUTO.

2.9.1 Standard Exerciser

Follow the instructions below to set the exercise timer to automatically start and run the generator set for 20 minutes every week. The exerciser can be set for loaded or unloaded exercise runs. The factory settings for the exerciser are summarized in Figure 2-22.

Exerciser	
Parameter	**Setting**
Frequency	Weekly
Duration	20 minutes
Unloaded/ Loaded	Unloaded: Hold Exercise button for 3–5 seconds. Loaded: Hold Exercise button for 6+ seconds.
Note: The optional accessory board allows adjustment of these parameters. See Section 4.1.5.	

Figure 2-22 Exerciser Settings

Pressing and holding the Exercise button will start an exercise run and set the exercise timer as described below. The exercise time and day are set to the time that the Exercise button is pushed. The exerciser will run at the same time on the same day each week.

While the generator set is running during an exercise period, the exercise can be ended early by pressing and holding the exercise button for 2 seconds. Ending the current exercise period early does not affect future exercise runs.

Unloaded exercise. The generator set runs, but the electrical load is not transferred. Press and hold the Exercise button for approximately 3 seconds until the GEN Available LED flashes to start an unloaded exercise and set the time and date of the next exercise run. The GEN available LED continues to flash throughout the exercise run to indicate an unloaded exercise. The generator set stops automatically after 20 minutes.

Loaded Exercise. The generator set runs and the ATS transfers the electrical load to the generator set. Hold the button for at least 6 seconds until the GEN available and GEN position LEDs flash to start a loaded exercise and set the time and date of the next exercise run. The GEN available and GEN position LEDs continue to flash throughout the exercise run to indicate a loaded exercise. After 20 minutes, the ATS transfers the load back to normal. The generator set stops automatically after the engine cooldown time delay.

Resetting the Exerciser. After the exerciser has been set, pressing and holding the Exercise button to start an exercise run at a different time resets the exerciser to that new time and day.

Clearing the Exercise Setting. If it is necessary to clear the exercise setting on the ATS controller, press and hold both the Exercise and Test buttons for at least 6 seconds.

Exercise with the RDC/DC or RDC2/DC2 Generator Set Controller

Note: When the RDT transfer switch is used with the generator sets equipped with the Kohler® Model RDC, DC, RDC2, or DC2 controller, it is possible to have two exercise settings (one set at the generator set controller, and one set at the ATS controller). If the exercise times overlap, the ATS exercise setting takes priority.

The RDC/DC and RDC2/DC2 generator set controllers allow the programming of an unloaded exercise at the generator set controller.

If the RDT transfer switch is used with a generator set with one of the controllers listed above and the unloaded exercise is set on the generator set controller, clearing the exercise on the RDT ATS controller is recommended.

2.9.2 Exerciser Options

The optional accessory board provides the option of biweekly exercise runs, adjustable exercise run duration from 5 to 50 minutes, and selection of loaded or unloaded exercises. See Section 4.1.

The optional programmable exercise timer provides more flexibility in programming additional exercise periods of different duration. See Section 4.3.

2.10 Warranty Registration

Startup Notification Form. The Startup Notification Form covers all equipment in the standby system. Complete the Startup Notification Form and register the equipment using the Kohler online Warranty Processing System within 60 days of the initial startup date. Standby systems not registered within 60 days of startup are automatically registered using the manufacturer's ship date as the startup date.

Notes

3.1 Introduction

Red and green LEDs on the transfer switch controls indicate which sources are available, show which source is connected to the load, and flash to indicate fault conditions. Pushbuttons allow you to start and stop the generator set and set the exercise timer. See Figure 3-1.

The transfer switch uses fixed settings for time delays, voltage and frequency pickup and dropout, and other system settings. An optional accessory board allows changes to the time delays and exerciser settings and provides connections for remote test and remote exercise inputs. See Section 4.1 for information on the accessory board.

3.2 Controls

The controller's user interface panel is accessible through an opening in the transfer switch cover (the inner panel on NEMA type 3R enclosures). Figure 3-1 explains the operation of the controller pushbuttons and LED indicators.

The LEDs light steadily or flash to indicate different ATS conditions as shown in Figure 3-2. See Section 3.3 for more information on fault conditions.

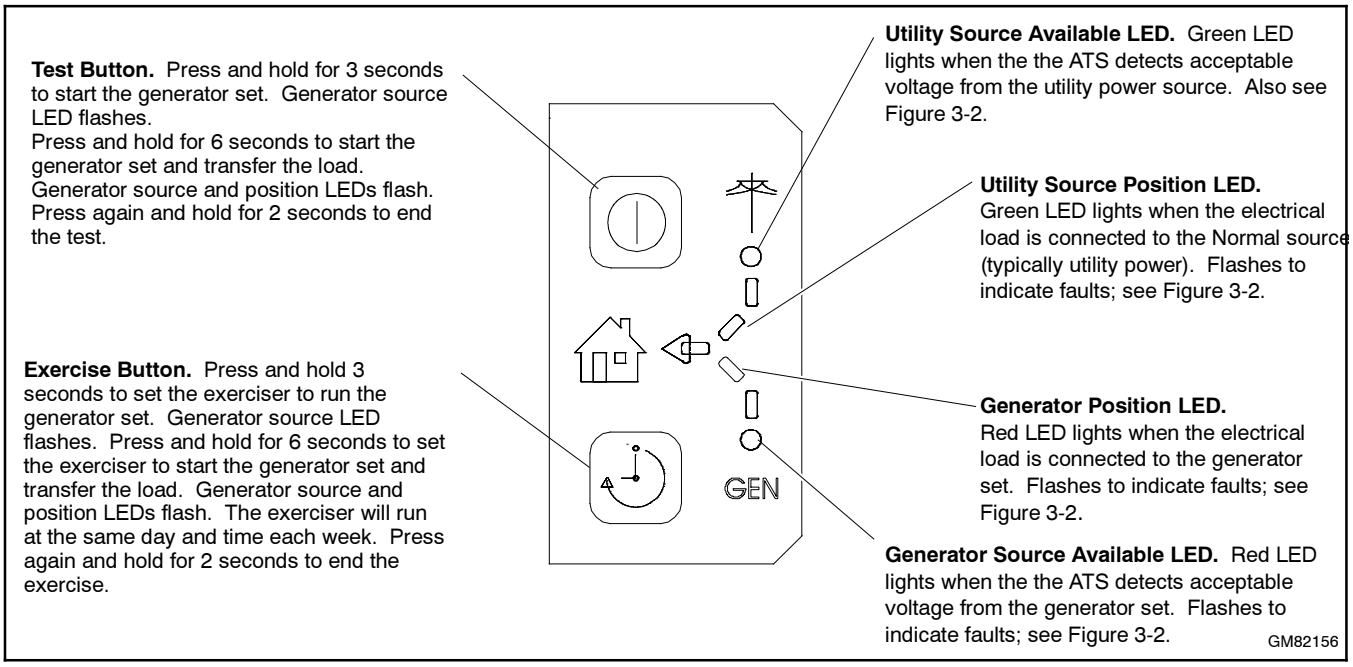


Figure 3-1 User Interface Panel

Condition	LED Indication
Utility source power available	Utility Source Available LED lights steadily.
Load connected to utility power	Utility Source Position LED lights steadily.
Generator set power available	GEN Source Available LED lights steadily.
Load connected to the generator set	GEN Position LED lights steadily.
Loaded test	GEN Available and GEN Position LEDs flash on 1 second, off 1 second.
Unloaded test	GEN Available LED flashes on 1 second, off 1 second.
Loaded exercise	GEN Available and GEN Position LEDs flash on 0.5 second, off 2 seconds.
Unloaded exercise	GEN Available LED flashes on 0.5 second, off 2 seconds.
Failure to acquire standby source fault	GEN Available LED flashes 2 times/second.
Failure to transfer fault	GEN or Utility Source Position LED flashes 2 times/second.
Auxiliary switch failure fault	GEN Position and Utility Source Position LEDs flash alternately 2 times/second.

Figure 3-2 LED Indication

3.3 Faults

The LEDs on the controller's user interface flash as shown in Figure 3-2 to indicate various fault conditions. Contact an authorized distributor/dealer for service if the fault persists.

3.3.1 Failure to Acquire Emergency Source Warning

The Failure to Acquire Emergency Source fault occurs if the transfer switch does not sense voltage from the generator set within 78 seconds after signaling the generator set to start. Check the generator set operation and the connections from the generator set to the ATS in the case of this fault.

The Failure to Acquire Emergency Time Delay is set for 78 seconds to allow for three 15-second engine cranking cycles plus 15 seconds rest between starting attempts.

The fault clears when the system acquires the emergency source.

3.3.2 Failure to Transfer Warning

The Failure to Transfer warning occurs if a signal to transfer is sent to the contactor and the position-indicating contacts do not indicate a complete transfer.

The controller will attempt to transfer three times before indicating the fault. If the transfer switch is in the Normal position, the Engine Cooldown time delay is executed and then the engine start contacts open to stop the generator set.

Reset the controller to clear the fault condition. See Section 3.4.

3.3.3 Auxiliary Switch Fault

An Auxiliary Switch fault occurs if the position-indicating contacts indicate that the ATS position changed when no transfer was called for. If the transfer switch is in the Normal position, the Engine Cooldown time delay is executed and then the engine start contacts open to stop the generator set.

An Auxiliary Switch fault also occurs if both auxiliary switches are open or closed so that the controller is unable to determine the transfer switch position.

Reset the controller to clear the fault condition. See Section 3.4.

3.4 Controller Resetting

3.4.1 Fault Reset

Always identify and correct the cause of a fault condition before resetting the ATS controller. Press and hold the Exercise and Test buttons for approximately 3 seconds until the LEDs flash to clear faults and warnings. Warnings reset automatically with a change in the source availability or a signal to transfer.

Note: The Common Fault output remains closed until the faults are reset. See Section 2.6.2.

3.4.2 Controller Reset

Press and hold both buttons for 6 seconds to reset the controller to its original state at powerup, if necessary.

Note: Resetting the controller clears the exerciser setting. Set the exercise time and day as described in Section 2.9 after resetting the controller.

3.4.3 Alarm Silence

If the transfer switch is equipped with an optional accessory board, pressing both buttons will also silence the alarm horn.

3.5 Operation Sequence

3.5.1 Source Sensing

The transfer switch controller monitors the utility power source voltage, and initiates the transfer sequence if the source voltage falls below the voltage dropout setting. Retransfer is initiated when the utility source rises above the voltage pickup settings and remains stable for at least 6 minutes. See Figure 3-3.

- Single-phase voltage sensing on both sources, ±5%.
- Line-to-line frequency sensing on emergency (GEN) source, ±2%.

Source Sensing	
Undervoltage dropout	80%
Undervoltage pickup	85%
Underfrequency dropout *	90%
Underfrequency pickup *	96%
* Emergency (GEN) source only	

Figure 3-3 Source Sensing

3.5.2 Transfer Sequence

Figure 3-4 illustrates the transfer sequence when the normal source fails and Figure 3-5 illustrates the sequence when it returns. Time delays before load transfer prevent nuisance transfers during brief power interruptions. See Figure 3-6. Events such as the failure of the generator set to start can change the sequence of operation.

The Failure to Acquire Emergency Time Delay is set for 78 seconds to allow for three 15-second engine cranking cycles plus 15 seconds rest between starting attempts.

If the emergency source fails and the normal source is not available, the transfer switch controller powers down until one of the sources returns.

The optional accessory board allows time delay adjustments. See Section 4.1.

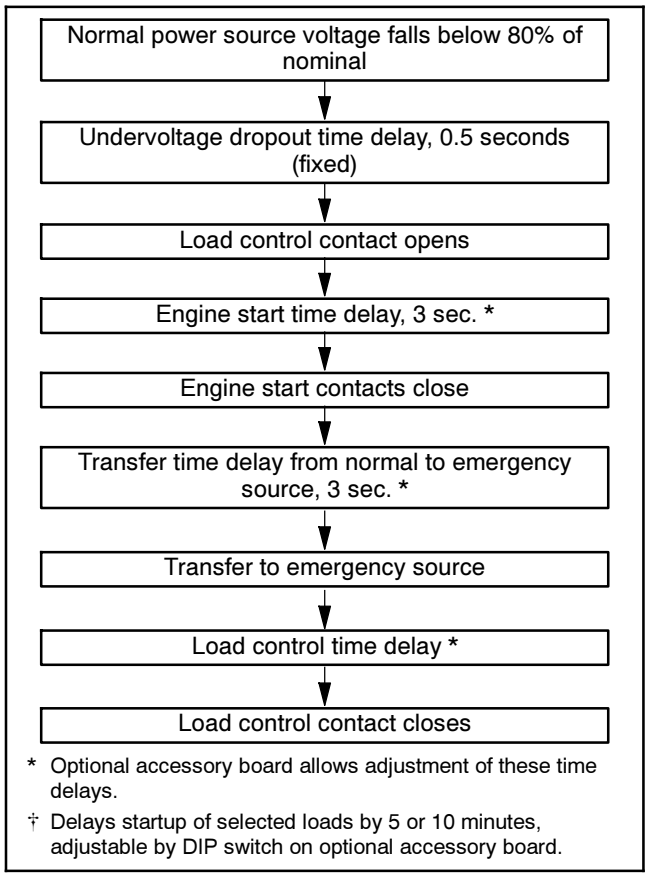


Figure 3-4 ATS Sequence of Operation, Transfer to Emergency

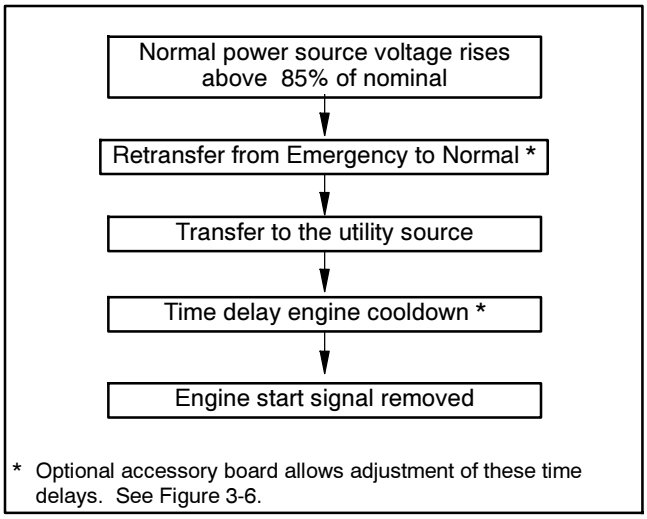


Figure 3-5 ATS Sequence of Operation, Retransfer to Normal

Time Delays			
		Adjustment with Accessory Board*	
Time Delay	Factory Setting	Range	Increment
Engine Start	3 seconds	1–10 seconds	1 second
Transfer from Normal to Emergency	3 seconds	1–10 seconds	1 second
Retransfer from Emergency to Normal	6 minutes	3–30 minutes	3 minutes
Engine Cooldown	5 minutes	1–10 minutes	1 minute
Failure to Acquire Emergency	78 seconds†	NA	
Exercise Time Duration	20 minutes	5–50 minutes	5 minutes
Load Control Time Delay	5 minutes	5 or 10 minutes (DIP switch)	
Undervoltage Dropout Time	0.5 second	NA	
Underfrequency Dropout Time	3 seconds	NA	

* Optional accessory board required for time delay adjustments. NA = not adjustable

† Allows for three 15-second crank attempts separated by two 15-second rest periods.

Figure 3-6 Time Delays

Notes

4.1 Accessory Board

The optional accessory board is mounted above the controller's main logic board. The accessory board kit is available factory-installed or as a loose kit. See Figure 2-17 and Figure 4-1 for the accessory board location.

The accessory board contains the following components:

- Audible alarm on system faults.
- Rotary switches for time delay adjustments.
- DIP switches for exercise, remote test switch operation, and load control functions.
- Connector for remote test input, programmable exerciser input, and generator set supplying load output.
- Connector for the optional External Alarm Module (EAM)

The accessory board is required if the External Alarm Module (EAM) is installed. See Section 4.2.

Note: Before opening the transfer switch enclosure to access the accessory board, open the circuit breakers to disconnect the power to the transfer switch.

4.1.1 Audible Alarm

The audible alarm sounds on the fault conditions shown in Section 3.3.

Always identify and correct the cause of the fault condition before resetting the controller. Press and hold the test and exercise pushbuttons on the controller to clear the fault and silence the alarm.

4.1.2 EAM Connection (P13)

Connect the optional External Alarm Module (EAM) to P13. See Figure 4-2 for the location of connector P13. See Section 4.2.2 for EAM connection instructions.

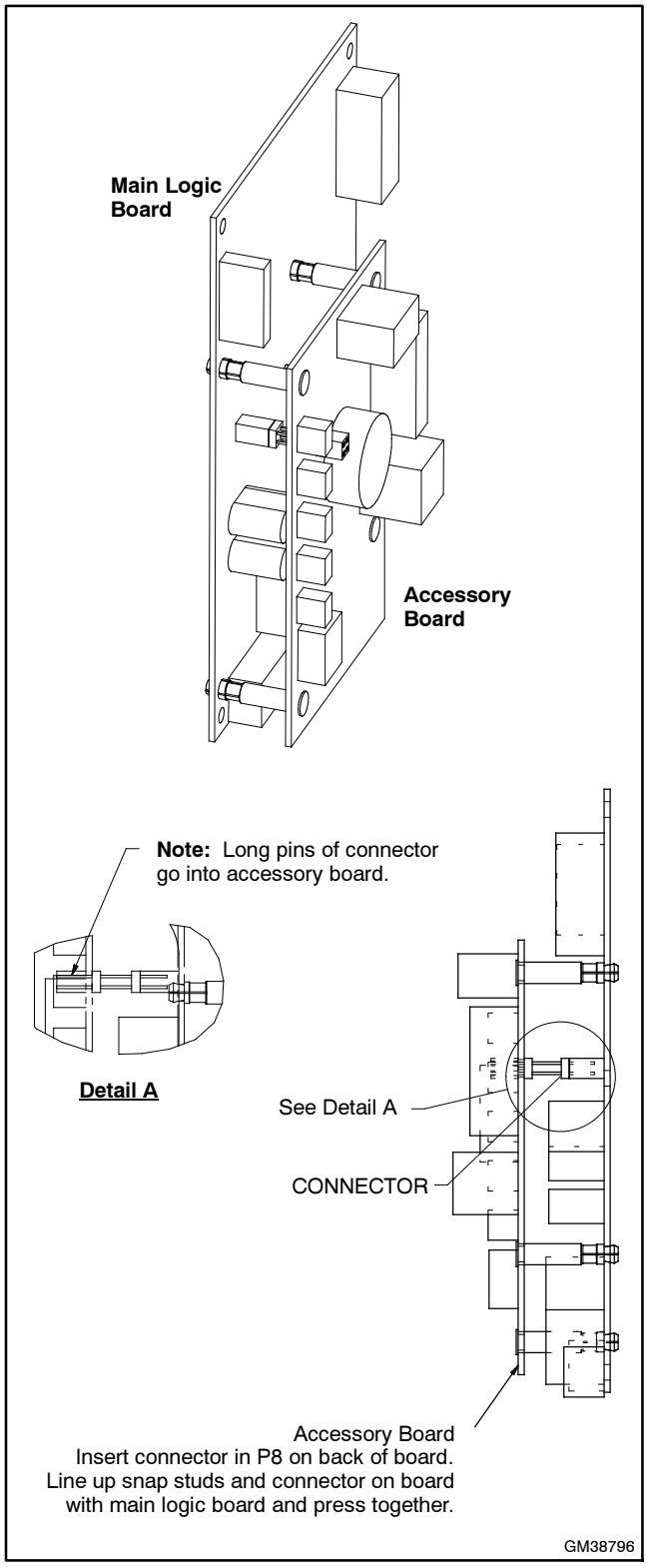
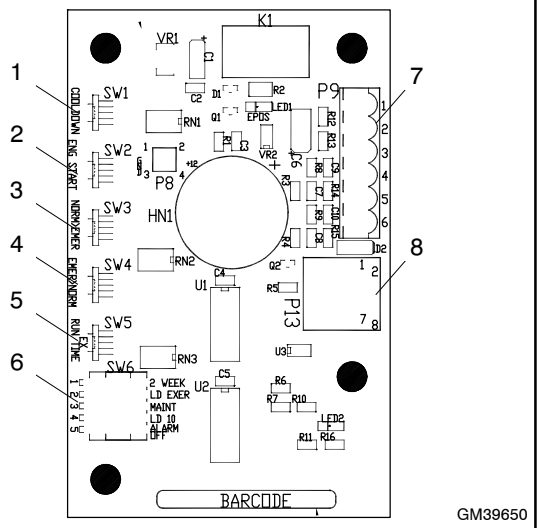


Figure 4-1 Accessory Board Installation



1. Engine cooldown time delay adjust SW1
2. Engine start time delay adjust SW2
3. Normal to emergency time delay adjust SW3
4. Emergency to normal time delay adjust SW4
5. Exercise run time adjust SW5
6. DIP switches SW6
7. Input/output connector P9 (black)
8. EAM connection P13

Figure 4-2 Accessory Board Component Locations

4.1.3 Inputs and Outputs (Connector P9)

A remote test switch and an external exerciser can be connected to the black 6-pin connector P9 on the accessory board. See Figure 4-2 and Figure 4-3. P9 also includes a generator set supplying load output connection.

Note: The ATS main logic board has a similar green 6-pin connector. Do not interchange the black and green mating connectors.

Connections. Connect input and output leads to connector P9. Refer to the label on the enclosure cover or Figure 4-3 for the connections. Use #12–24 AWG wire and tighten the connections to 0.5 Nm (4.4 in. lb.).

Remote Test Input. Connect a remote switch to this input for remote starting and stopping of a loaded test. DIP switch 3 affects the operation of this switch. See Section 4.1.5, Accessory Board DIP Switches, and Section 4.2, External Alarm Module.

Generator Set Suppling Load Output. This output provides a closed contact to indicate that the generator set is supplying the load when the transfer switch is in the Emergency position and the GEN source is available. Connect to customer-supplied equipment.

Remote Exercise Input. Connect the optional Programmable Exerciser to this input to allow scheduling of additional loaded or unloaded generator set exercise runs. DIP switch 2 affects the operation of this input. See Section 4.1.5, Accessory Board DIP Switches.

See Section 4.3 and TT-1403, Programmable Exerciser Instructions, for more information about the programmable exerciser.

Note: Always replace the cover before energizing the transfer switch controls.

Function	Terminals, Connector P9
Generator set supplying load output Contact rated 10 amps @ 120VAC	1 – 2
Remote exercise input	3 – 4
Remote test input	5 – 6

Figure 4-3 Accessory Board Inputs and Outputs

4.1.4 Time Delay Adjustment Switches

The 10-position rotary switches allow adjustment of the time delays shown in Figure 4-4. Use a small screwdriver or other small tool to increase or decrease the time delays within the range shown in the table. The rotary switch positions range from 1 to 10, with position 10 labeled 0 (zero).

The factory settings are the same as the controller time delays without the optional accessory board.

	Factory Setting		Adjustment with Accessory Board	
Time Delay	Setting	Switch Position (1–10[0])	Range	Increment
Engine Cooldown	5 minutes	5	1–10 minutes	1 minute
Engine Start	3 seconds	3	1–10 seconds	1 second
Transfer from Normal to Emergency	3 seconds	3	1–10 seconds	1 second
Retransfer from Emergency to Normal	15 minutes	5	3–30 minutes	3 minutes
Exercise Run Time	20 minutes	4	5–50 minutes	5 minutes

Figure 4-4 Accessory Board Time Delay Adjustments

4.1.5 DIP Switches

DIP switches on the optional accessory board control the exercise, remote test, and load control functions. The DIP switch location is shown in Figure 4-2. The DIP switch functions are summarized in Figure 4-5. Check the DIP switch settings and adjust if necessary for the application.

1 Week/2 Week Exercise. Switch 1. This switch controls the frequency for exercise runs that are set by pressing the Exercise button on the ATS controller. This switch does not affect exercise periods set through the optional programmable exerciser. If the setting is changed after the exerciser has been set, the new DIP switch setting becomes effective *after* the next exercise.

Loaded/Unloaded Exercise. Switch 2. This switch controls automatic exercise runs. The first exercise started by pressing the Exercise button on the controller is not affected by this switch. All subsequent automatic exercise runs will be loaded or unloaded according to this switch setting.

An unloaded exercise starts and runs the generator set. A loaded exercise starts the generator set and transfers the electrical load. See Section 2.9, Exerciser Setup, for more information.

Maintained/Momentary Test. Switch 3.

- With DIP switch 3 in the ON (maintained) position, close a remote test switch or contact to start and run the generator set. Open the remote contact to end the test and signal the generator set to stop.

  Set DIP switch 3 to ON if the EAM is connected.

- With DIP switch 3 in the OFF (momentary) position, hold the test switch for 1 second and release to start a test. The remote switch must be held closed for at least 1 second. Press the test switch again to stop the test and signal the generator set to stop.

  Note: Some generator sets may continue to run for an engine cooldown time period after receiving the remote stop signal.

Load Control. Switch 4. Sets the load control time delay to 5 or 10 minutes. See Section 2.6.2.

Alarm Enable. Switch 5. Enables or disables the alarm horn on the accessory board. If this switch is changed while the horn is sounding, allow several seconds for the change to register and the horn to stop.

Install the front panel(s) or close and lock the enclosure door before energizing the transfer switch.

Switch		Off (Open)	On (Closed)	Notes
1	2 Week Exercise	1 week	2 Weeks	For the exercise button on the controller's user interface.
2	Loaded Exercise	Unloaded	Loaded	For automatic exercise runs set at the controller (excluding the first exercise) or set on the optional programmable exercise timer.
3	Maintained Test	Momentary	Maintained	For an optional remote switch, such as the start/stop switch on the EAM.
4	Load Control	5 Minutes	10 Minutes	For delayed connection of selected large loads to the generator set.
5	Alarm	Alarm Disabled	Alarm Enabled	For the alarm horn on the accessory board (inside the ATS enclosure). Does not affect the alarm horn on the External Alarm Module.

Figure 4-5 Accessory Board DIP Switches

4.2 External Alarm Module (EAM)

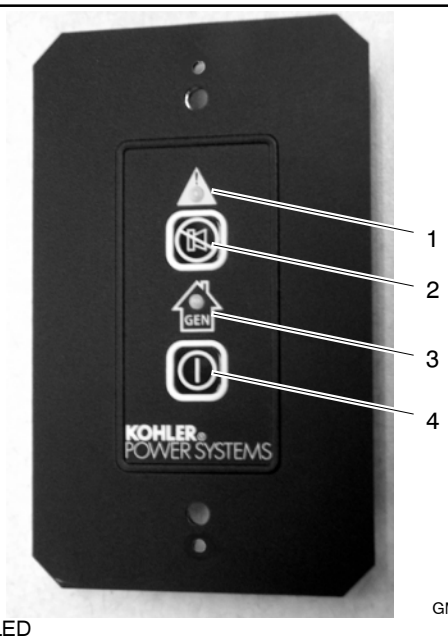
The optional External Alarm Module (EAM) is illustrated in Figure 4-6. The EAM:

- Allows remote starting and stopping of the generator set and load transfer.
- Provides remote indication that the generator set is supplying the load.
- Provides remote indication of the system faults listed in Section 3.3.

The EAM can be installed indoors up to 152 m (500 ft.) away from the generator set.

Note: The optional accessory board is required for EAM connection and operation.

The EAM is powered through the accessory board. The EAM also contains a rechargeable battery that powers the module for up to 1 hour when no power is available. The battery recharges in place when the power returns. See TT-1416, Installation Instructions, provided with the EAM for more information.



1. Fault LED
2. Alarm silence button
3. Generator set supplying load LED
4. Test (start/stop) button

Figure 4-6 External Alarm Module (EAM)

4.2.1 Installation

Locate the EAM indoors in a convenient location up to 152 m (500 ft.) from the transfer switch. The EAM is designed for indoor installation only. Mount the EAM in a standard 21 cu. in. utility box with standard GFCI cover (not provided with kit).

Set DIP switch 3 on the accessory board to the ON (maintained) position. See Section 4.1.5.

4.2.2 Connection

Use Category 5 straight networking cable with RJ45 connectors to connect P10 on the EAM circuit board to connector P13 on the accessory board. Cable is not supplied with the accessory kit; obtain the length of cable required for the application locally. Use a maximum cable length of 152 m (500 ft.).

4.2.3 EAM Operation

See Figure 4-6 for an illustration of EAM buttons and indicators.

Test (start/stop) button. Press and hold the Test (Start/Stop) button until the GEN LED flashes (approximately 1 second) to start the generator set and transfer the load. If no power source is available, the EAM will attempt to start the generator set until the EAM battery discharges (10–15 seconds).

Press and hold the button until the GEN LED flashes again to transfer back to the utility source and stop the generator set. Pressing the test button will not stop the generator set if utility power is not available.

Note: The operation of the Test button is affected by the Maintained/Momentary Test DIP switch on the accessory board. Set DIP switch 3 to the ON (maintained) position.

When the EAM Test button is used to start the generator set and transfer the load, the audible alarm chirps once every 10 minutes to indicate that the system has been started remotely and is running.

Alarm silence button. Press the alarm silence button to silence the alarm. Press the button again to reactivate the alarm. The alarm silence button also acts as a lamp test button. Press it to light all of the EAM LEDs.

4.2.4 EAM Indicators

Figure 4-7 summarizes the operation of LEDs and the audible alarm.

LEDs		Alarm	Condition
GEN	Steady	One chirp/10 minutes	Emergency power system supplying load after a remote start signal from the EAM Test button.
GEN	Steady	None	Emergency power system supplying load due to automatic start after utility power loss or exercise run.
GEN	Flashing Fast (every second)	None	Supply load in silent mode.
GEN	Flashing Slow (every 2 seconds)	None	System starting or stopping in response to Test (Start/Stop) button.
Fault	Steady	Three chirps/10 minutes	Power system fault or EAM low battery.
Fault	Flashing		Test did not start within 2 minutes of Test button activation.

Figure 4-7 EAM LED and Audible Alarm Operation

Generator Set Supplying Load LED. Lights steadily to indicate that the generator set is running and connected to the electrical load.

When the test button is pressed to start a test, the LED flashes slowly until the generator set starts and the ATS transfers the load. When the Test button is pressed to stop a test, the LED flashes slowly until the generator set stops.

Fault LED. Lights steadily to indicate a system fault. Flashes slowly to indicate that a test did not start within 2 minutes after the Test button was pressed.

Audible alarm. The audible alarm can indicate that the system is running or that there is a fault.

- System Running: The alarm sounds to indicate that the generator set has been started by a remote start command from the EAM. The alarm does *not* sound if the system is running due to an exercise run or due to an automatic start triggered by loss of the utility power.

- Faults: The alarm sounds and the fault LED lights or flashes to indicate power system faults or a low battery in the alarm module. See Figure 4-7.

4.3 Programmable Exerciser

The optional programmable exerciser is a 7-day timer that allows programming of up to 8 on/off events per day. Use it to program weekly exercise periods in addition to the exercise time set through the ATS controller. The timer mounts inside the ATS enclosure. See Figure 4-8.

Figure 4-8 Programmable Exerciser

Note: The optional accessory board is required for programmable exerciser connection and operation.

Programmable exerciser features include:

- Seven-day programmable timer allows scheduling up to 56 on/off events.

- LCD display indicates day, time, program/run modes, on/off status, and skip cycle status.

- Skip next cycle button.

- 5-year lithium backup battery.

The programmed exercise periods operate in addition to an exercise period set by pressing the exercise button on the ATS controller.

Connect the programmable exerciser to the remote exercise terminals on accessory board connector P9. See Section 4.1.3 and the wiring diagram in Section 7. Refer to the instruction sheet provided with the programmable exerciser for programming instructions.

4.4 Model SE Accessories

The service entrance (SE) model transfer switch offers all the standard accessories discussed in previous sections plus the additional accessories discussed here. See dimension drawings ADV-8444 or ADV-8445 in Section 7 for model SE accessory locations.

4.4.1 Surge Protective Device (SPD) (Model SE)

An optional surge protective device (SPD) is available for the service entrance model transfer switch. Installed on the Normal source side, the SPD protects the system from voltage surges, preventing damage to household loads. The SPD resets automatically.

Diagnostic LEDs

Red and green indicators on the surge protective device (SPD) indicate connected power and protected status. See Figure 4-9 and Figure 4-10.

Note: All wires must be connected and power applied for the LEDs to illuminate.

If the red indicator is on, the SPD no longer provides protection. Replace the SPD. See Section 6.5 for replacement instructions.

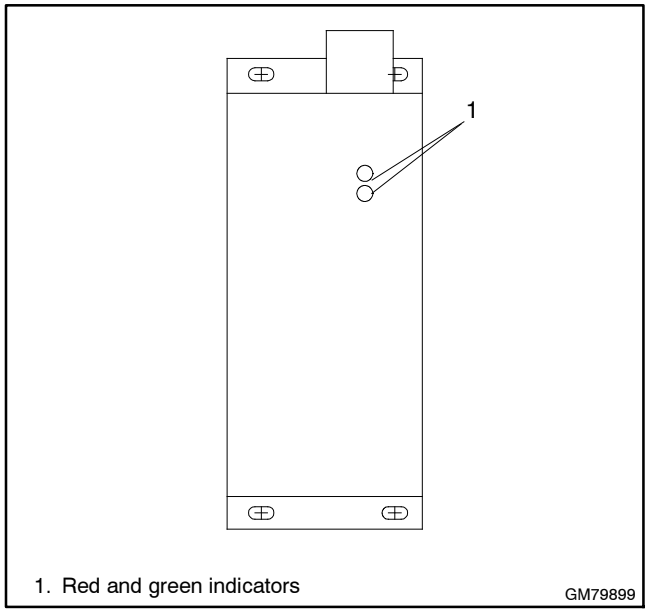


Figure 4-9 SPD Status Indicators

Green LED	Red LED	Status
ON	OFF	AC power is present and protection is provided.
OFF	ON	AC power is present but the SPD module needs replacement. The remote indication changes state. See Section 6.5 for SPD replacement instructions.
OFF	OFF	AC power or ground is missing: Verify that wire connections are correct. Make sure that circuit breaker is engaged. Check panel for power.

Figure 4-10 SPD Diagnostic Indication

SPD Specifications	
Surge current	80 kA per phase
Let-through voltage	430 V @ 3 kA 690 V @ 10 kA

Figure 4-11 SPD Specifications

Remote Indication

An indicator for the optional surge protective device (SPD) can also be connected to the accessory connection terminal block. The contact changes state to indicate that the SPD module needs replacement. See Section 2.7.5 for remote indicator connection instructions.

4.4.2 Accessory Circuit Breakers (Model SE)

Optional 15-amp single-pole circuit breakers for the generator set carburetor heater and the transfer switch space heater are available for the service entrance model transfer switch. See Section 2.7.5 for connection instructions.

The service entrance model includes a 15-amp single-pole circuit breaker for the generator set battery charger as standard equipment.

Circuit Breaker Trip/Reset

The trip indication window appears red when the breaker is tripped. Identify and correct the cause of the overcurrent trip before resetting the breaker.

To reset the circuit breaker, move the breaker handle to the O/OFF position and then back to I/ON.

4.4.3 Enclosure Space Heater (Model SE)

An optional enclosure space heater is available for the service entrance model transfer switch. The heater prevents condensation on the electrical components inside the enclosure.

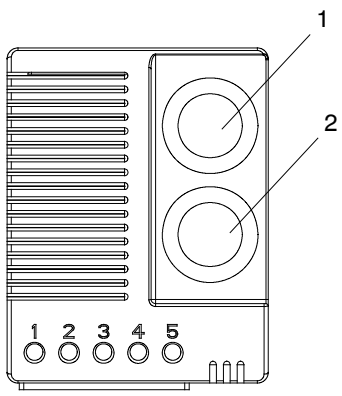
The space heater control is located on the left side of the enclosure. See ADV-8444 or ADV-8445 in Section 7 for the location of the space heater and controls.

The space heater is equipped with an adjustable temperature and humidity control. See Figure 4-13. The space heater will include either temperature/humidity control GM 47356 or humidity control GM64488. See Figure 4-12 for temperature and relative humidity adjustment ranges and factory settings. Adjust the temperature and relative humidity to prevent condensation. The appropriate settings will vary with location and climate conditions.

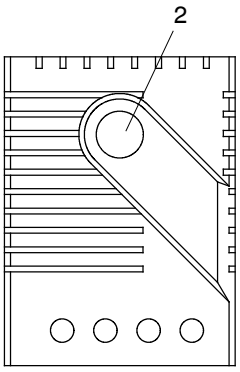
See the accessory schematic diagrams in Section 7 for connections.

Control	Control	Adjustment Range
GM47356	Temperature	32–140° F
	Relative Humidity	50–90%
GM64488	Relative Humidity	35–95%

Figure 4-12 Heater Control Settings



Temperature/Humidity Control GM47356



Humidity Control GM64488

1. Temperature control
2. Relative humidity control

Figure 4-13 Space Heater Controls

Notes

Note: This section applies only to service entrance model transfer switches.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

5.1 Service Disconnect Procedure

Use the following procedure to disconnect the utility source on service entrance model transfer switches.

Note: Power is still present on the input side of the utility source circuit breaker after this procedure.

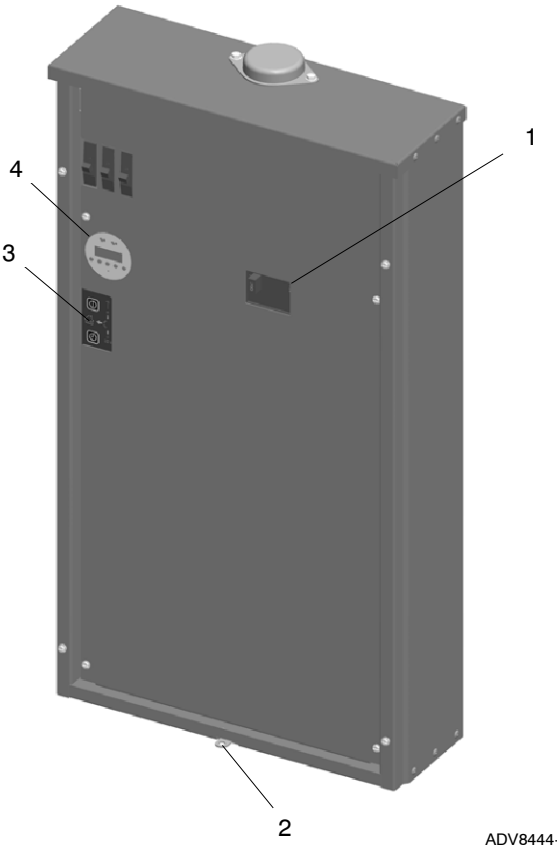
1. Prevent the emergency generator set from starting:
   a. Turn the generator set OFF.
   b. Disconnect power to the generator set battery charger.
   c. Disconnect the generator set engine starting battery, negative (-) lead first.
2. On the transfer switch, remove the enclosure front panel. Do not remove the inner panel.
3. Move the utility source circuit breaker to the OFF position.
4. Check the LEDs on the transfer switch controller's user interface. Both the Utility Available and GEN Available LEDs should be off.

   Note: Power is still present on the input side of the utility source circuit breaker. Do not remove the protective barrier around the utility source connection lugs.
5. To lock out the transfer switch, replace the enclosure front panel and attach a padlock to the hasp.

5.2 Source Circuit Breaker Reset

If the utility source circuit breaker trips due to an overcurrent condition, the transfer switch will issue an engine start signal and then transfer to the emergency source when it is available.

When the circuit breaker trips, the handle moves to an intermediate position. To reset a tripped circuit breaker. move the handle to the extreme OFF position and then to the ON position.



1. Normal/utility circuit breaker
2. Padlock hasp
3. Controller's user interface
4. Optional programmable exerciser

Figure 5-1 Service Entrance Model, Front Panel Removed (200 Amp model shown)

Notes

6.1 Introduction

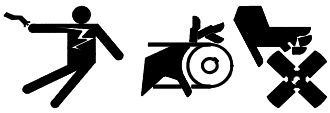
Regular preventive maintenance ensures safe and reliable operation and extends the life of the transfer switch. Preventive maintenance includes periodic testing, cleaning, inspection, and replacement of worn or missing components. Section 6.4 contains a service schedule for recommended maintenance tasks.

A local authorized distributor/dealer can provide complete preventive maintenance and service to keep the transfer switch in top condition. Unless otherwise specified, have maintenance or service performed by an authorized distributor/dealer in accordance with all applicable codes and standards. See the Service Assistance section in this manual for how to locate a local distributor/dealer.

Keep records of all maintenance or service.

Replace all barriers and close and lock the enclosure door after maintenance or service and before reapplying power.

⚠ 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.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

⚠ 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.

Grounding the transfer switch. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Open main circuit breakers of all power sources before servicing equipment. Configure the installation to electrically ground the 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, as the chance of electrocution increases under such conditions.

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

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.

NOTICE

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

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

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.

6.2 Testing

6.2.1 Weekly Generator Set Exercise

Use the exerciser or a manual test to start and run the generator set under load once a week to maximize the reliability of the emergency power system. See Section 2.8 for test instructions and Section 2.9 for instructions to set the exerciser.

Optional accessories allow adjustment of the exercise schedule and duration. See Sections 4.1 and 4.3. Refer to the generator set operation manual for exercise recommendations.

6.2.2 Monthly Automatic Control System Test

Test the transfer switch's automatic control system monthly. See Section 2.8 for the test procedure.

- Verify that the expected sequence of operations occurs as the switch transfers the load to the emergency source when a preferred source failure occurs or is simulated.
- Observe the indicator LEDs included on the transfer switch to check their operation.
- Watch and listen for signs of excessive noise or vibration during operation.
- After the switch transfers the load to the standby source, end the test and verify that the expected sequence of operations occurs as the transfer switch retransfers to the preferred source and signals the generator set to shut down after a cooldown period.

6.3 Inspection and Service

Contact an authorized distributor/dealer to inspect and service the transfer switch annually and also when any wear, damage, deterioration, or malfunction of the transfer switch or its components is evident or suspected.

6.3.1 General Inspection

External Inspection. Keep the transfer switch clean and in good condition by performing a weekly general external inspection of the transfer switch. Check for any condition of vibration, leakage, excessive temperature, contamination, or deterioration. Remove accumulations of dirt, dust, and other contaminants from the transfer switch's external components or enclosure with a vacuum cleaner or by wiping with a dry cloth or brush.

Note: Do not use compressed air to clean the transfer switch because it can cause debris to lodge in the components and damage the switch.

Tighten loose external hardware. Replace worn, missing, or broken external components with manufacturer-recommended replacement parts. Contact an authorized distributor/dealer for specific part information and ordering.

Internal Inspection. Disconnect all power sources, open the transfer switch enclosure door, and inspect internal components monthly or when any condition noticed during an external inspection may have affected internal components.

Contact an authorized distributor/dealer to inspect and service the transfer switch if any of the following conditions are found inside the transfer switch.

- Accumulations of dirt, dust, moisture, or other contaminants.
- Signs of corrosion.
- Worn, missing, or broken components.
- Loose hardware.
- Wire or cable insulation deterioration, cuts, or abrasion.
- Signs of overheating or loose connections: discoloration of metal, melted plastic, or a burning odor.
- Other evidence of wear, damage, deterioration, or malfunction of the transfer switch or its components.

If the application does not allow a power interruption for the time required for the internal inspection, have an authorized distributor/dealer perform the internal inspection.

6.3.2 SPD Inspection (Model SE)

At intervals not exceeding two months, check the following items on the surge protective device (SPD):

- Status indication LEDs
- Condition of connecting leads

6.3.3 Other Inspections and Service

Have an authorized distributor/dealer perform scheduled maintenance, service, and other maintenance that ensures the safe and reliable operation of the transfer switch. See Section 6.4, Service Schedule, for the recommended maintenance items and service intervals.

Have an authorized distributor/dealer repair or replace damaged or worn internal components with manufacturer-recommended replacement parts.

6.4 Service Schedule

Follow the service schedule below for the recommended service intervals. Have all service performed by an authorized distributor/dealer except for activities designated by an X, which may be performed by the switch operator.

System Component or Procedure	See Section	Visually Inspect	Check	Adjust, Repair, Replace	Clean	Test	Frequency
Electrical System							
Check for signs of overheating or loose connections: discoloration of metal, melted plastic, or a burning odor	6.3.1	X	X				Y
Check the contactor's external operating mechanism for cleanliness; clean and relubricate if dirty *	6.3.1	X			D (clean and lube)		Y
Inspect wiring insulation for deterioration, cuts, or abrasion. Repair or replace deteriorated or damaged wiring	6.3.1	X	D	D			Y
Tighten control and power wiring connections to specifications	2.5		D			D	Y
Check the transfer switch's main power switching contacts' condition; clean or replace the main contacts or replace the contactor assembly as necessary	S/M	D		D	D		Y
Control System							
Exercise the generator set under load	2.9					X	W
Test the transfer switch's automatic control system	2.8	X				X	M
Test all indicators (LEDs) and all remote control systems for operation	3.2	D	D	D		D	Y
General Equipment Condition							
Inspect the outside of the transfer switch for any signs of excessive vibration, leakage, high temperature, contamination, or deterioration *	6.3	X			X		M
Check that all external hardware is in place, tightened, and not badly worn	6.3	X	X	X			M
Inspect the inside of transfer switch for any signs of excessive vibration, leakage, high temperature, contamination, or deterioration *	6.3	D	D		D		Y
Check that all internal hardware is in place, tightened, and not badly worn	6.3	X	D	D			Y
SPD Modules (if equipped, SE model only)							
Check status indication light	4.4.1	X		D			Every 2 months
Check condition of connecting leads	7 (W/D)	X		D			

* Service more frequently if the transfer switch is operated in dusty or dirty areas.

See Section: Read these sections carefully for additional information before attempting maintenance or service.

Visually Inspect: Examine these items visually.

Check: Requires physical contact with or movement of system components, or the use of nonvisual indications.

Adjust, Repair, Replace: Includes tightening hardware and lubricating the mechanism. May require replacement of components depending upon the severity of the problem.

Clean: Remove accumulations of dirt and contaminants from external transfer switch's components or enclosure with a vacuum cleaner or by wiping with a dry cloth or brush. *Do not use compressed air to clean the switch because it can cause debris to lodge in the components and cause damage.*

Test: May require tools, equipment, or training available only through an authorized distributor/dealer.

Symbols used in the chart:

X= The transfer switch operator can perform these tasks.
D=Authorized distributor/dealer must perform these tasks.
W=Weekly
M=Monthly
Q=Quarterly
S=Semiannually (every six months)
Y=Yearly (annually)
W/D=Wiring diagram

6.5 Surge Protective Device (SPD) Replacement

The green indicator light goes out if the SPD capability is exceeded or if there is an internal safety component failure in the SPD module. See Figure 4-10. Replace the module if the green indicator is off and the red indicator is on. Follow the replacement procedure in this section and see Figure 6-1.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

SPD Replacement Procedure

1. Remove the ATS enclosure's front panel and move the battery charger circuit breaker handle to the OFF position.

2. Disable the generator set to prevent starting as follows:

   a. Turn the generator set OFF: Move the generator set master switch to the OFF position or press the OFF button on the generator set controller.

   b. Disconnect power to the battery charger.

   c. Disconnect the generator set engine starting battery, negative (-) lead first.

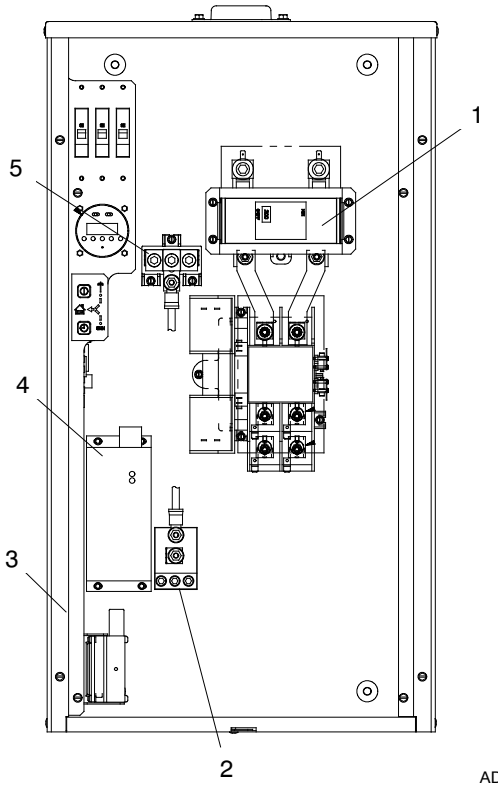
3. On the ATS, move the Normal service disconnect circuit breaker to the OFF position.

   Note: Utility power is still present at the inlet side of the normal source circuit breaker.

4. Remove the ATS enclosure's inner panel.

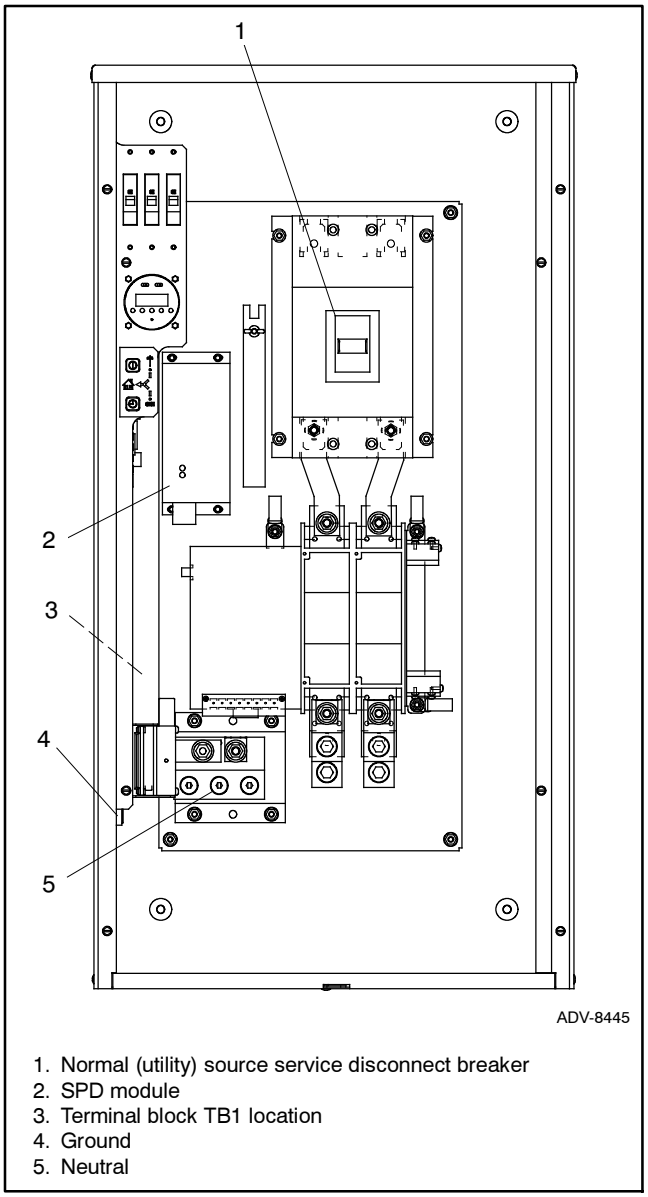
5. Refer to the service entrance switch wiring diagram in Section 7. Note connections and disconnect the SPD leads to the normal source service disconnect circuit breaker, ground, and neutral. Disconnect the SPD red, yellow, and blue leads from the customer connection terminal block.

6. Remove the 4 SPD mounting screws.



1. Normal source service disconnect circuit breaker
2. Ground
3. Terminal block TB1 location
4. SPD module
5. Neutral

Figure 6-1 SPD Module Replacement, 200 Amp SE Models



1. Normal (utility) source service disconnect breaker
2. SPD module
3. Terminal block TB1 location
4. Ground
5. Neutral

Figure 6-2 SPD Module Replacement, 400 Amp SE Models

7. Install the new module and tighten the mounting screws to 3 Nm (26 in. lb.).
8. Connect the SPD leads. See the service entrance transfer switch wiring diagram in Section 7. Also see Figure 6-3.
9. Replace the enclosure's inner panel.
10. Close the Normal and Emergency service disconnect circuit breakers.
11. Reconnect the generator set engine starting battery, negative (-) lead last.
12. Reconnect power to the battery charger.
13. Close the battery charger circuit breaker.
14. Replace the ATS enclosure's front panel.
15. Put the generator set into automatic (standby) mode: Move the generator set master switch to the AUTO position or press the AUTO button on the generator set controller.

SPD Lead	Connection
Black	Normal Source service disconnect breaker
Black	
White	Neutral
Green	Ground
Red	NC, TB1-7
Blue	NO, TB1-6
Yellow	C, TB1-5

Figure 6-3 SPD Connections

Section 7 Diagrams and Drawings

Drawings are arranged in alphanumeric order on the following pages.

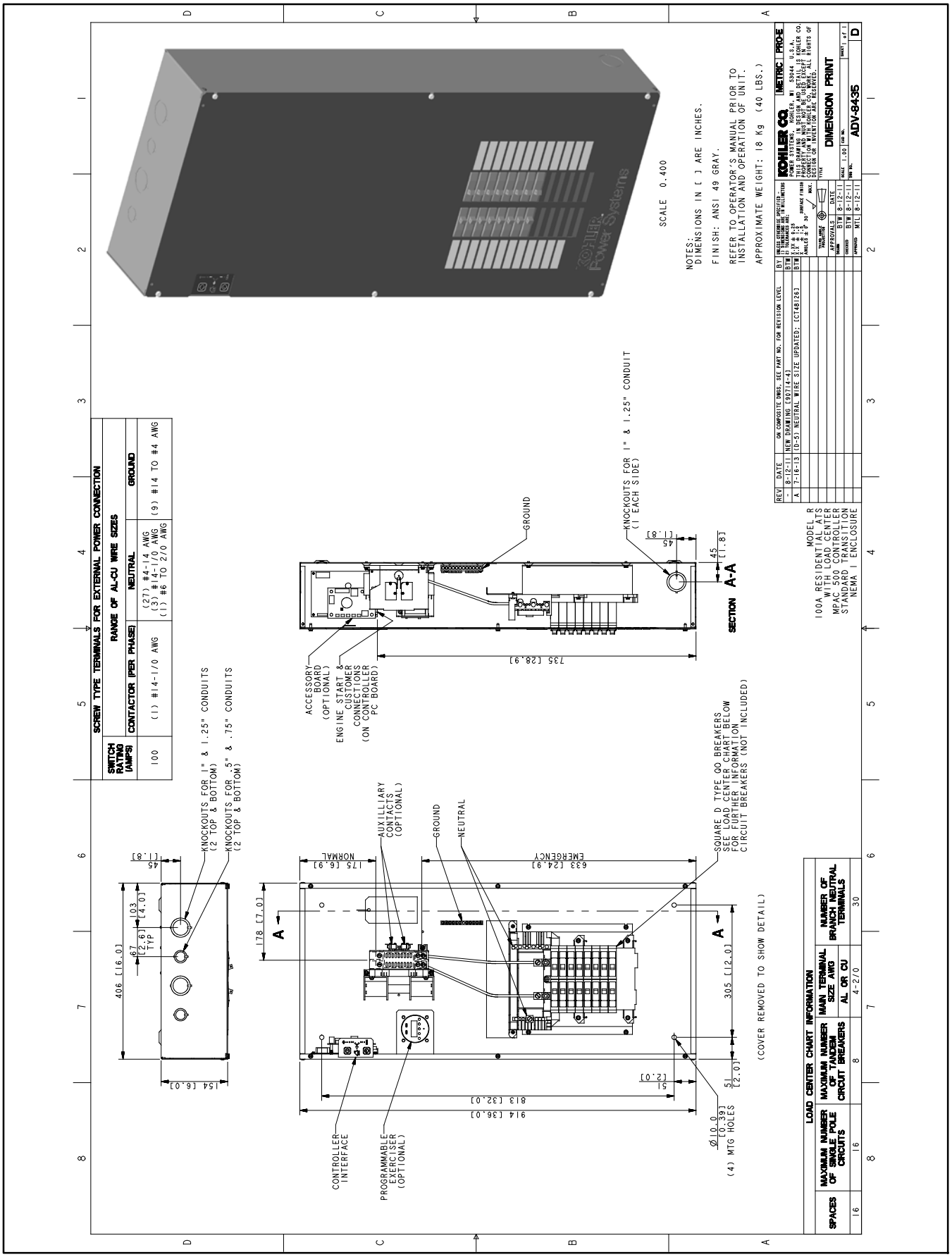


Figure 7-1 Dimension Drawing, 100 Amp NEMA Type 1 Enclosure with Load Center, ADV-8435

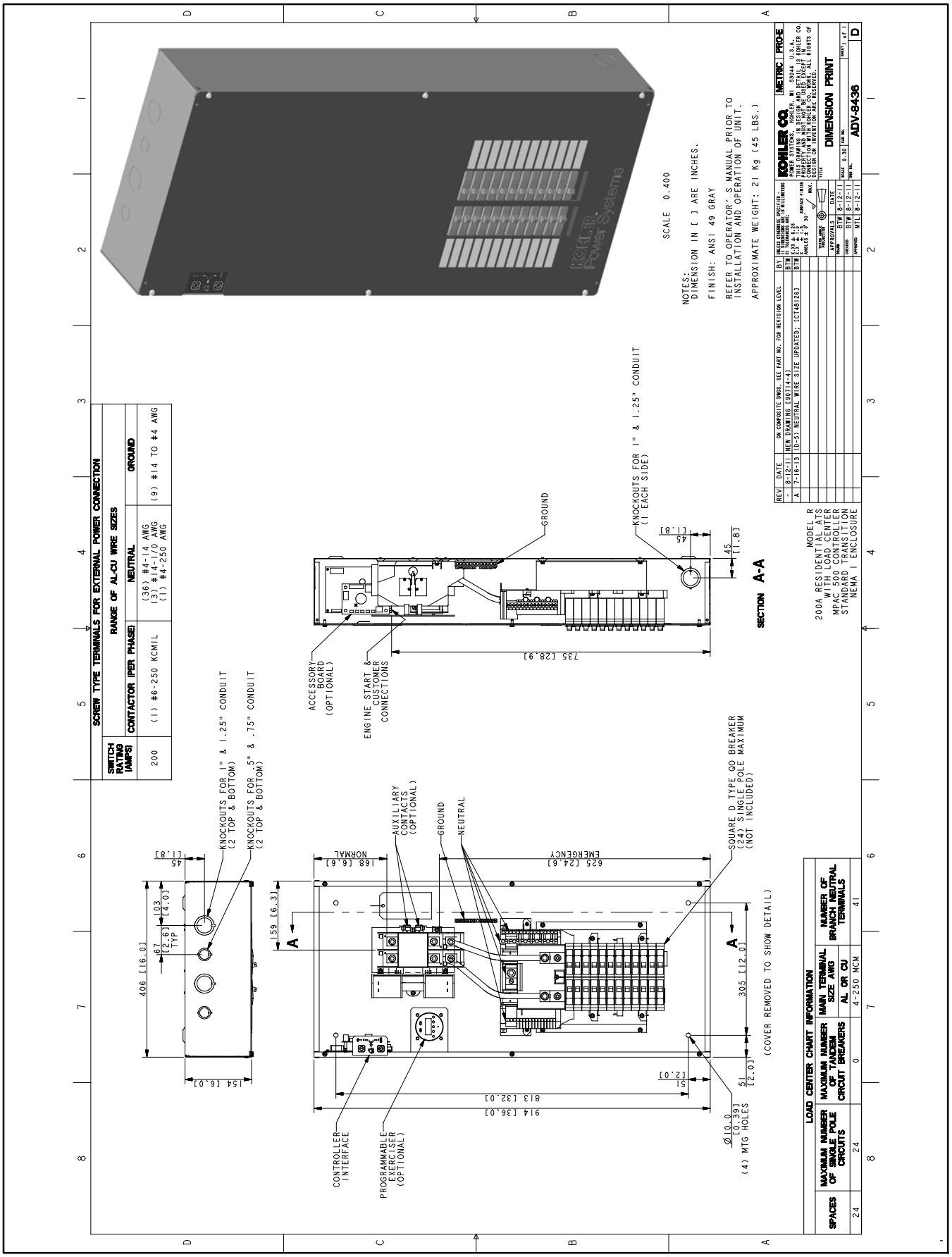


Figure 7-2 Dimension Drawing, 200 Amp NEMA Type 1 Enclosure with Load Center, ADV-8436

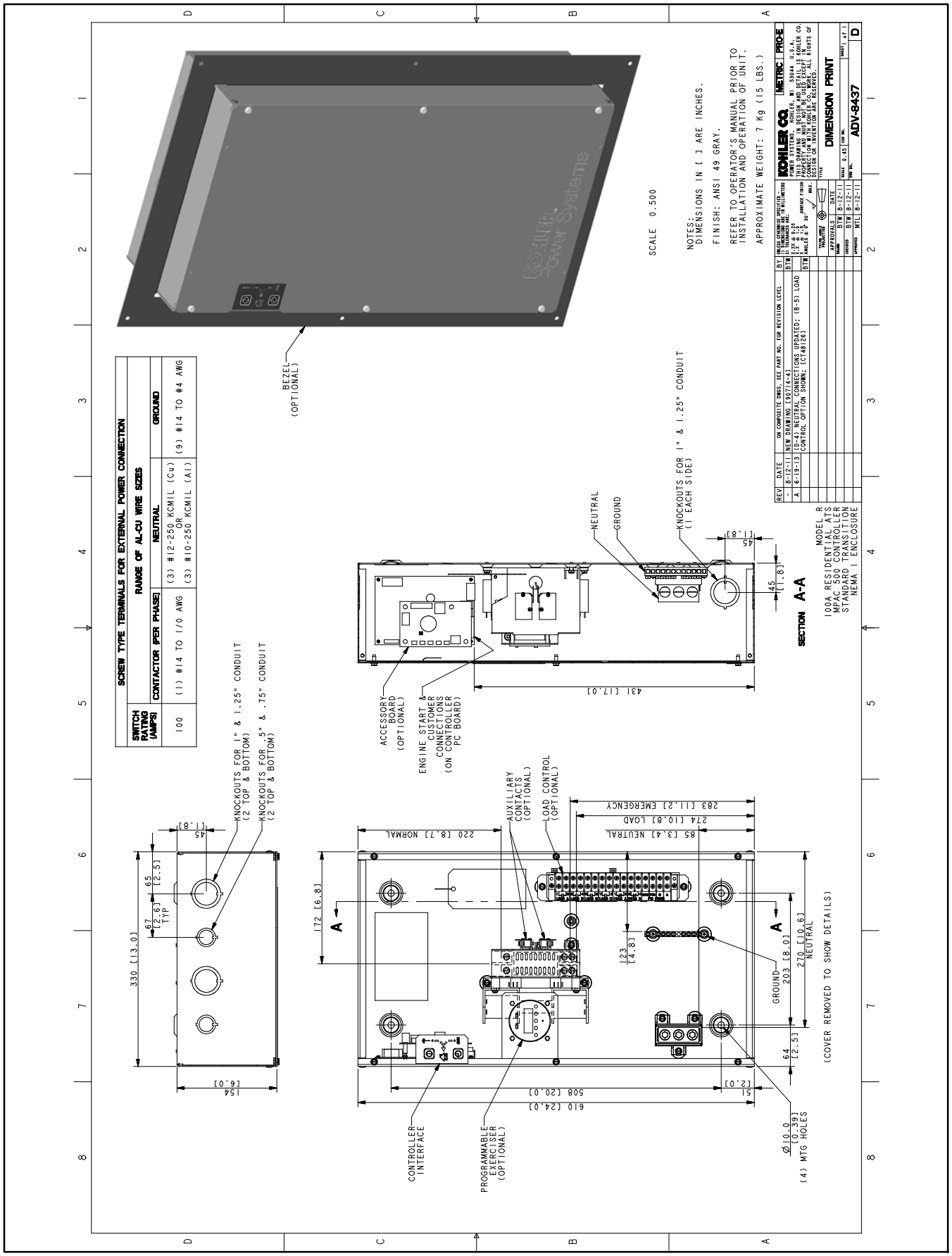


Figure 7-3 Enclosure Dimensions 100 Amp NEMA 1 without Load Center, ADV-8437

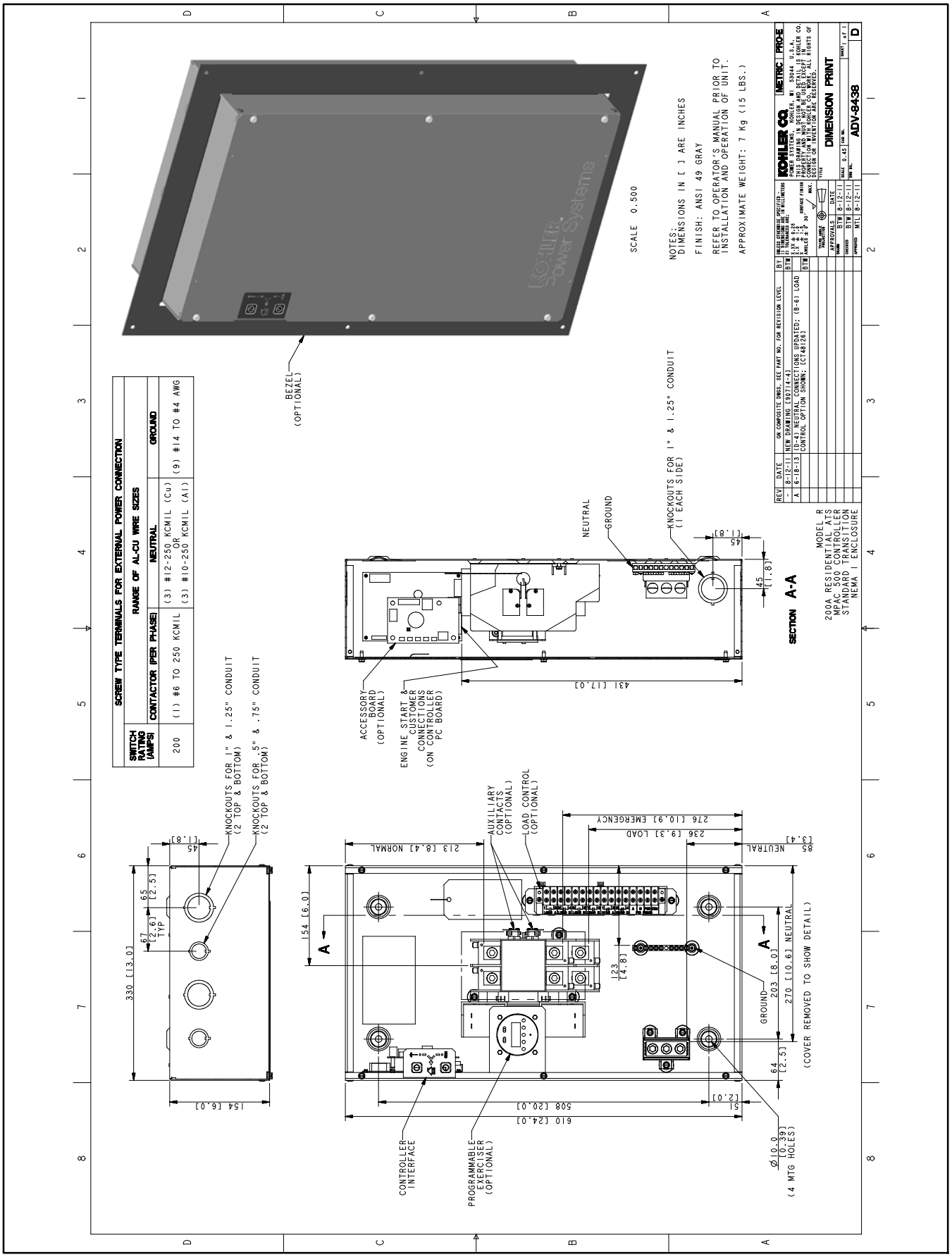


Figure 7-4 Dimension Drawing, 200 Amp NEMA Type 1 Enclosure without Load Center, ADV-8438

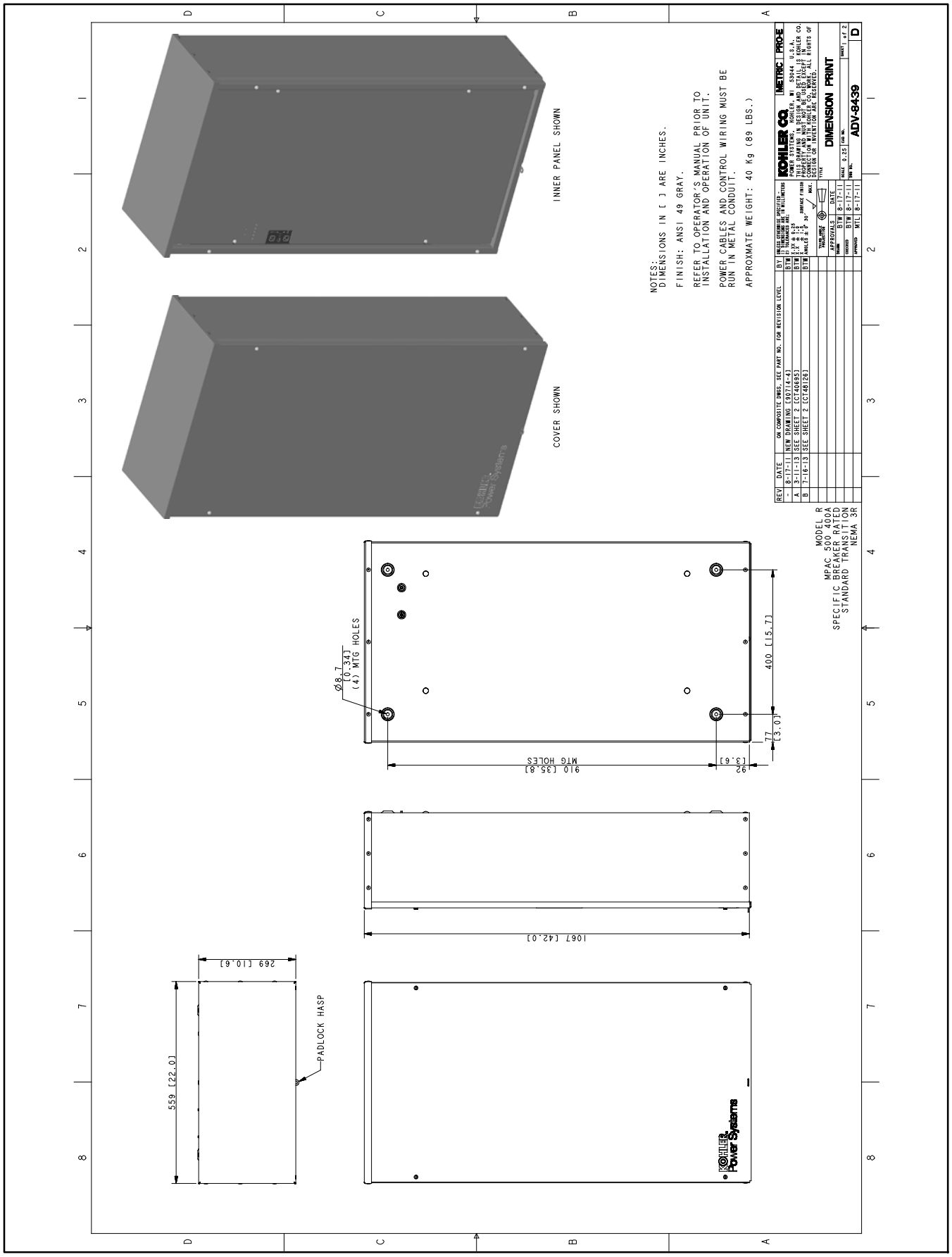


Figure 7-5 Dimension Drawing, 400 Amp NEMA Type 1 and 3R Enclosure, ADV-8439, Sheet 1 of 2

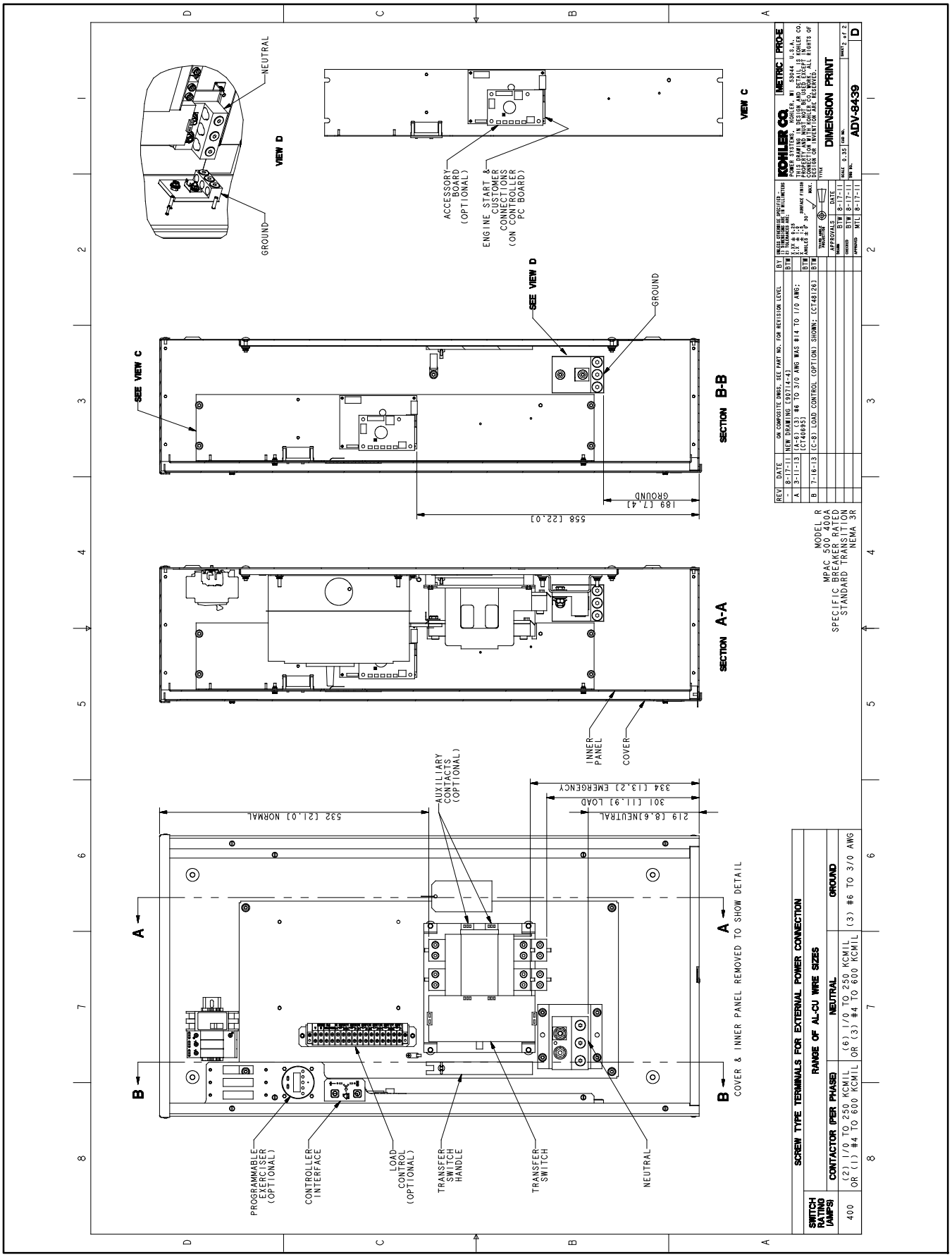


Figure 7-6 Dimension Drawing, 400 Amp NEMA Type 1 and 3R Enclosure, ADV-8439, Sheet 2 of 2

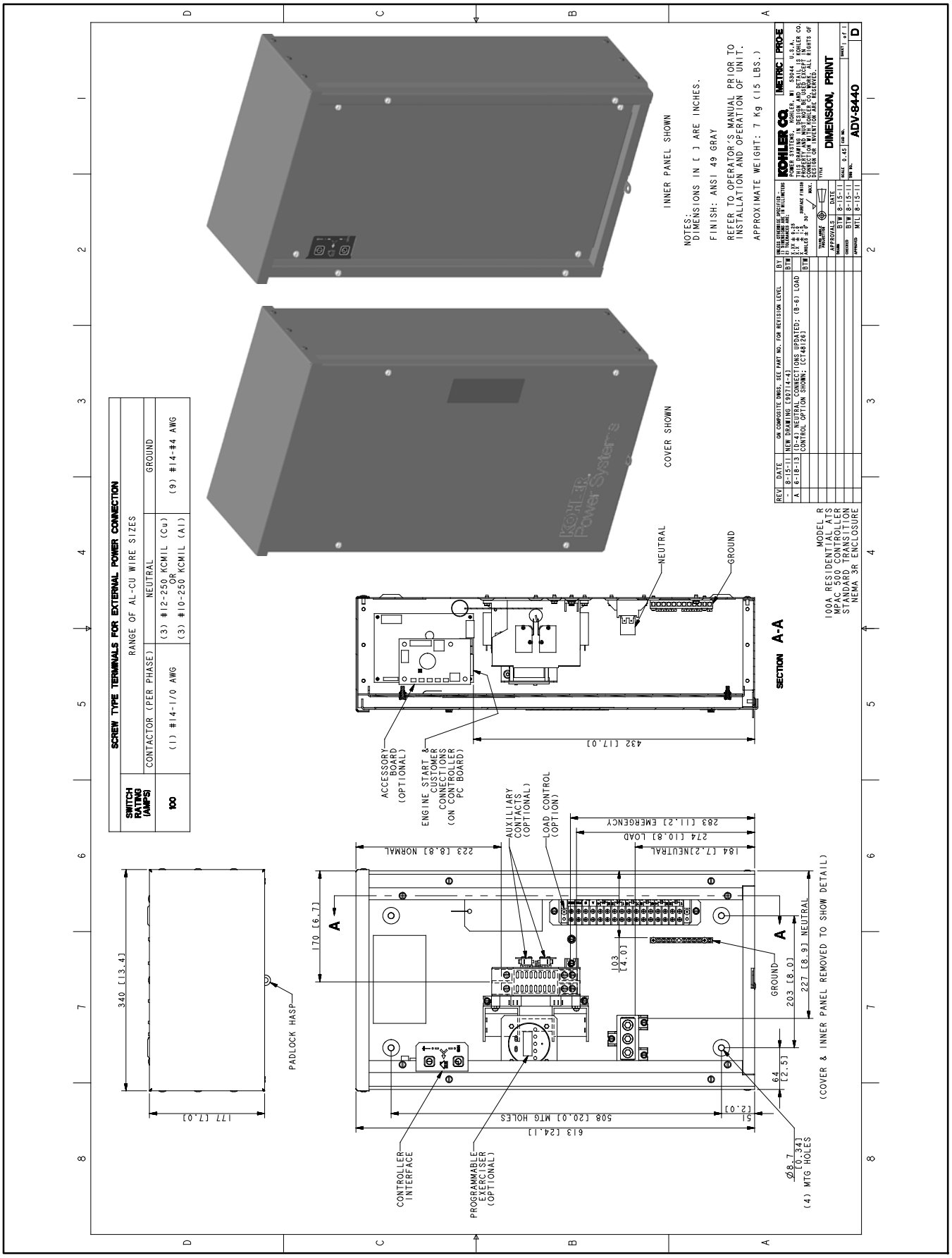


Figure 7-7 Dimension Drawing, 100 Amp NEMA Type 3R Enclosure without Load Center, ADV-8440

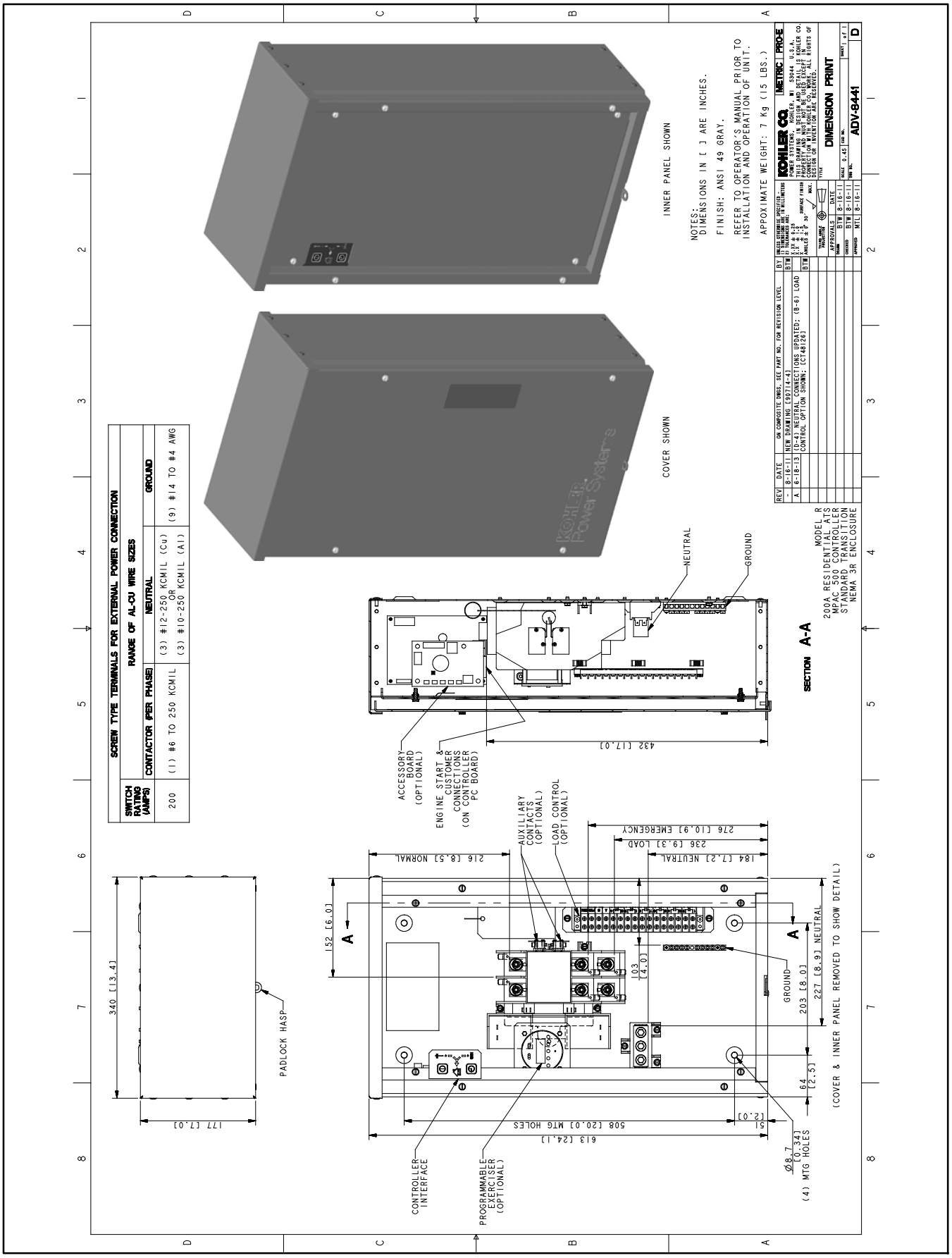


Figure 7-8 Dimension Drawing, 200 Amp NEMA Type 3R Enclosure without Load Center, ADV-8441

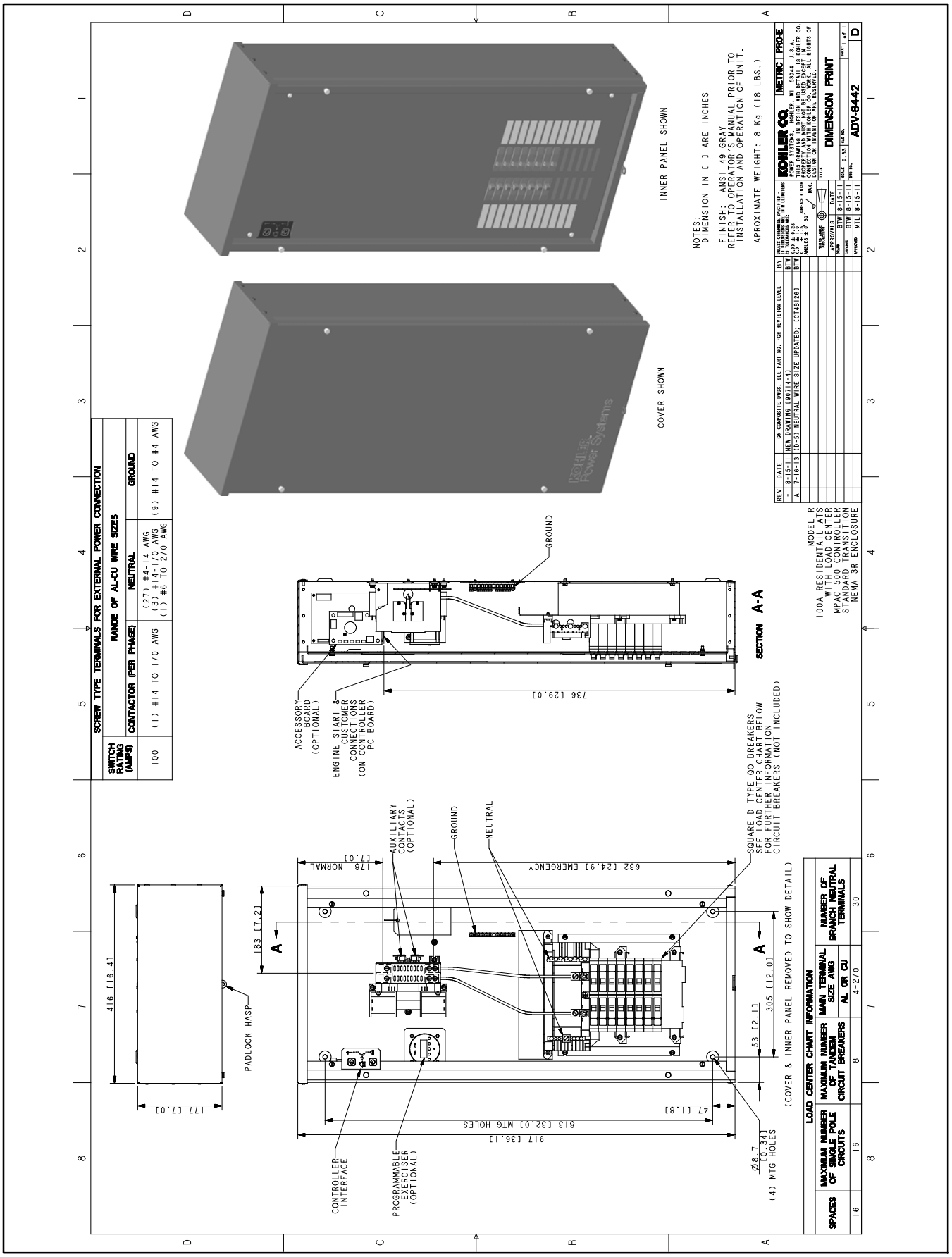


Figure 7-9 Dimension Drawing, 100 Amp NEMA Type 3R Enclosure with Load Center, ADV-8442

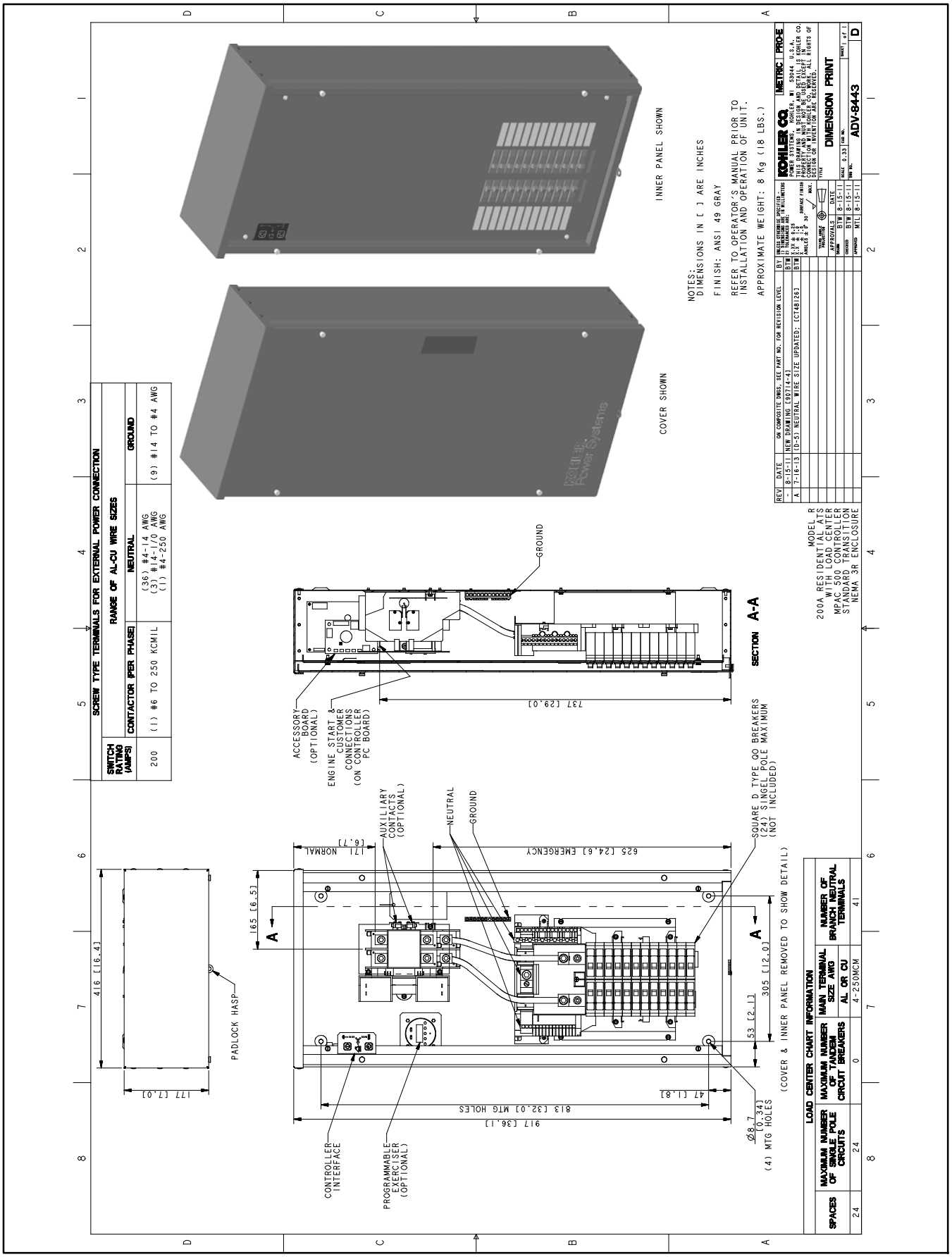


Figure 7-10 Dimension Drawing, 200 Amp NEMA Type 3R Enclosure with Load Center, ADV-8443

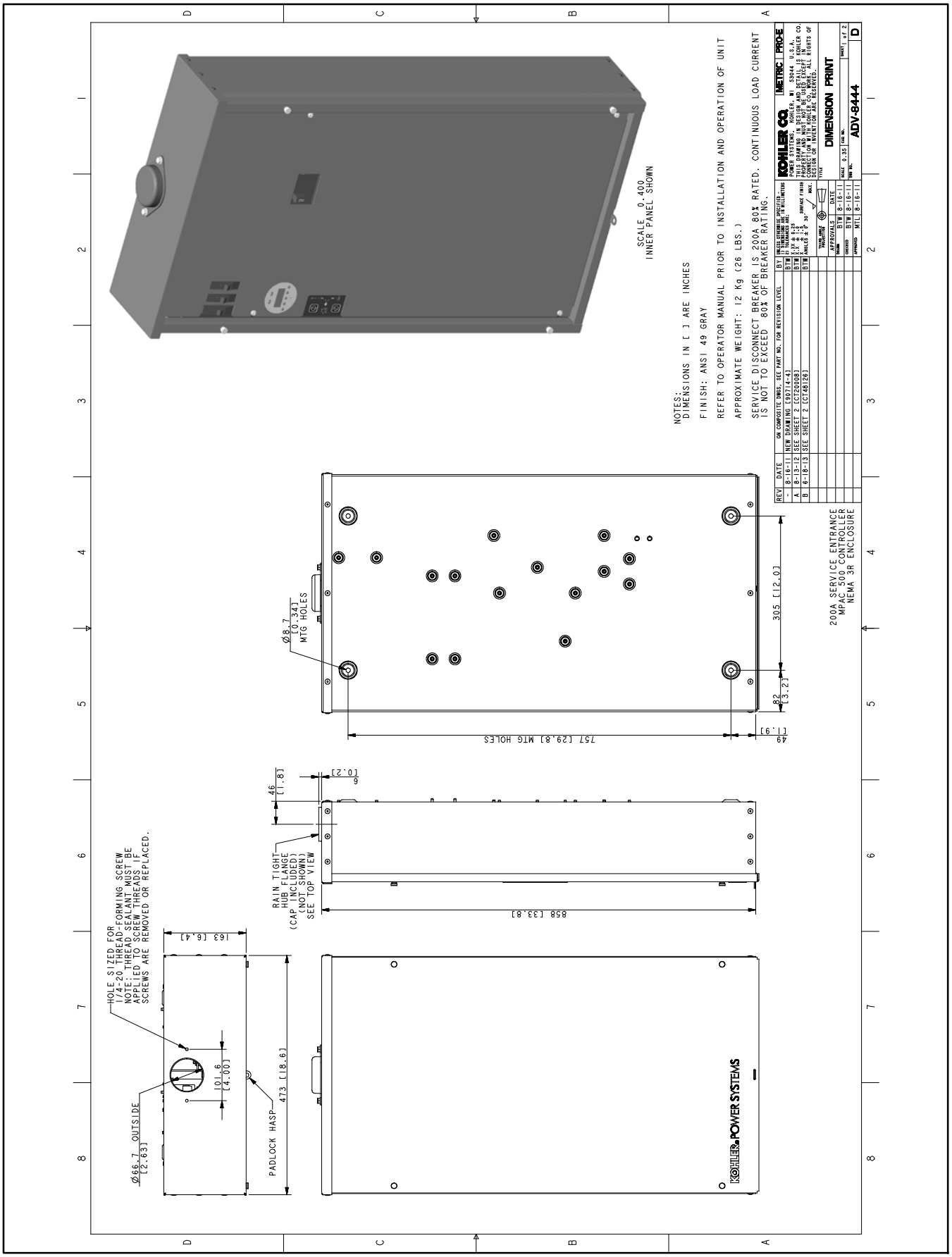


Figure 7-11 Dimension Drawing, 200 Amp Service Entrance Model, ADV-8444, Sheet 1 of 2

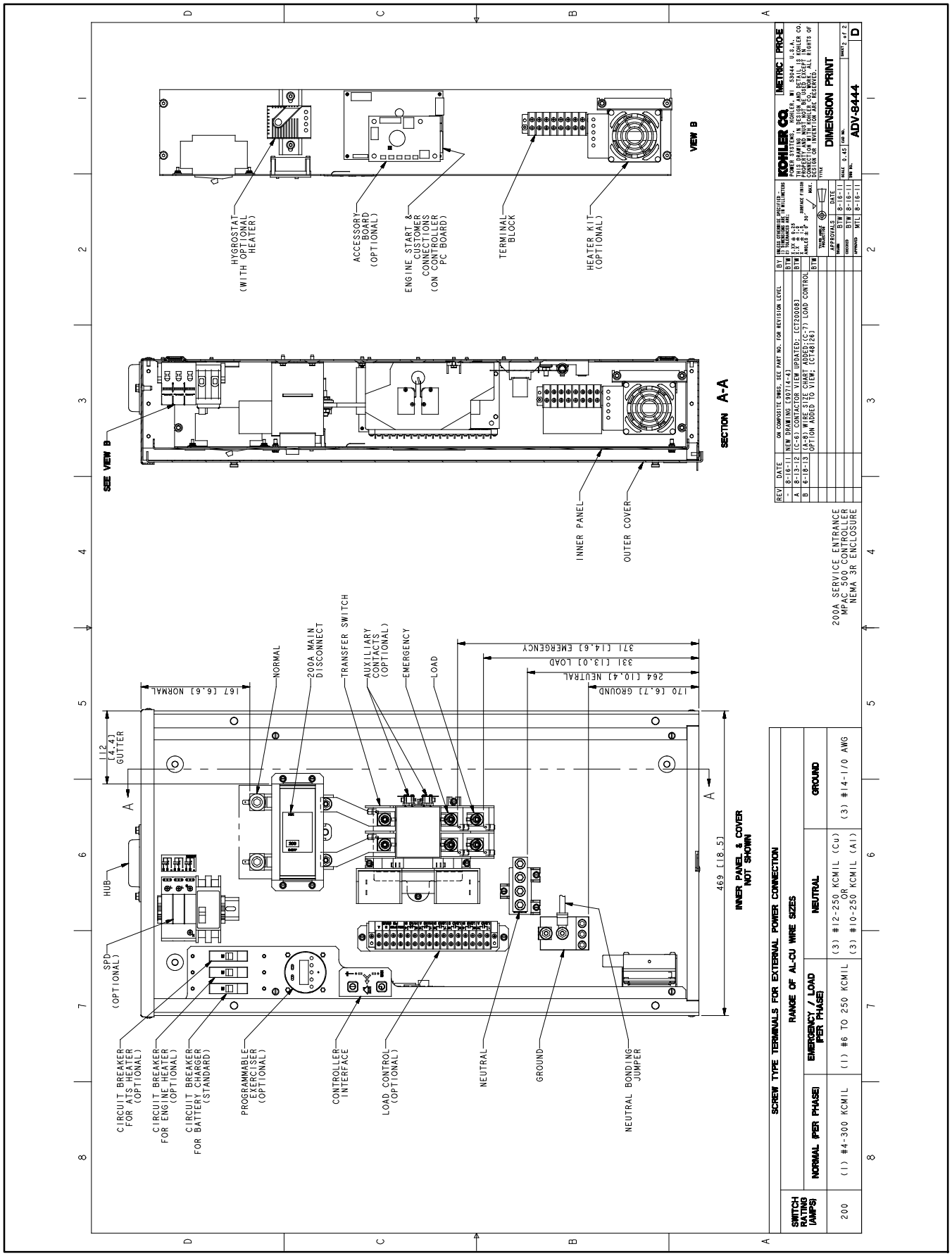


Figure 7-12 Dimension Drawing, 200 Amp Service Entrance Model, ADV-8444, Sheet 2 of 2

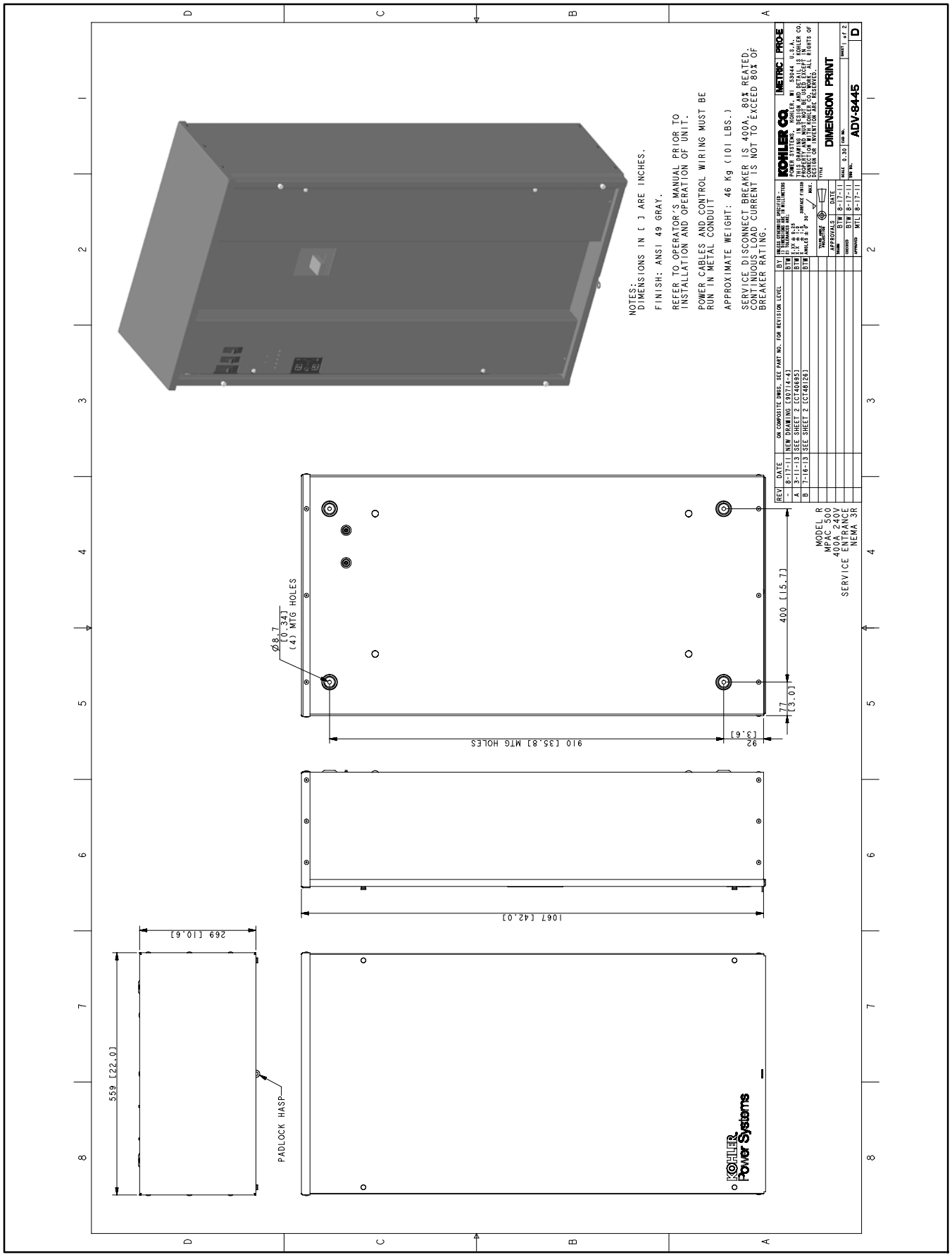


Figure 7-13 Dimension Drawing, 400 Amp Service Entrance Model, ADV-8445, Sheet 1 of 2

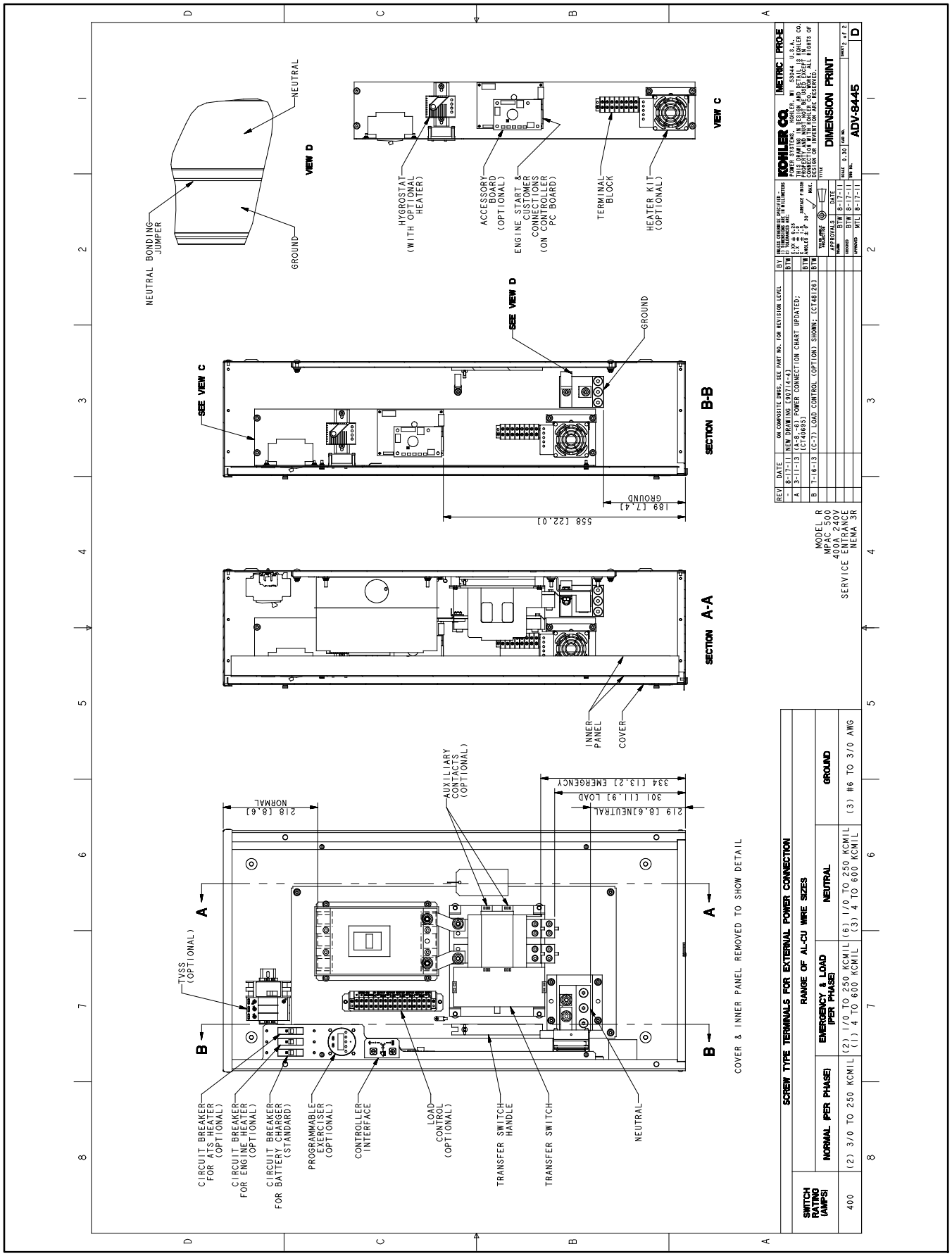


Figure 7-14 Dimension Drawing, 400 Amp Service Entrance Model, ADV-8445, Sheet 2 of 2

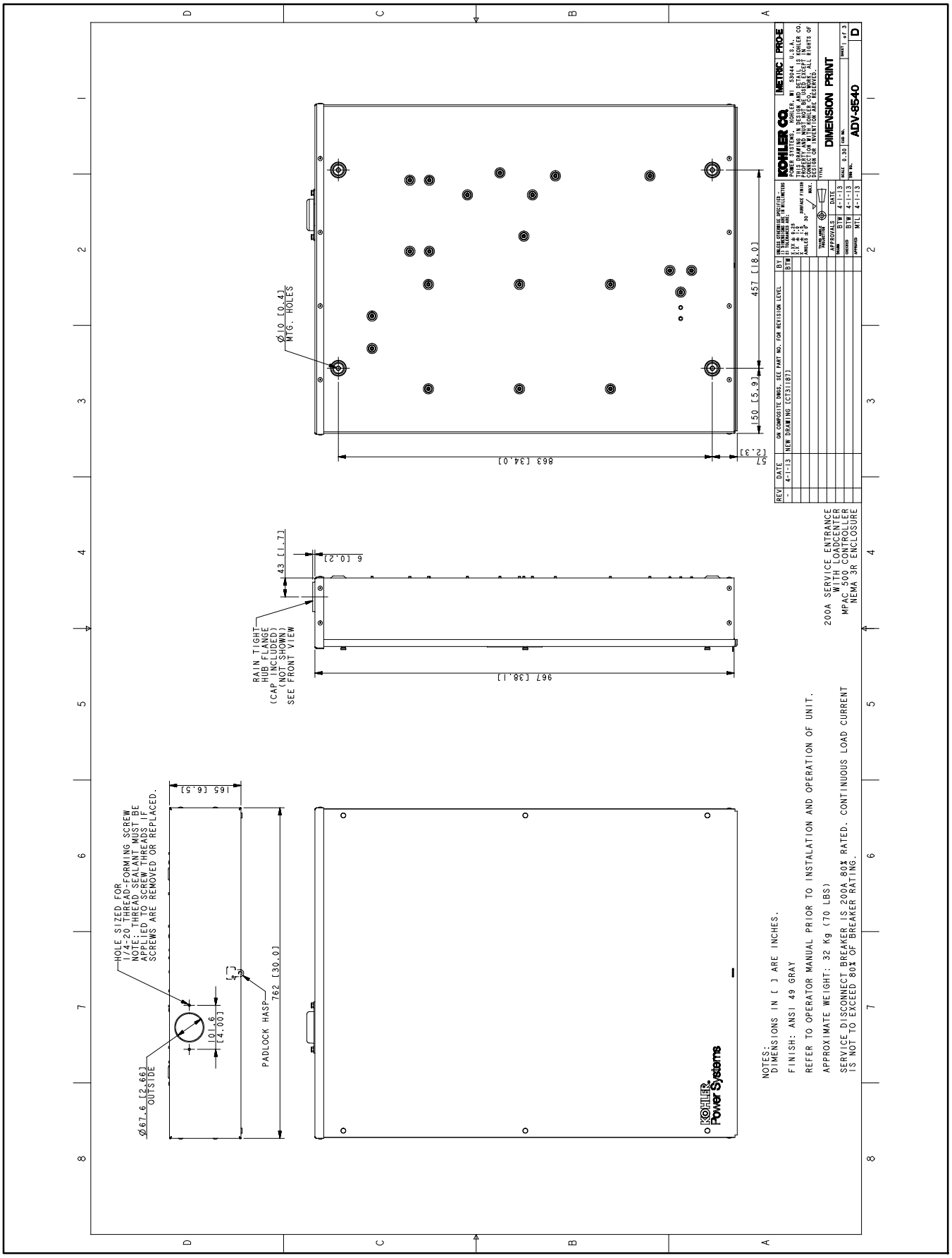


Figure 7-15 Dimension Drawing, 200 Amp Service Entrance Model with Load Center, ADV-8540, Sheet 1 of 3

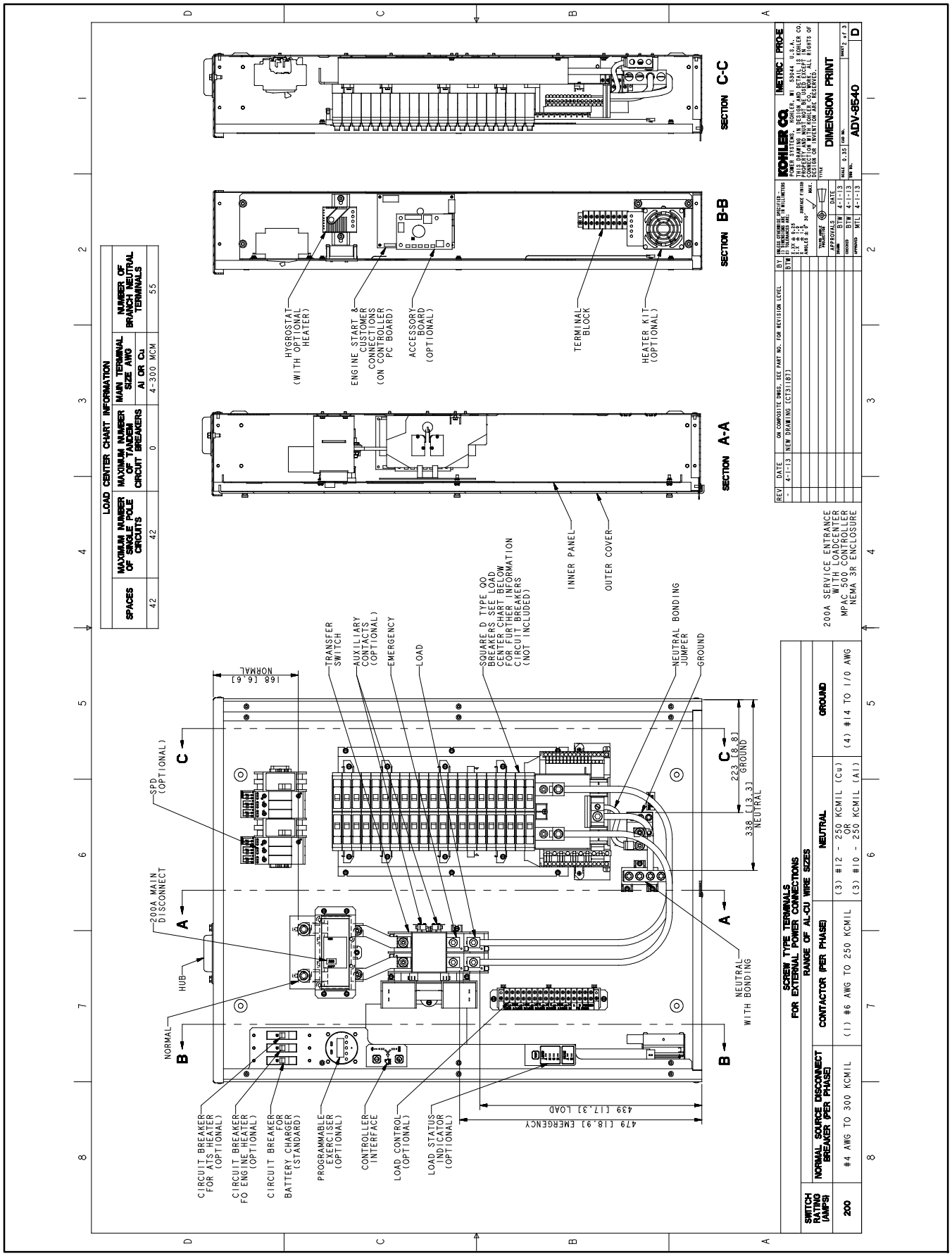


Figure 7-16 Dimension Drawing, 200 Amp Service Entrance Model with Load Center, ADV-8540, Sheet 2 of 3

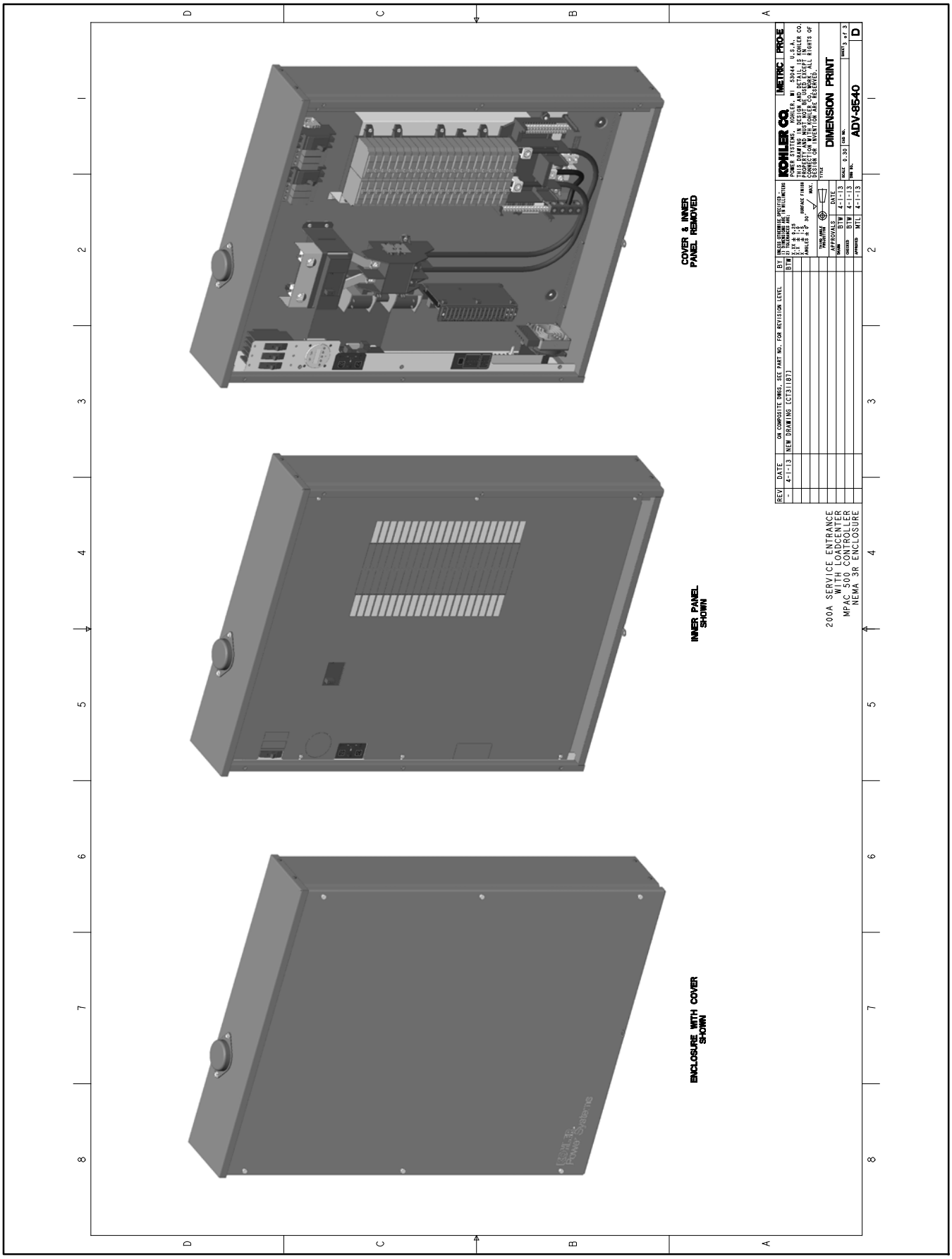


Figure 7-17 Dimension Drawing, 200 Amp Service Entrance Model with Load Center, ADV-8540, Sheet 3 of 3

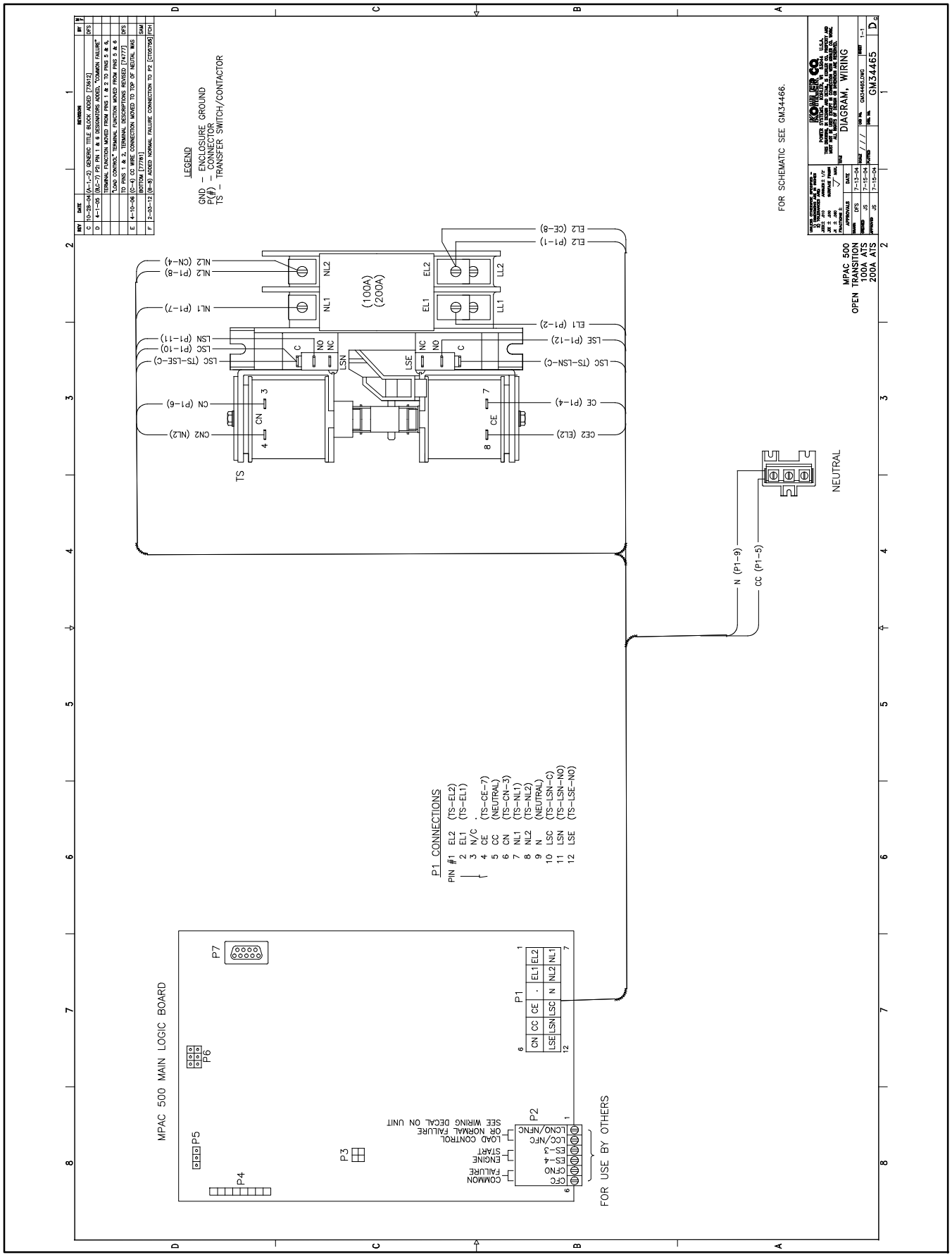


Figure 7-18 Wiring Diagram, 100/200 amp without Load Center, GM34465

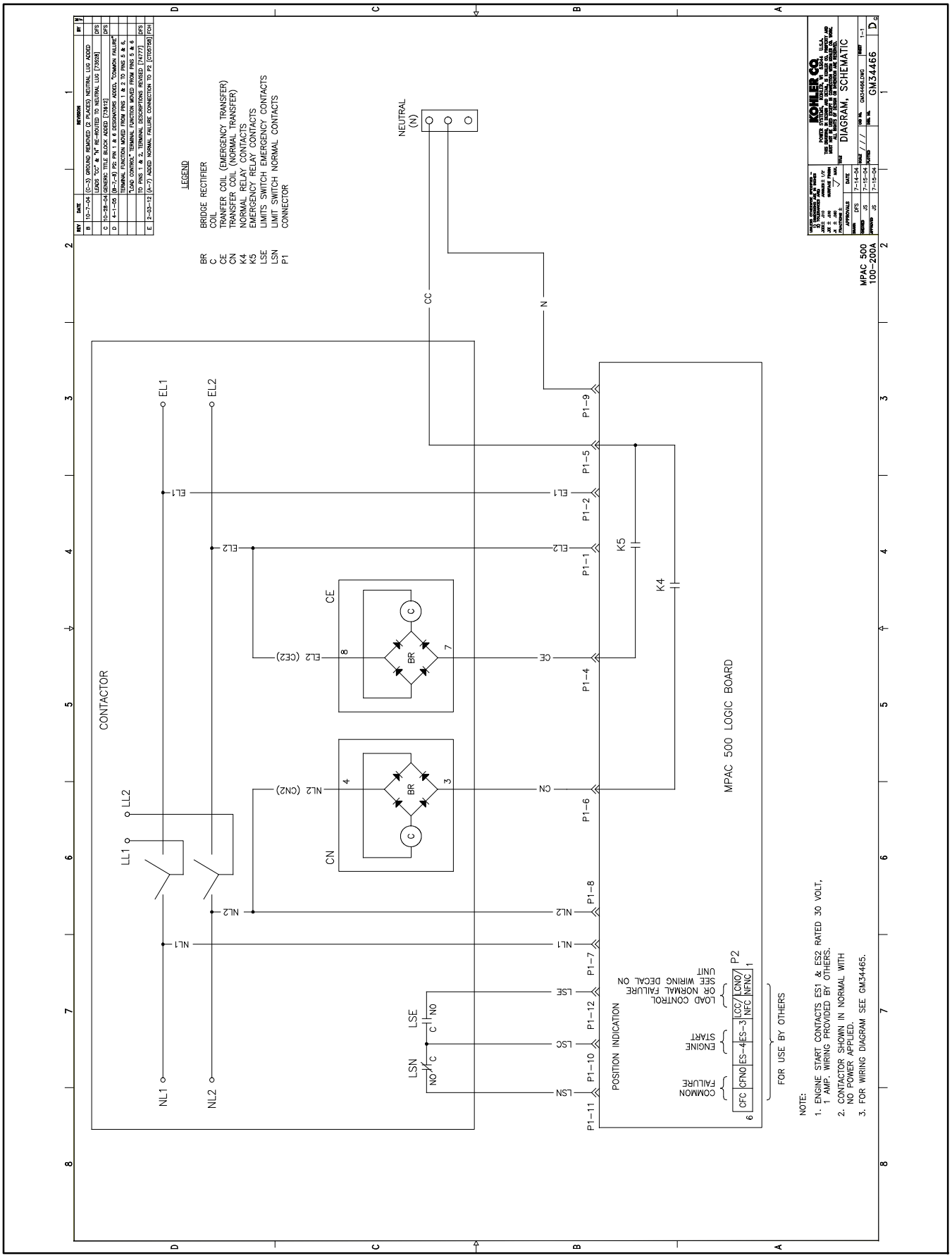


Figure 7-19 Schematic Diagram, 100/200 Amp without Load Center, GM34466

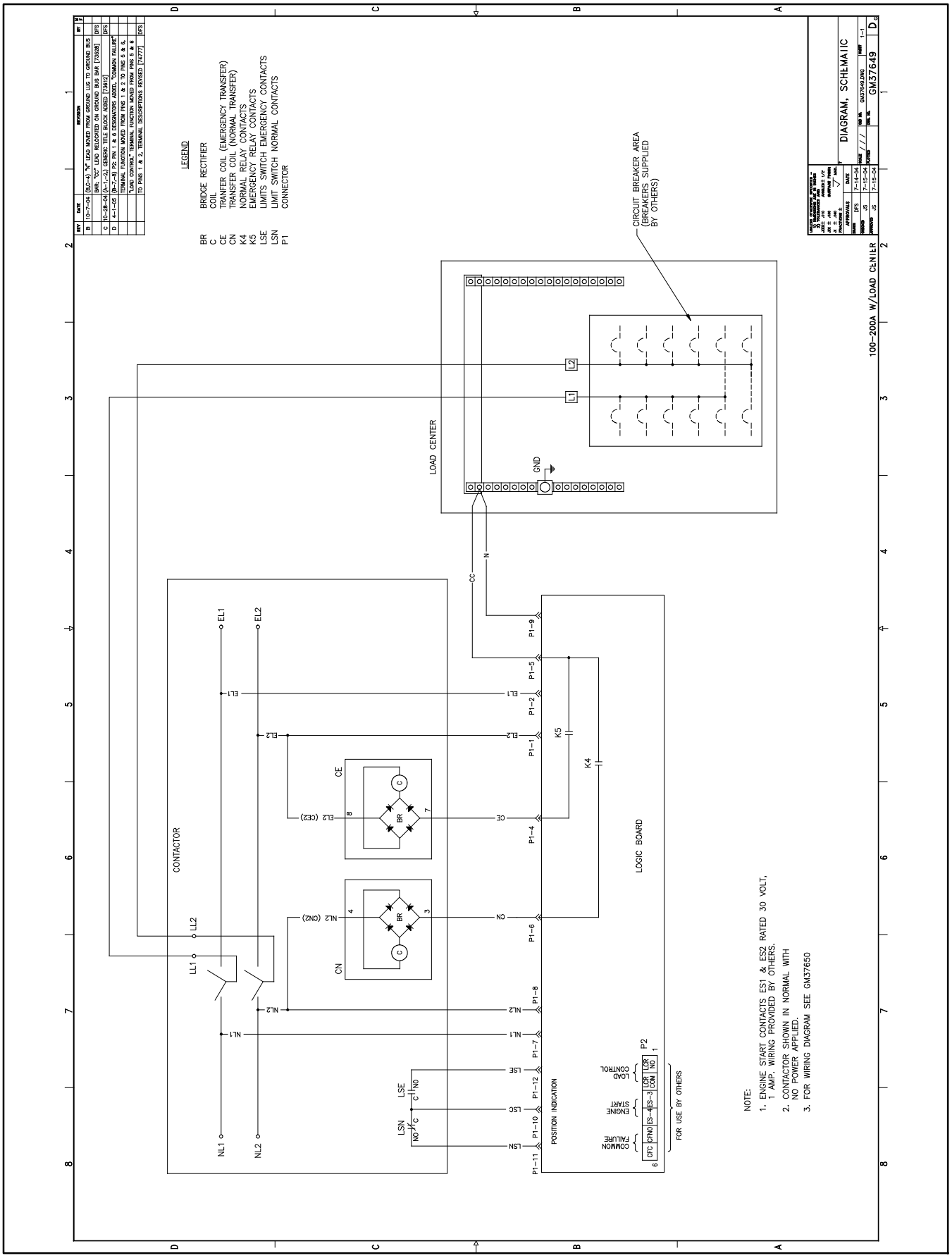


Figure 7-20 Schematic Diagram, 100/200 Amp with Load Center, GM37649

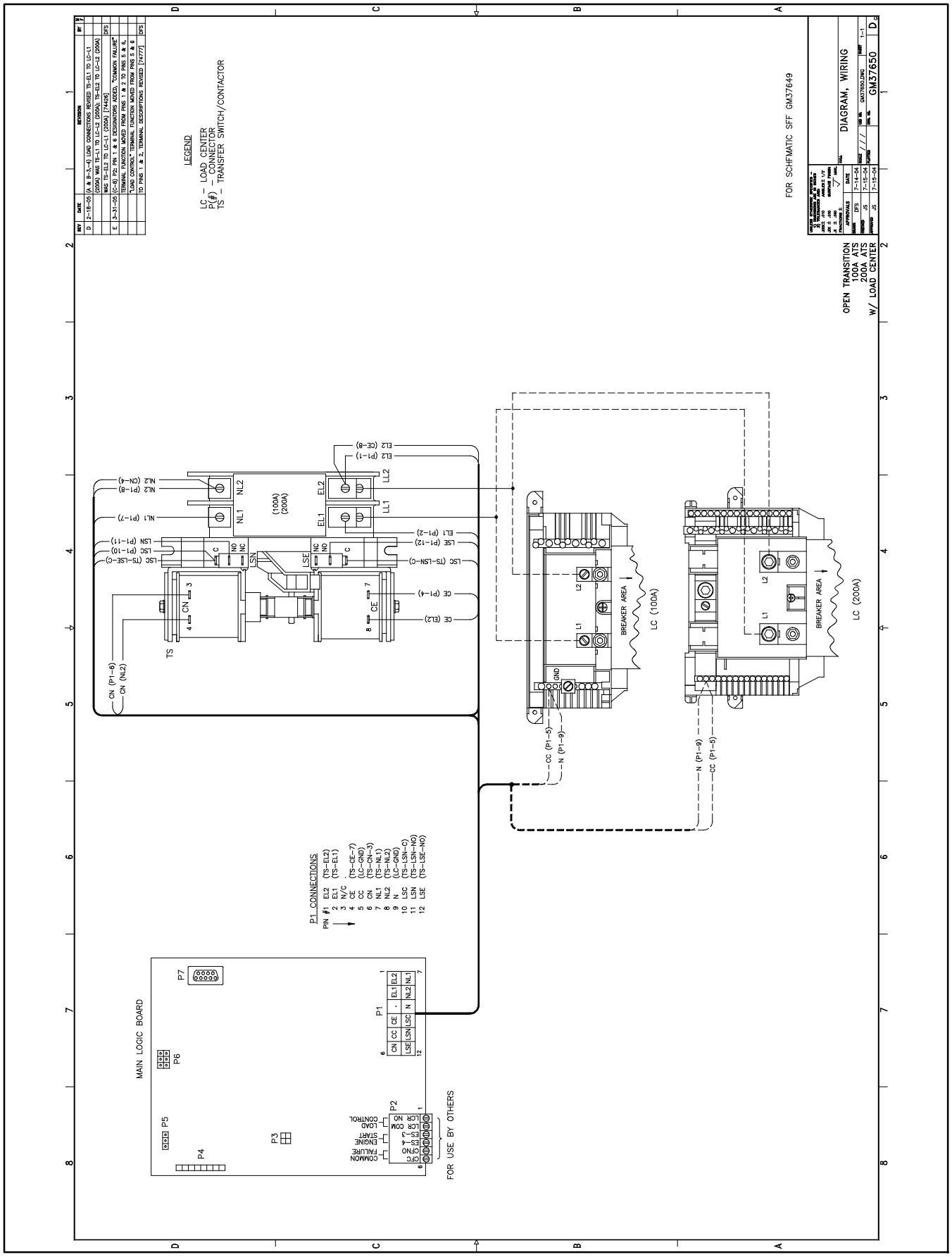


Figure 7-21 Wiring Diagram, 100/200 Amp with Load Center, GM37650

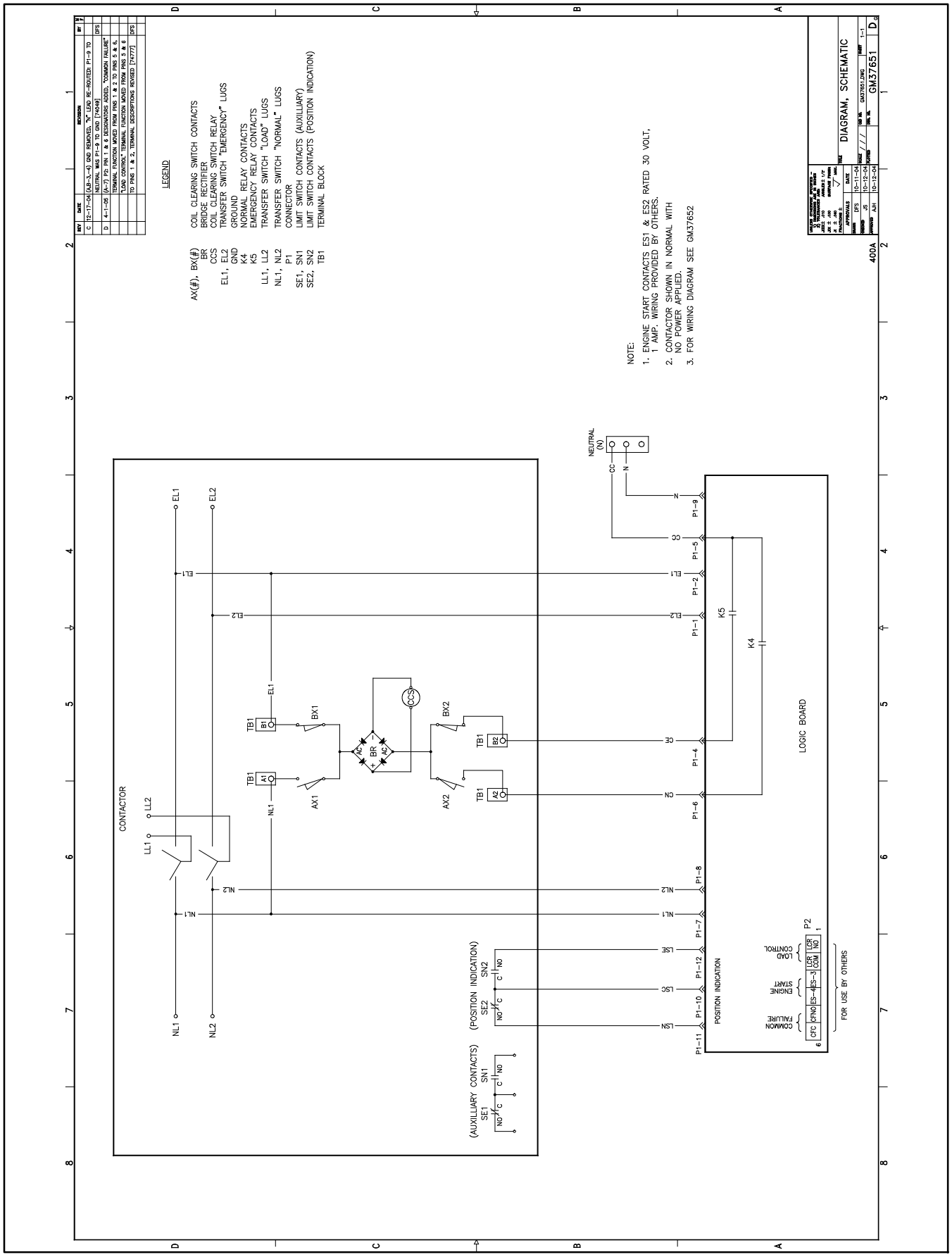


Figure 7-22 Schematic Diagram, 400 Amp, GM37651

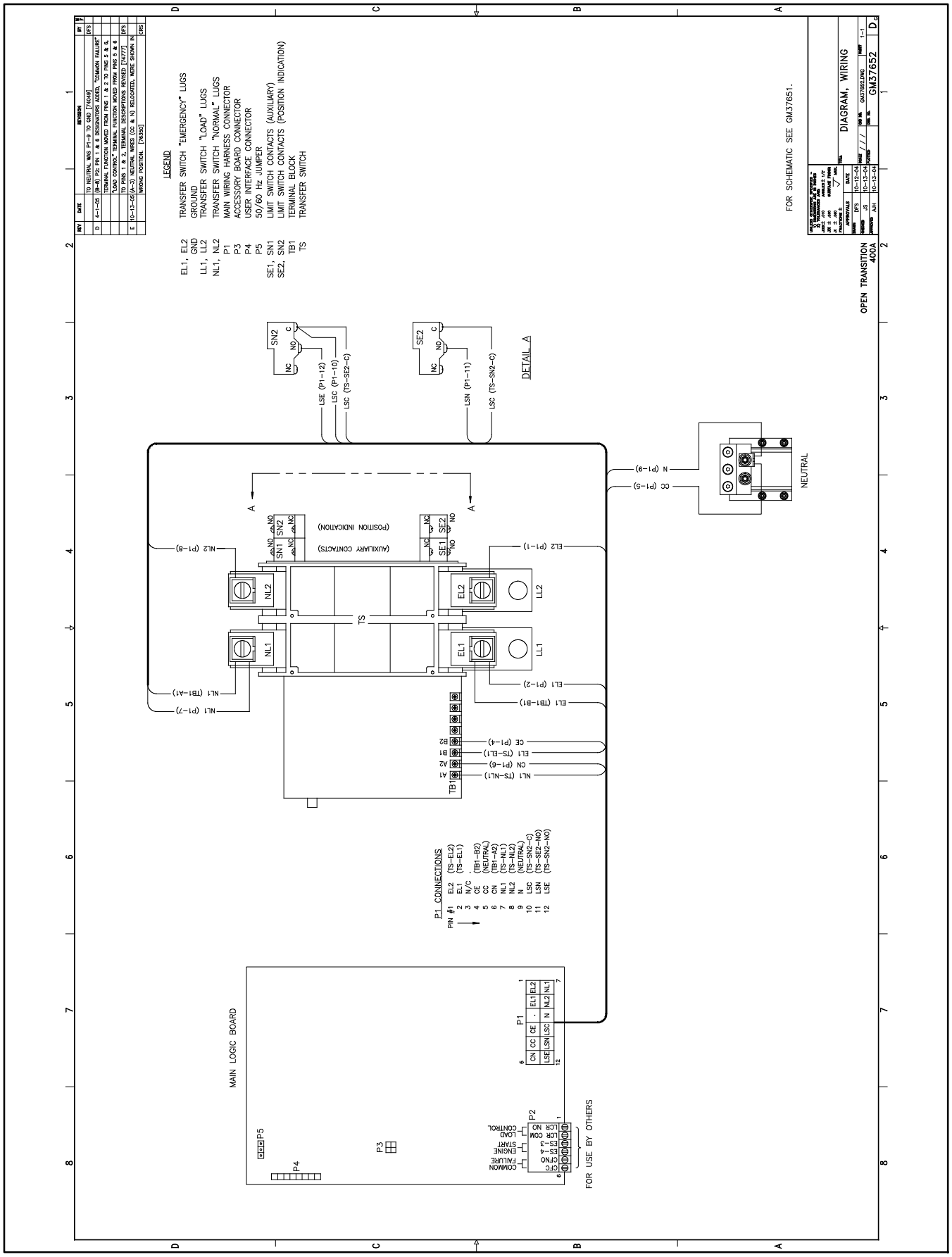


Figure 7-23 Wiring Diagram, 400 Amp, GM37652

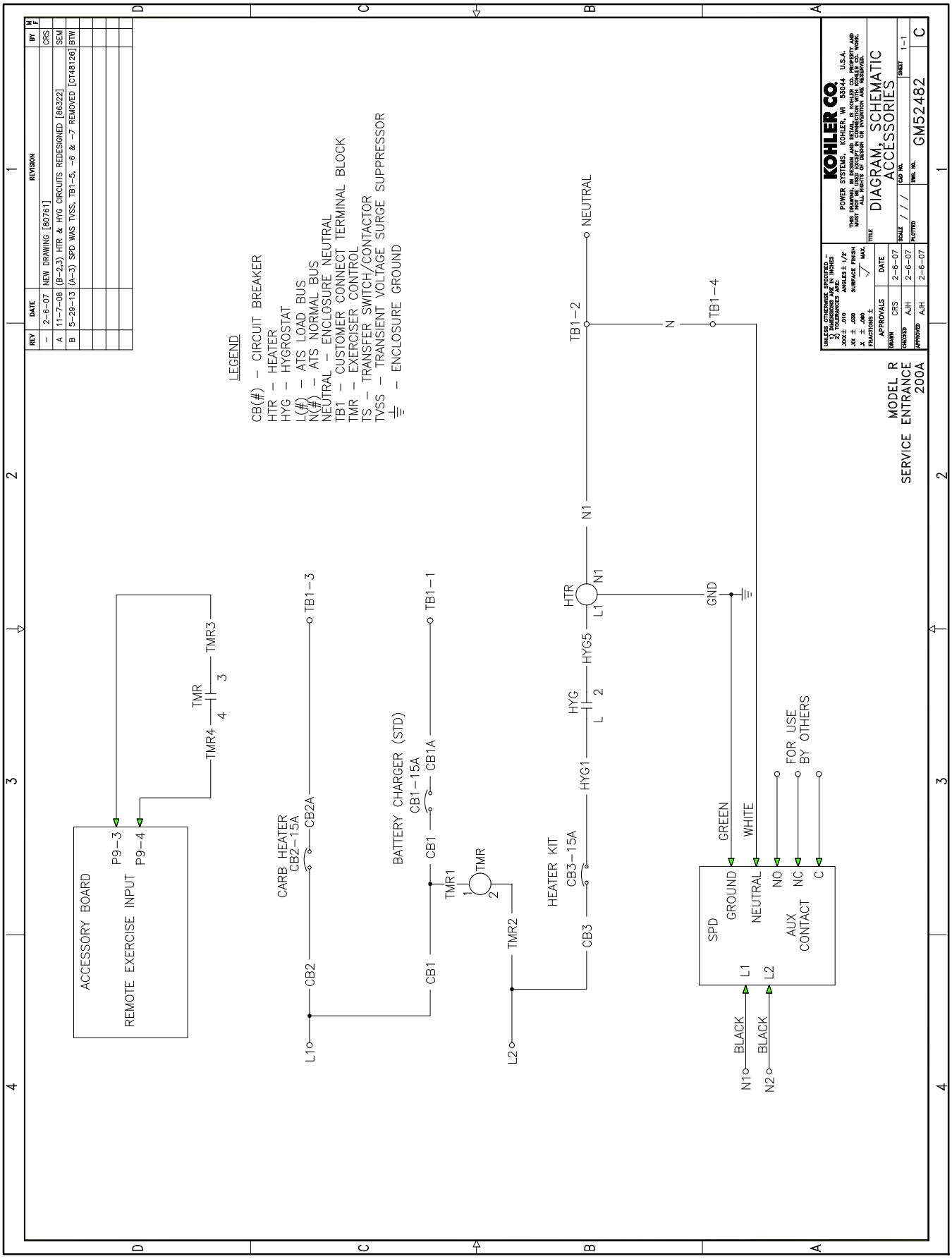


Figure 7-24 Schematic Diagram, 200 Amp Service Entrance Switch Accessories, GM52482

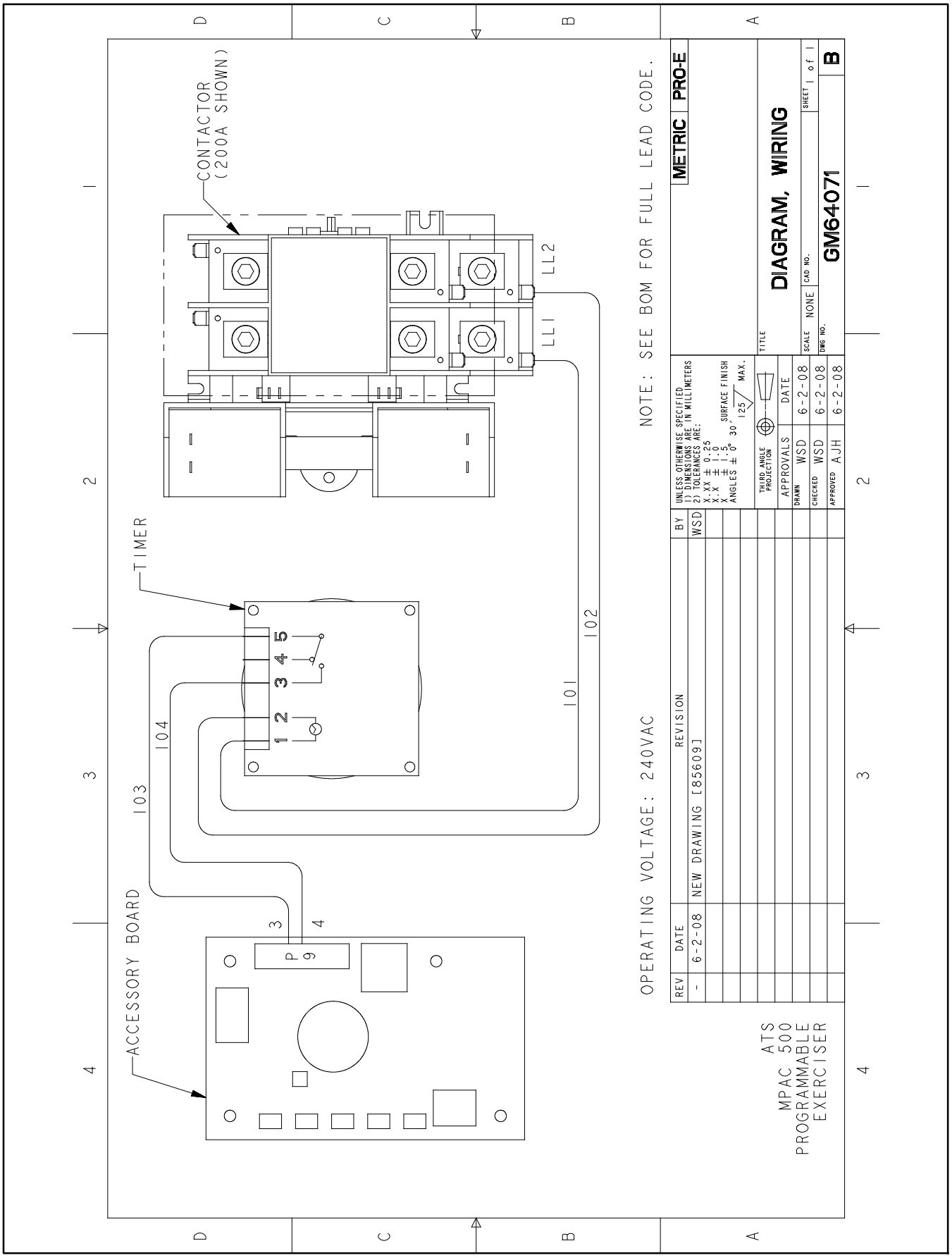


Figure 7-25 Wiring Diagram for Programmable Exerciser GM64027 and GM64028, Drawing GM64071

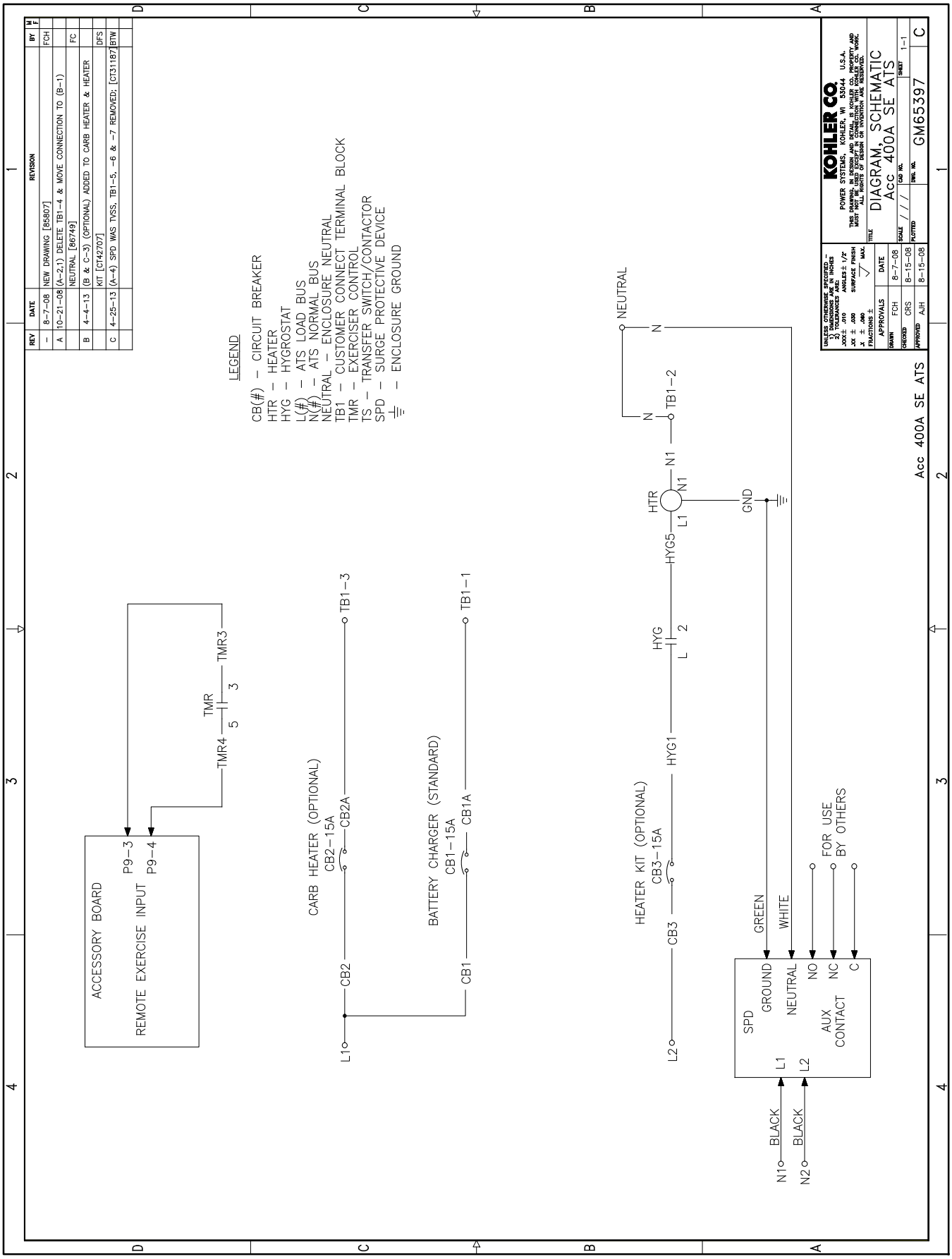


Figure 7-26 Schematic Diagram, 400 Amp Service Entrance Switch Accessories, GM65397

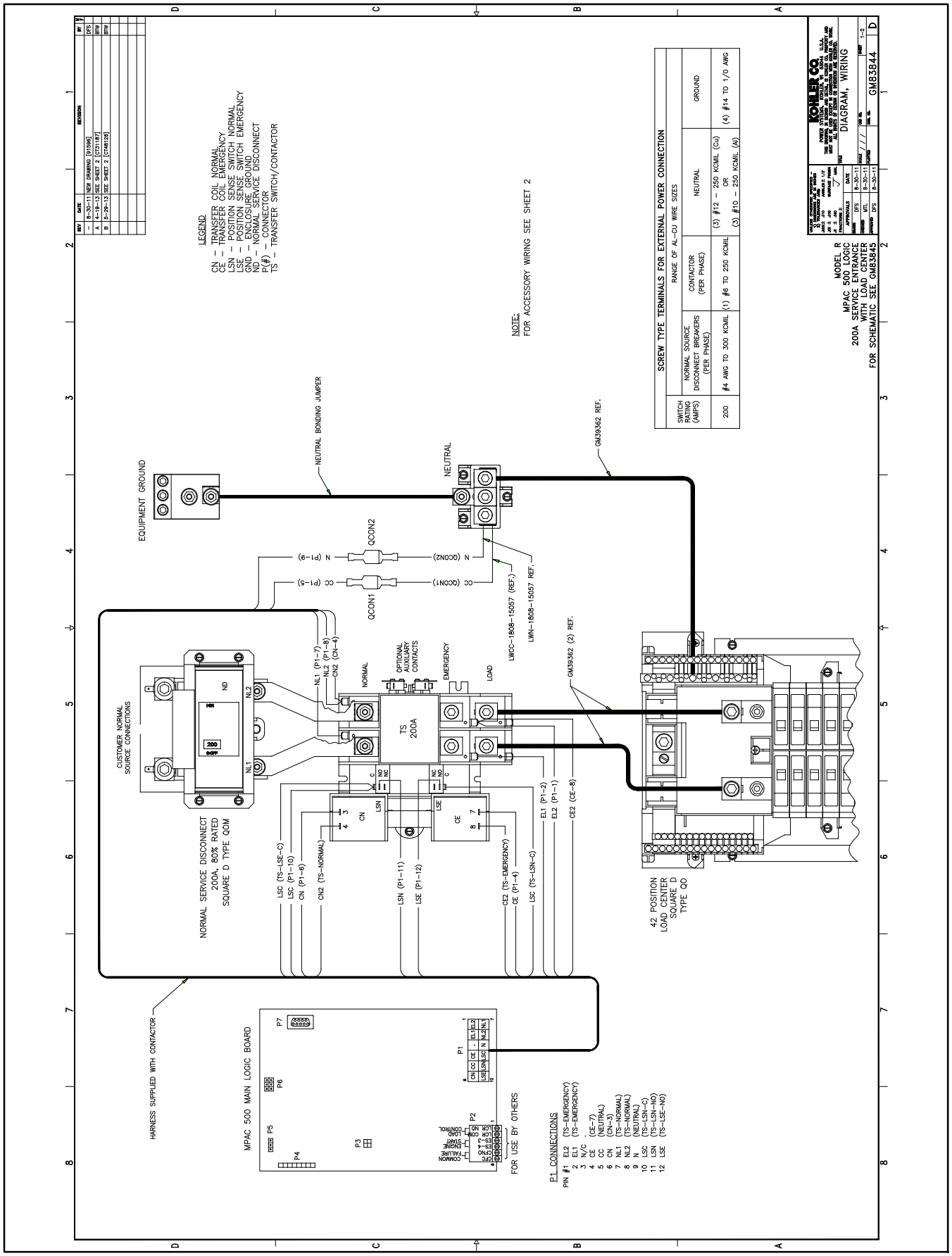


Figure 7-27 Wiring Diagram, 200 Amp Service Entrance Switch with Load Center, GM83844, Sheet 1 of 2

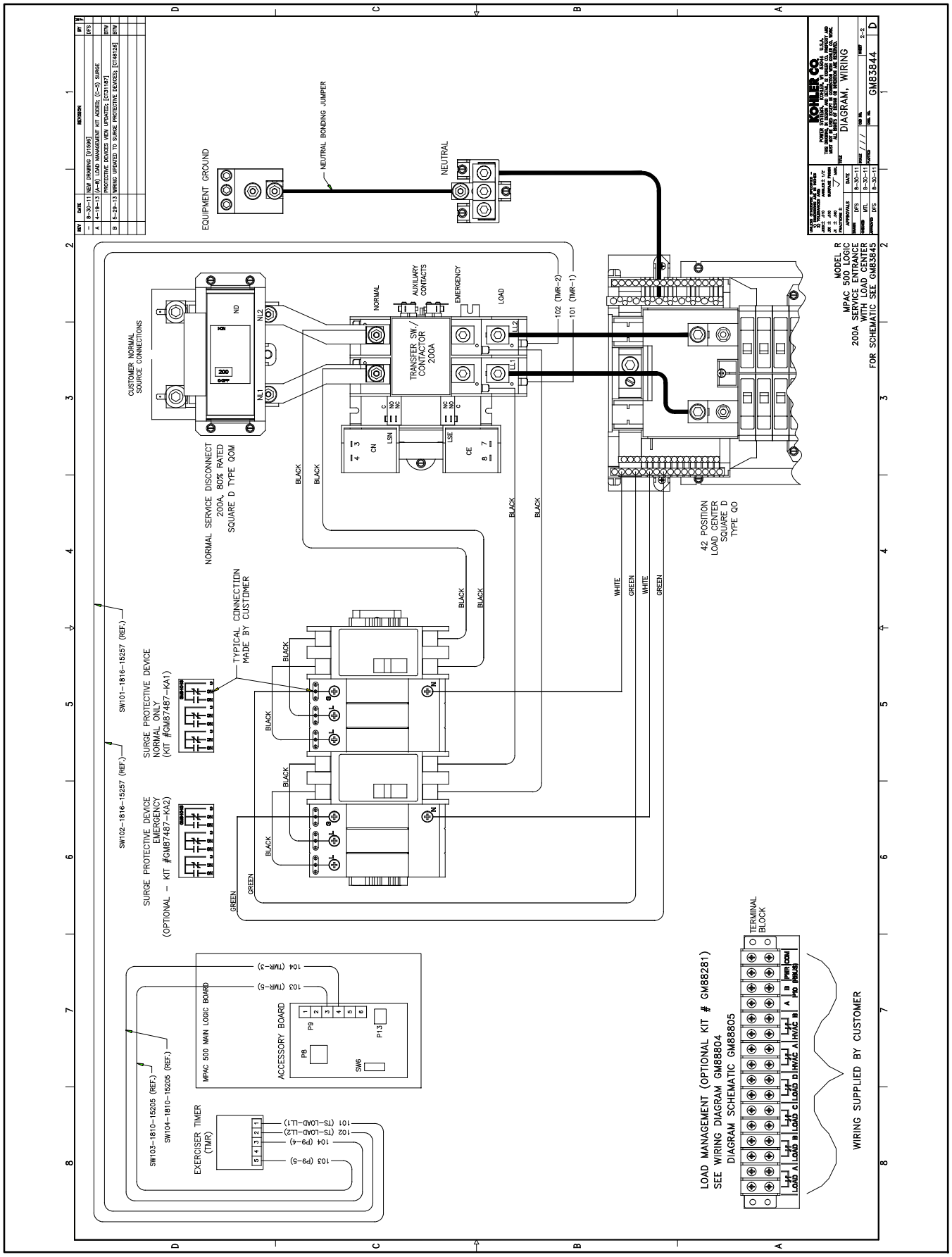


Figure 7-28 Wiring Diagram, 200 Amp Service Entrance Switch with Load Center, GM83844, Sheet 2 of 2

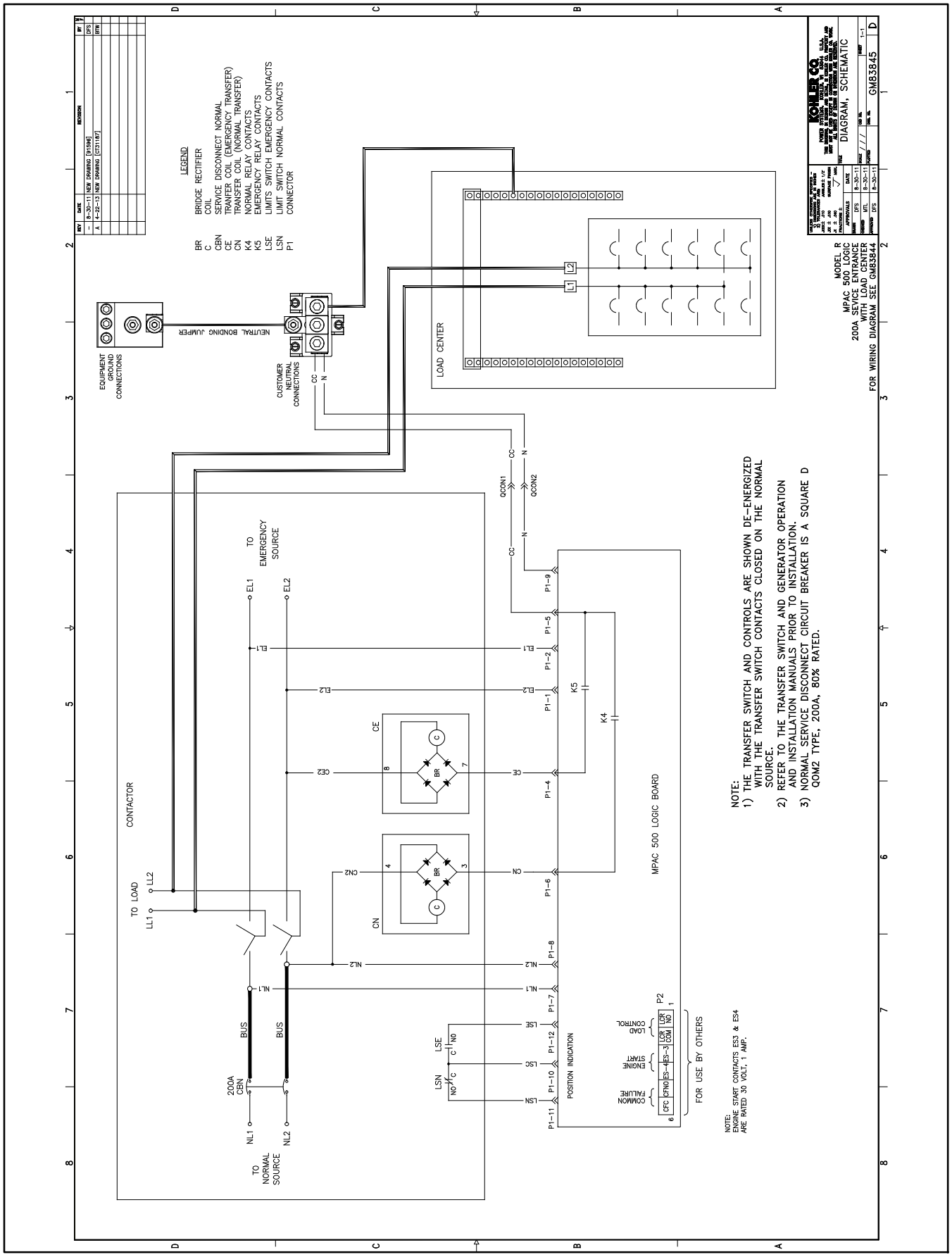


Figure 7-29 Schematic Diagram, 200 Amp Service Entrance Switch with Load Center, GM83845

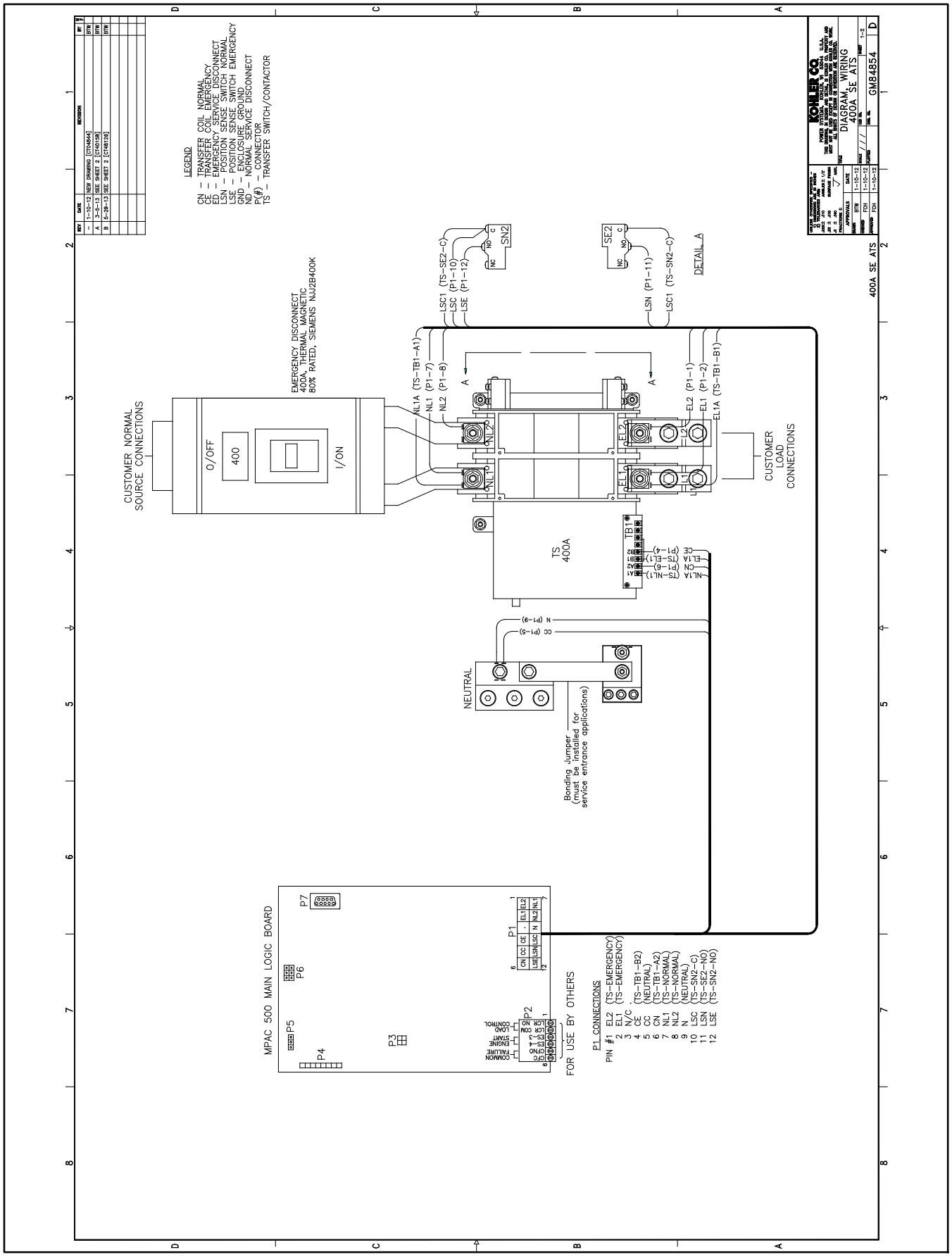


Figure 7-30 Wiring Diagram, 400 Amp Service Entrance Switch, GM84854, Sheet 1 of 2

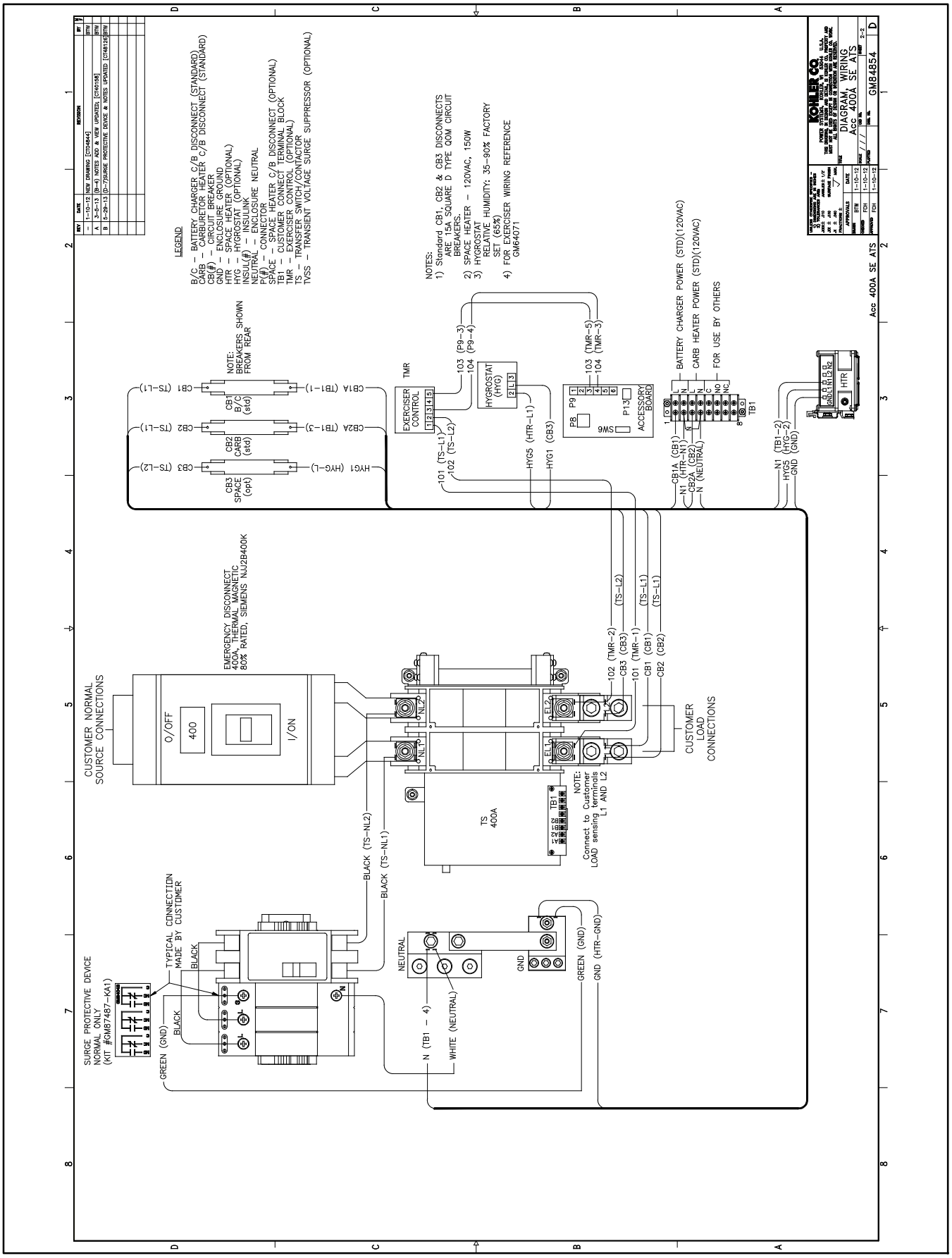


Figure 7-31 Wiring Diagram, 400 Amp Service Entrance Switch Accessories, GM84854, Sheet 2 of 2

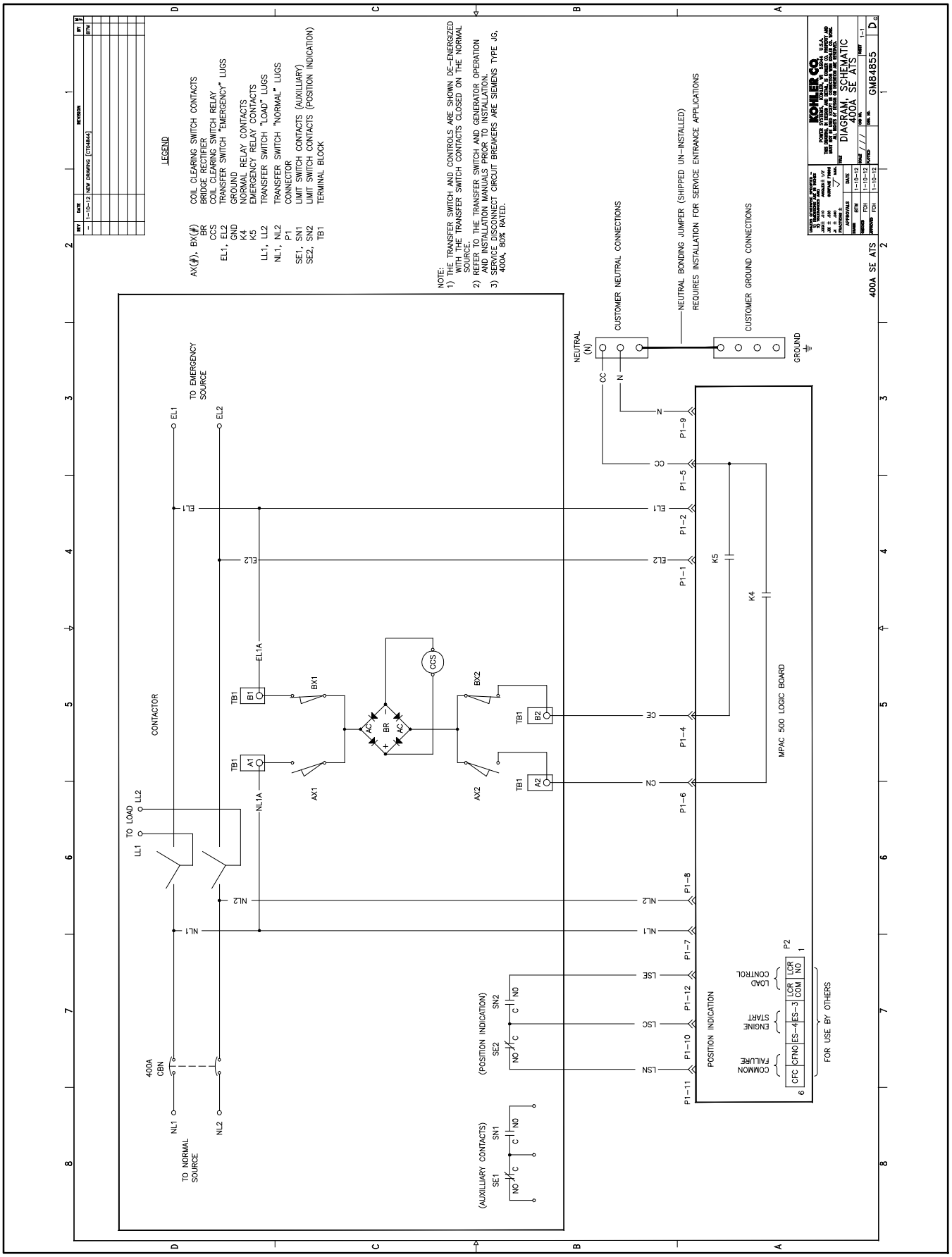


Figure 7-32 Schematic Diagram, 400 Amp Service Entrance Switch, GM84855

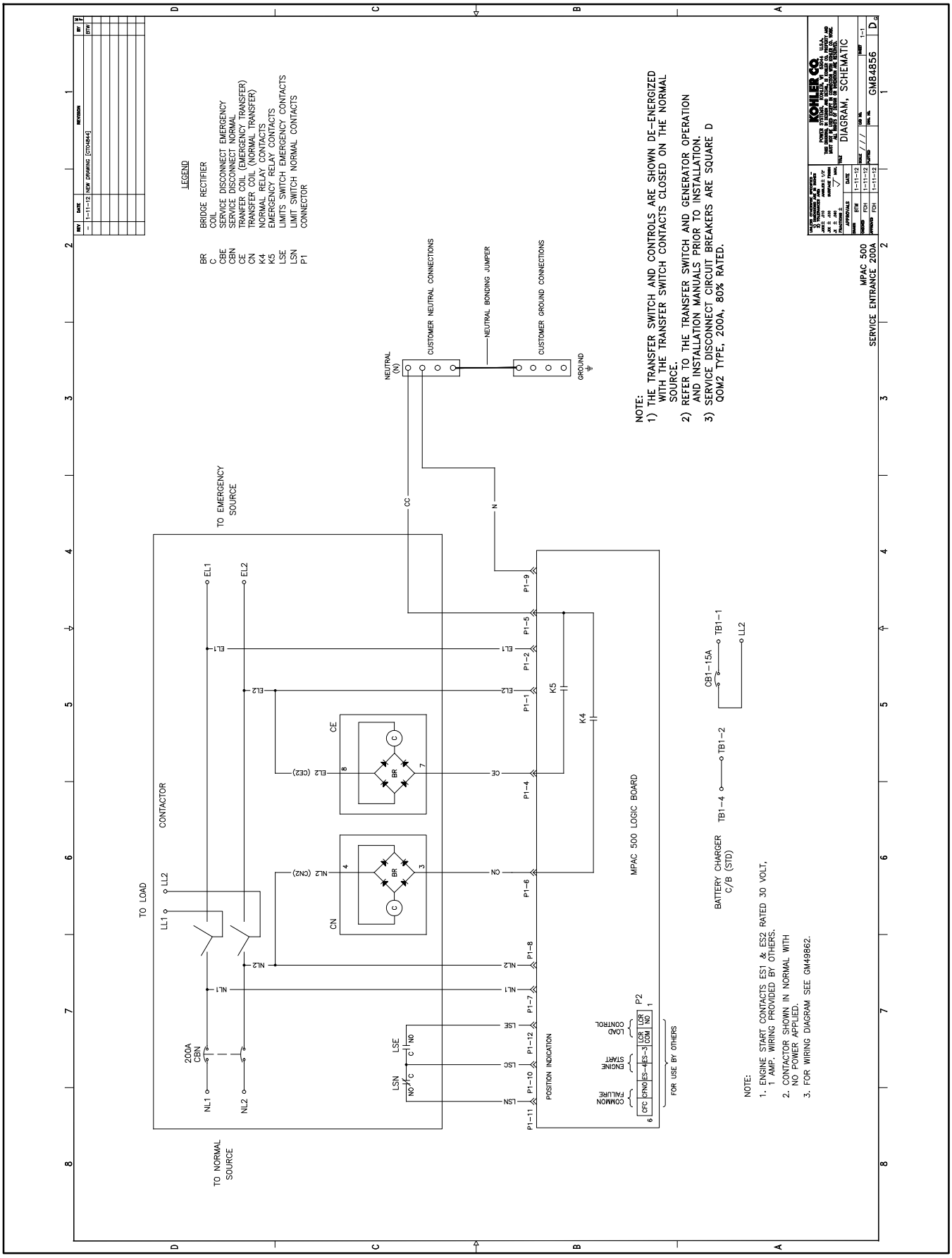


Figure 7-33 Schematic Diagram, 200 Amp Service Entrance Switch, GM84856

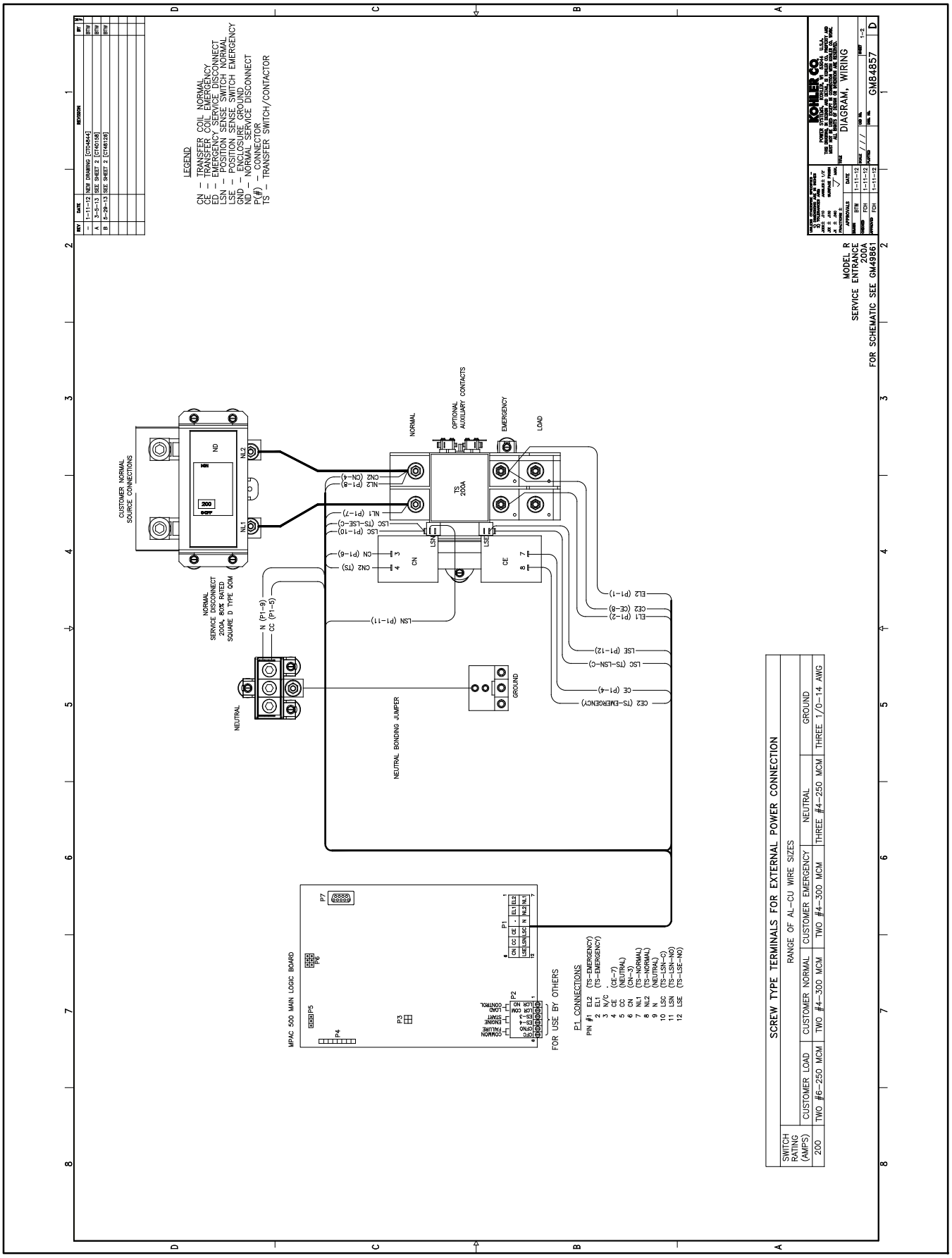


Figure 7-34 Wiring Diagram, 200 Amp Service Entrance Switch, GM84857, Sheet 1 of 2

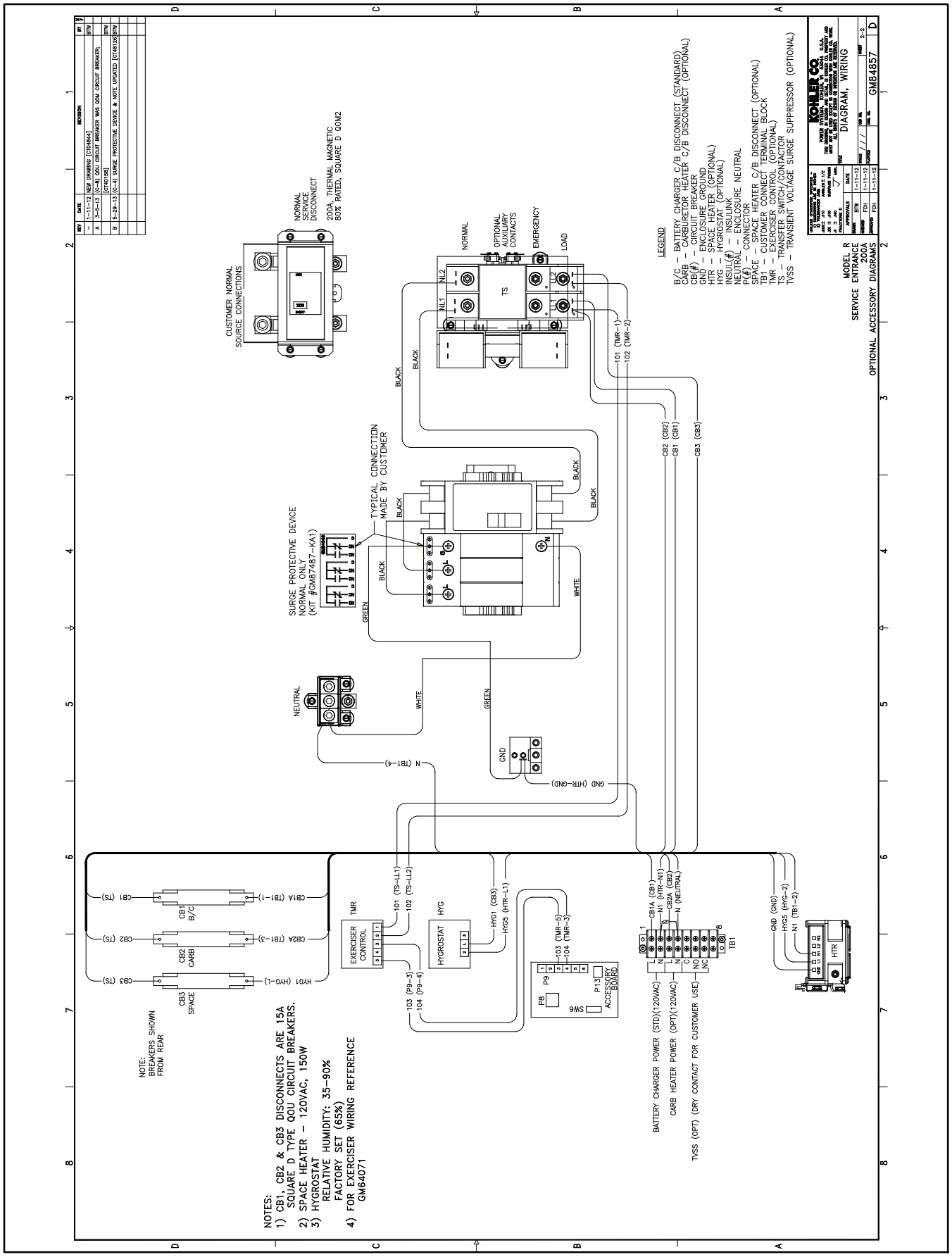


Figure 7-35 Wiring Diagram, 200 Amp Service Entrance Switch, GM84857, Sheet 2 of 2

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
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
CB	circuit breaker
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)
cogen.	cogeneration
com	communications (port)
coml	commercial
Coml/Rec	Commercial/Recreational
conn.	connection
cont.	continued
CPVC	chlorinated polyvinyl chloride
crit.	critical
CRT	cathode ray tube
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
DFMEA	Design Failure Mode and Effects Analysis
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, 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
fglass.	fiberglass
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)
IC	integrated circuit
ID	inside diameter, identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMS	improved motor starting
in.	inch
in. H_2O	inches of water
in. Hg	inches of mercury
in. lb.	inch pounds
Inc.	incorporated
ind.	industrial
int.	internal
int./ext.	internal/external
I/O	input/output
IP	iron pipe
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
ld. shd.	load shed
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
MTBF	mean time between failure
MTBO	mean time between overhauls
mtg.	mounting
MTU	Motoren-und Turbinen-Union
MW	megawatt
mW	milliwatt
μF	microfarad
N, norm.	normal (power source)
NA	not available, not applicable
nat. gas	natural gas
NBS	National Bureau of Standards
NC	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	newton meter
NO	normally open
no., nos.	number, numbers
NPS	National Pipe, Straight
NPSC	National Pipe, Straight-coupling
NPT	National Standard taper pipe thread per general use
NPTF	National Pipe, Taper-Fine
NR	not required, normal relay
ns	nanosecond
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OF	overfrequency
opt.	option, optional
OS	oversize, overspeed
OSHA	Occupational Safety and Health Administration
OV	overvoltage
oz.	ounce
p., pp.	page, pages
PC	personal computer
PCB	printed circuit board
pF	picofarad
PF	power factor
ph., ∅	phase
PHC	Phillips® head Crimptite® (screw)
PHH	Phillips® hex head (screw)
PHM	pan head machine (screw)
PLC	programmable logic control
PMG	permanent magnet generator
pot	potentiometer, potential
ppm	parts per million
PROM	programmable read-only memory
psi	pounds per square inch
psig	pounds per square inch gauge
pt.	pint
PTC	positive temperature coefficient
PTO	power takeoff
PVC	polyvinyl chloride
qt.	quart, quarts
qty.	quantity
R	replacement (emergency) power source
rad.	radiator, radius
RAM	random access memory
RDO	relay driver output
ref.	reference
rem.	remote
Res/Coml	Residential/Commercial
RFI	radio frequency interference
RH	round head
RHM	round head machine (screw)
rly.	relay
rms	root mean square
rnd.	round
ROM	read only memory
rot.	rotate, rotating
rpm	revolutions per minute
RS	right side
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
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
SS	stainless steel
std.	standard
stl.	steel
tach.	tachometer
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
TIR	total indicator reading
tol.	tolerance
turbo.	turbocharger
typ.	typical (same in multiple locations)
UF	underfrequency
UHF	ultrahigh frequency
UL	Underwriter's Laboratories, Inc.
UNC	unified coarse thread (was NC)
UNF	unified fine thread (was NF)
univ.	universal
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
w/o	without
wt.	weight
xfmr	transformer

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