Operation

Marine Generator Sets

Models:

33EFOZ/40EOZ
40EFOZ/50EOZ
55EFOZ/65EOZ
70EFOZ/80EOZ
80EFOZ/99EOZ
100EFOZ/125EOZ
125EFOZ/150EOZ

ISO 9001
KOHLER POWER SYSTEMS
NATIONALLY REGISTERED

KOHLER®
POWER SYSTEMS

TP-6109 11/02b

California Proposition 65

⚠ WARNING

Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

Product Identification Information

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

Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

x:in:007:001

Table of Contents

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

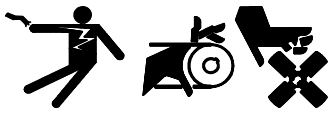
NOTICE

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

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

Accidental Starting

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

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

Battery

⚠ WARNING

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

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

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

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

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

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

Engine Backfire/Flash Fire

⚠ WARNING

Fire.
Can cause severe injury or death.

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

Servicing the 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.

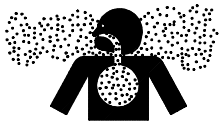
Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner/silencer removed.

Combustible materials. A sudden flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the fuel system. Keep the compartment and the generator set clean and free of debris to minimize the risk of fire. Wipe up spilled fuels and engine oil.

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.

Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide poisoning symptoms include but are not limited to the following:

- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles
- Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision
- Stomachache, vomiting, nausea

If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve within minutes of breathing fresh air.

Copper tubing exhaust systems. Carbon monoxide can cause severe nausea, fainting, or death. Do not use copper tubing in diesel exhaust systems. Sulfur in diesel exhaust causes rapid deterioration of copper tubing exhaust systems, resulting in exhaust/water leakage.

Inspecting the exhaust system. Carbon monoxide can cause severe nausea, fainting, or death. For the safety of the craft's occupants, install a carbon monoxide detector. Consult the boat builder or dealer for approved detector location and installation. Inspect the detector before each generator set use. In addition to routine exhaust system inspection, test the carbon monoxide detector per the manufacturer's instructions and keep the detector operational at all times.

Operating the generator set. 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. Use the following precautions when installing and operating the generator set. Do not install the exhaust outlet where exhaust can be drawn in through portholes, vents, or air conditioners. If the generator set exhaust discharge outlet is near the waterline, water could enter the exhaust discharge outlet and close or restrict the flow of exhaust. Never operate the generator set without a functioning carbon monoxide detector. Be especially careful if operating the generator set when moored or anchored under calm conditions because gases may accumulate. If operating the generator set dockside, moor the craft so that the exhaust discharges on the lee side (the side sheltered from the wind). Always be aware of others, making sure your exhaust is directed away from other boats and buildings. Avoid overloading the craft.

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.

Draining the fuel system. Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining the fuel system. Wipe up spilled fuel after draining the system.

Installing the fuel system. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Do not modify the tank or the propulsion engine fuel system. Equip the craft with a tank that allows one of the two pickup arrangements described in the installation section. The tank and installation must conform to USCG Regulations.

Pipe sealant. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Use pipe sealant on all threaded fittings to prevent fuel leakage. Use pipe sealant that resists gasoline, grease, lubrication oil, common bilge solvents, salt deposits, and water.

Ignition-protected equipment. Explosive fuel vapors can cause severe injury or death. Gasoline vapors can cause an explosion. USCG Regulation 33CFR183 requires that all electrical devices (ship-to-shore transfer switch, remote start panel, etc.) must be ignition protected when used in a gasoline and gaseous-fueled environment. The electrical devices listed above are not ignition protected and are not certified to operate in a gasoline and gaseous-fueled environment such as an engine room or near fuel tanks. Acceptable locations are the wheelhouse and other living areas sheltered from rain and water splash.

Hazardous Noise

⚠ CAUTION

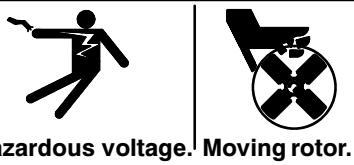
Hazardous noise.
Can cause hearing loss.

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/ Electrical Shock

⚠ WARNING



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

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

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Open the main circuit breakers of all power sources before servicing the equipment. Configure the installation to electrically ground the generator set, transfer switch, and related equipment and electrical circuits to comply with applicable codes and standards. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Disconnecting the electrical load. Hazardous voltage can cause severe injury or death. Disconnect the generator set from the load by opening the line circuit breaker or by disconnecting the generator set output leads from the transfer switch and heavily taping the ends of the leads. High voltage transferred to the load during testing may cause personal injury and equipment damage. Do not use the safeguard circuit breaker in place of the line circuit breaker. The safeguard circuit breaker does not disconnect the generator set from the load.

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.

Testing the voltage regulator. Hazardous voltage can cause severe injury or death. High voltage is present at the voltage regulator heat sink. To prevent electrical shock do not touch the voltage regulator heat sink when testing the voltage regulator. *(PowerBoost™, PowerBoost™ III, and PowerBoost™ V voltage regulator models only)*

Electrical backfeed to the utility. Hazardous backfeed voltage can cause severe injury or death. Connect the generator set to the building/marina electrical system only through an approved device and after the building/marina main switch is opened. Backfeed connections can cause severe injury or death to utility personnel working on power lines and/or personnel near the work area. Some states and localities prohibit unauthorized connection to the utility electrical system. Install a ship-to-shore transfer switch to prevent interconnection of the generator set power and shore power.

Testing live electrical circuits. Hazardous voltage or current can cause severe injury or death. Have trained and qualified personnel take diagnostic measurements of live circuits. Use adequately rated test equipment with electrically insulated probes and follow the instructions of the test equipment manufacturer when performing voltage tests. Observe the following precautions when performing voltage tests: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Do not touch the enclosure or components inside the enclosure. (4) Be prepared for the system to operate automatically. *(600 volts and under)*

Hot Parts

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.

⚠ WARNING

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

Do not work on the generator set until it cools.

Checking the coolant level. Hot coolant can cause severe injury or death. Allow the engine to cool. Release pressure from the cooling system before removing the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise to the first stop. Remove the cap after pressure has been completely released and the engine has cooled. Check the coolant level at the tank if the generator set has a coolant recovery tank.

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.

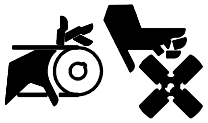
Moving Parts

⚠ WARNING

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

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

⚠ WARNING



Rotating parts.
Can cause severe injury or death.

Operate the generator set only when all guards, screens, and covers are in place.

⚠ WARNING

Airborne particles.
Can cause severe injury or blindness.

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

Tightening the hardware. Flying projectiles can cause severe injury or death. Loose hardware can cause the hardware or pulley to release from the generator set engine and can cause personal injury. Retorque all crankshaft and rotor hardware after servicing. Do not loosen the crankshaft hardware or rotor thrubolt when making adjustments or servicing the generator set. Rotate the crankshaft manually in a clockwise direction only. Turning the crankshaft bolt or rotor thrubolt counterclockwise can loosen the hardware.

Servicing the generator set when it is operating. Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Sound shield removal. Exposed moving parts can cause severe injury or death. The generator set must be operating in order to perform some scheduled maintenance procedures. Be especially careful if the sound shield has been removed, leaving the belts and pulleys exposed. *(Sound-shield-equipped models only)*

Notice

NOTICE

This generator set has been rewired from its nameplate voltage to

246242

NOTICE

Voltage reconnection. Affix a notice to the generator set after reconnecting the set to a voltage different from the voltage on the nameplate. Order voltage reconnection decal 246242 from an authorized service distributor/dealer.

NOTICE

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

NOTICE

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

NOTICE

Fuse replacement. Replace fuses with fuses of the same ampere rating and type (for example: 3AB or 314, ceramic). Do not substitute clear glass-type fuses for ceramic fuses. Refer to the wiring diagram when the ampere rating is unknown or questionable.

NOTICE

Saltwater damage. Saltwater quickly deteriorates metals. Wipe up saltwater on and around the generator set and remove salt deposits from metal surfaces.

Notes

Introduction

This manual provides operation instructions for 40/50/65/80/99/125/150EOZ and 33/40/55/70/80/100/125EFOZ model generator sets equipped with the following controllers:

- Decision-Maker™ 3+ 16-Light
- Decision-Maker™ 1 Expanded
- Decision-Maker™ 1 Standard

x:in:001:001

This manual may be used for models not listed on the front cover.

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.

Before installing a marine generator set, obtain the most current installation manual from your local distributor/dealer. Only qualified persons should install the generator set.

x:in:001:002:a

Service Assistance

For professional advice on generator 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 KohlerPowerSystems.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

Africa, Europe, Middle East
London Regional Office
Langley, Slough, England
Phone: (44) 1753-580-771
Fax: (44) 1753-580-036

Asia Pacific
Power Systems Asia Pacific Regional Office
Singapore, Republic of Singapore
Phone: (65) 264-6422
Fax: (65) 264-6455

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

X:in:008:001a

Maintenance and Service Parts/Related Literature

Maintenance and Service Parts

Figure 1 identifies maintenance and service parts for your generator set. Obtain a complete list of maintenance and service parts from your authorized generator distributor/dealer.

Part Description	Models						
	40EOZ/ 33EFOZ	50EOZ/ 40EFOZ	65EOZ/ 55EFOZ	80EOZ/ 70EFOZ	99EOZ/ 80EFOZ	125EOZ/ 100EFOZ	150EOZ/ 125EFOZ
Air Filter Element	GM15397	GM15397	GM15397	GM15398	GM15398	324134	324134
Belt (Alternator and Seawater Pump)	GM15402	GM15402	GM15402	GM15402	GM15402	GM18704	GM18704
Dec I Standard Controller: Input Fuse (10 amp)	223316	223316	223316	223316	223316	223316	223316
Dec I Expanded Controller: Input Fuse (10 amp)	223316	223316	223316	223316	223316	223316	223316
Dec 3+ Controller:							
Remote Annunciator Fuse (3 amp)	243273	243273	243273	243273	243273	243273	243273
Controller Fuse (3 amp)	243273	243273	243273	243273	243273	243273	243273
Engine & Accessory Fuse (15 amp)	283645	283645	283645	283645	283645	283645	283645
Fuel Filter Element	GM15399	GM15399	GM15399	GM15399	GM15399	GM18808	GM18808
Oil Filter	GM15400	GM15400	GM15400	GM15400	GM15400	223673	223673
Seawater Pump Impeller Kit	GM15401	GM15401	GM15401	GM15401	GM15401	GM18793	GM18793
Spray Paint (White)	221335	221335	221335	221335	221335	221335	221335
Touch-Up Paint (White)	GM19490	GM19490	GM19490	GM19490	GM19490	GM19490	GM19490
Zinc Anode	GM15403	GM15403	GM15403	GM15404	GM15404	GM15404	GM15404

Figure 1 Maintenance and Service Parts

Related Literature

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

Literature Type	Models						
	40EOZ/ 33EFOZ	50EOZ/ 40EFOZ	65EOZ/ 55EFOZ	80EOZ/ 70EFOZ	99EOZ/ 80EFOZ	125EOZ/ 100EFOZ	150EOZ/ 125EFOZ
Installation Manual	TP-6069	TP-6069	TP-6069	TP-6069	TP-6069	TP-6069	TP-6069
Parts Catalog*	TP-5738	TP-5738	TP-5738	TP-5738	TP-5738	TP-5738	TP-5738
Operation & Service Manual (Engine)	TP-6084	TP-6084	TP-6084	TP-6084	TP-6084	N/A	N/A
Service Manual (Generator)	TP-5737	TP-5737	TP-5737	TP-5737	TP-5737	TP-5737	TP-5737
* Includes the generator and engine information.							

Figure 2 Generator Set Literature

x:in:001:005

1.1 Introduction

The specification sheets for each generator set provide specific generator and engine information. Refer to the respective specification sheet for data not supplied in this manual. Consult the generator set service manual, installation manual, engine operation manual, and engine service manual for additional specifications.

1.2 Specifications

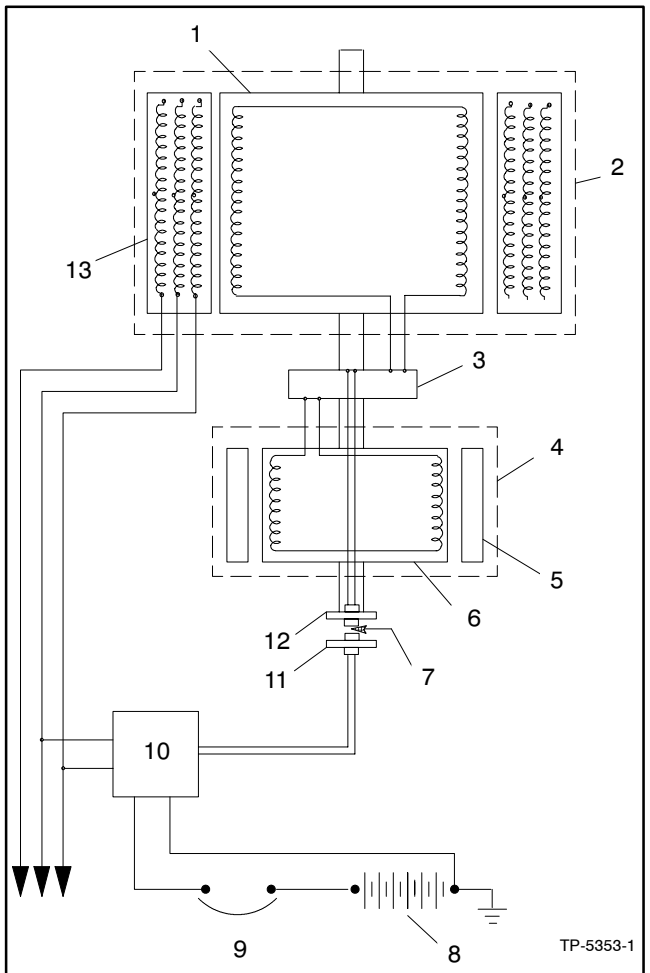
The alternator is a 4-pole, rotating-field unit with a brushless, permanent-magnet-generator (PMG) excitation system. The generator set excitation system uses a permanent-magnet exciter with a silicon-controlled rectifier (SCR) assembly that controls the amount of DC current supplied to the generator field. The voltage regulator sends a signal to the SCR assembly through an optical coupling. The voltage regulator bases the signal on engine speed and generator output voltage. The signal turns a stationary light-emitting diode (LED) on or off. The LED is mounted on the end bracket opposite a photo transistor board that rotates on the shaft. The photo transistor receives the signal from the LED and signals the SCR assembly to turn on or off. See Figure 1-1.

PMG, Fast-Response™ II generator sets offer the following advantages:

- The voltage recovery period of this type of generator is several times faster than the conventional PMG generators because the generator set does not have to contend with the inductance of the 2nd exciter field.
- Better recovery characteristics than static-excited generators because the system doesn't draw excitation power from the generator output voltage.
- The inherent ability to support short-circuit current and allow system coordination for tripping downstream branch circuit breakers.

The PMG exciter system changes the level of exciter current to the main field within 0.05 seconds of a load change.

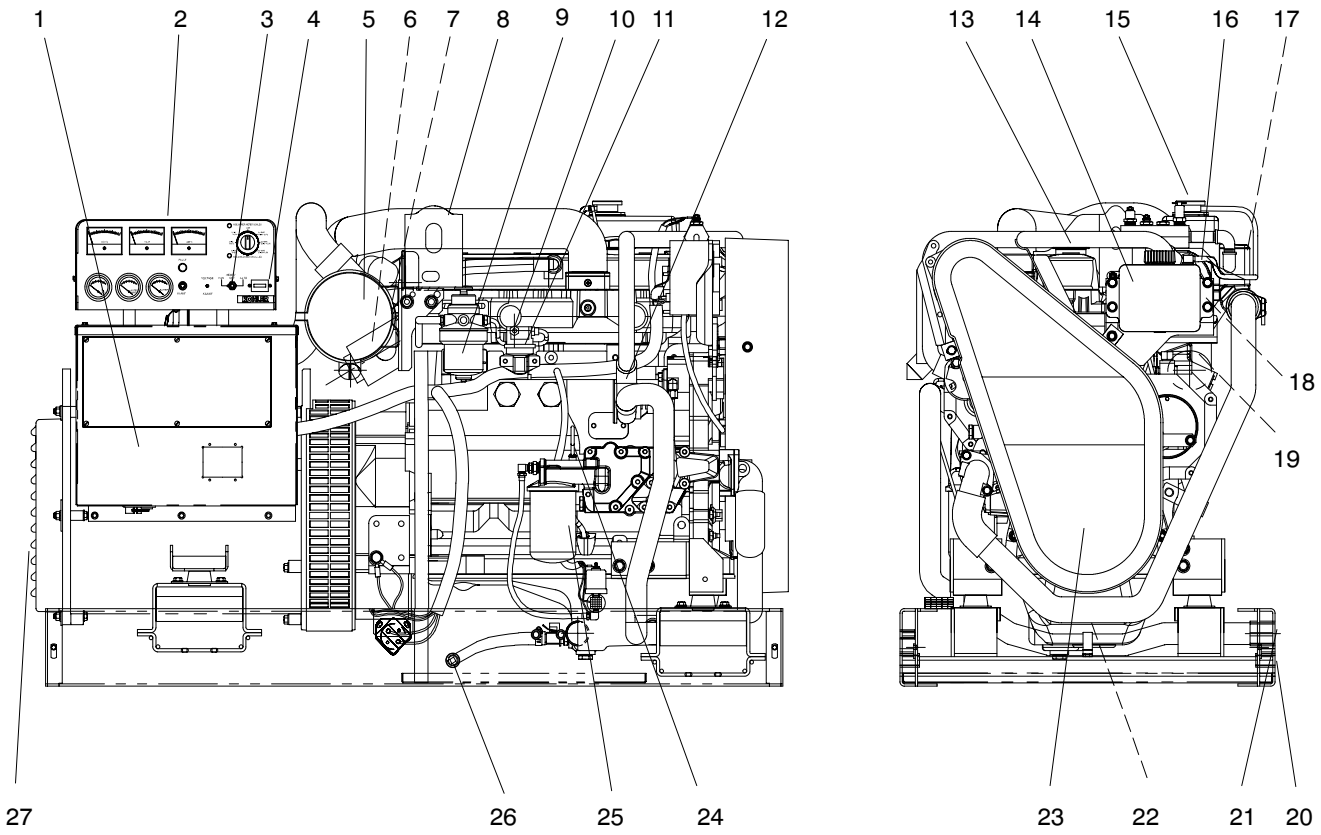
For the duration of a short circuit in the load circuit(s), the output voltage drops and the amperage momentarily rises to 200–300% of the generator set's rated current, and 200–300% for the duration of the short circuit. The SCR assembly sends full exciter power to the main field and the generator sustains up to 300% of rated current. The sustained high current causes the correspondingly rated load circuit fuses/breakers to trip. The safeguard breaker kit collapses the generator set's main field during a sustained heavy overload or short circuit.



1. Field
2. Main generator/alternator
3. SCR assembly
4. Exciter generator/alternator
5. Exciter field magnets
6. Exciter armature
7. Optical coupling
8. Starting battery
9. Safegaurd breaker (optional)
10. AC voltage regulator
11. LED board
12. Photo transistor board
13. Stator

Figure 1-1 Alternator Schematic

1.3 Service Views



1. Nameplate
2. Controller (Decision-Maker™ I expanded controller shown)
3. Generator set master switch
4. Hourmeter
5. Air cleaner
6. Exhaust outlet (nonservice side)
7. Fuel return
8. Lifting eye
9. Fuel filter
10. Fuel inlet
11. Fuel pump
12. Seawater pump
13. Oil fill
14. Coolant overflow bottle
15. Pressure cap
16. Overflow tube
17. Heat exchanger
18. Anticorrosion zinc anode
19. Fuel injection pump
20. Oil drain (optional location)
21. Seawater inlet (drain)
22. Coolant drain
23. Belt guard
24. Oil dipstick (check)
25. Oil filter
26. Oil drain valve and hose
27. Cooling air inlets (generator)

Figure 1-2 Service Views (Typical)

1.4 Remote Annunciator Kit

A remote annunciator provides convenient monitoring of the generator set's condition from a remote location. See Figure 1-3. The remote annunciator includes an alarm horn, alarm silence switch, lamp test, and the same lamp indicators (except air damper and auxiliary prealarm) as the microprocessor controller, plus the following lamps:

Line Power lamp illuminates to indicate that the commercial utility is the power source.

Generator Power lamp illuminates to indicate that the generator set is the power source.

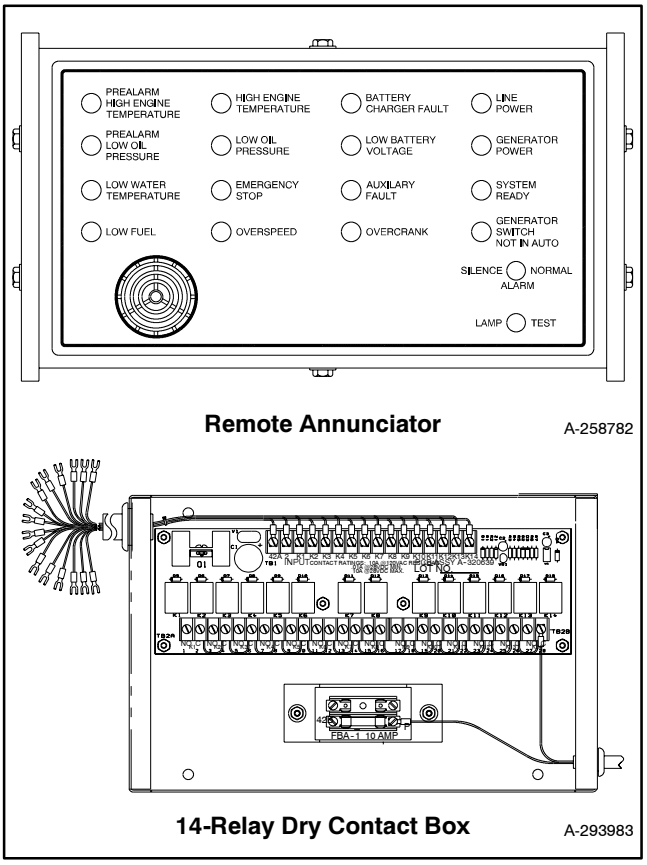


Figure 1-3 Remote Annunciator with 14-Relay Dry Contact Box

1.5 Safeguard Breaker

The safeguard breaker senses output current on each generator phase and shuts off the AC voltage regulator if a sustained overload or short circuit occurs. It is not a line circuit breaker and does not disconnect the generator set from the load. See Figure 1-4.

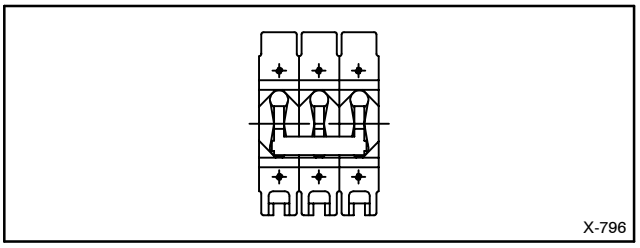


Figure 1-4 Safeguard Breaker

1.6 Line Circuit Breaker

The line circuit breaker interrupts generator output if an overload or short circuit occurs. Use the line circuit breaker to manually disconnect the generator set from the load during generator set service. See Figure 1-5.

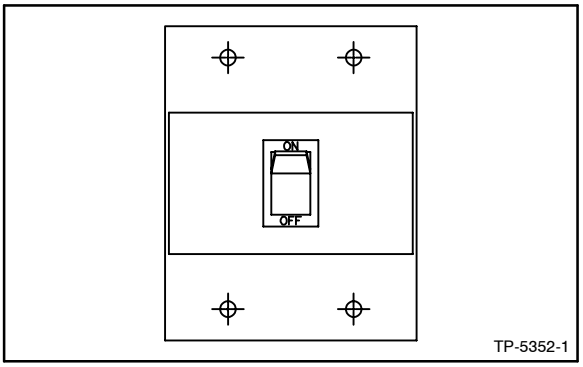


Figure 1-5 Line Circuit Breaker

1.7 Run Relay Kit

The run relay kit includes three sets of contacts that energize only during generator set operation. The run relay kit can control air intake louvers, radiator louvers, alarms, and other signaling devices. See Figure 1-6.

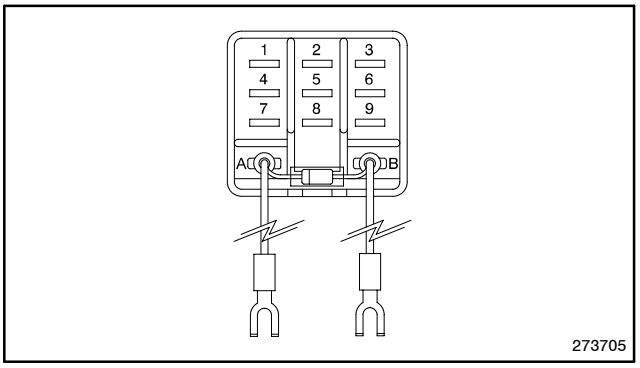


Figure 1-6 Run Relay Kit

Notes

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.

Air Shrouding. Check for securely installed and positioned air shrouding.

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

Coolant Level. Check the coolant level according to the cooling system maintenance information.

Drive Belts. Check the belt condition and tension of the water pump and battery charging alternator belt.

Exhaust System. Check for exhaust leaks and blockages. Check the silencer and piping condition and check for tight exhaust system connections.

Inspect the exhaust system components (exhaust manifold, mixing elbow, exhaust line, hose clamps, silencer, and exhaust outlet) for cracks, leaks, and corrosion.

- Check the hoses for softness, cracks, leaks, or dents. Replace the hoses as needed.
- Check for corroded or broken metal parts and replace them as needed.
- Check for loose, corroded, or missing clamps. Tighten or replace the hose clamps as needed.
- Check that the exhaust outlet is unobstructed.
- Visually inspect for exhaust leaks *(blowby)*. Check for carbon or soot residue on exhaust components. Carbon and soot residue indicates an exhaust leak. Seal leaks as needed.
- Ensure that the carbon monoxide detector(s) is (1) in the craft, (2) functional, and (3) energized whenever the generator set operates.

  Note: Never operate the generator set without a functioning carbon monoxide detector.

Fuel Level. Check the fuel level and keep the tank(s) full to ensure adequate fuel supply.

Lamp Test. Press the lamp test button, if equipped to verify that all controller LEDs illuminate.

Oil Level. Maintain the oil level at or near, not over, the full mark on the dipstick.

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

Seawater Pump Priming. Prime the seawater pump before initial startup. To prime the pump: (1) close the seacock, (2) remove the hose from the water-filter outlet, (3) fill the hose and seawater pump with clean water, (4) reconnect the hose to the water filter outlet, and (5) open the seacock. Confirm seawater pump operation on startup as indicated by water discharge from the exhaust outlet.

2.2 Marine Inspection

Kohler Co. recommends that all boat owners have their vessels—especially the exhaust system attached to the generator set—inspected at the start of each boating season by the local Coast Guard Auxiliary. If there is no Coast Guard Auxiliary in the area, contact an authorized Kohler distributor/dealer for the inspection.

2.3 Angular Operation

See Figure 2-1 for angular operation limits for units covered in this manual.

Continuous	Intermittent— 3 minutes or less
25°	30°
Maximum value for all directions	

Figure 2-1 Angular Operation

m:op:001:004

2.4 Operation in European Union Member Countries

This generator set is specifically intended and approved for operation below the deck in the engine compartment. Operation above the deck and/or outdoors would constitute a violation of European Union Directive 2000/14/EC noise emission standard.

2.5 Exercising the Generator Set

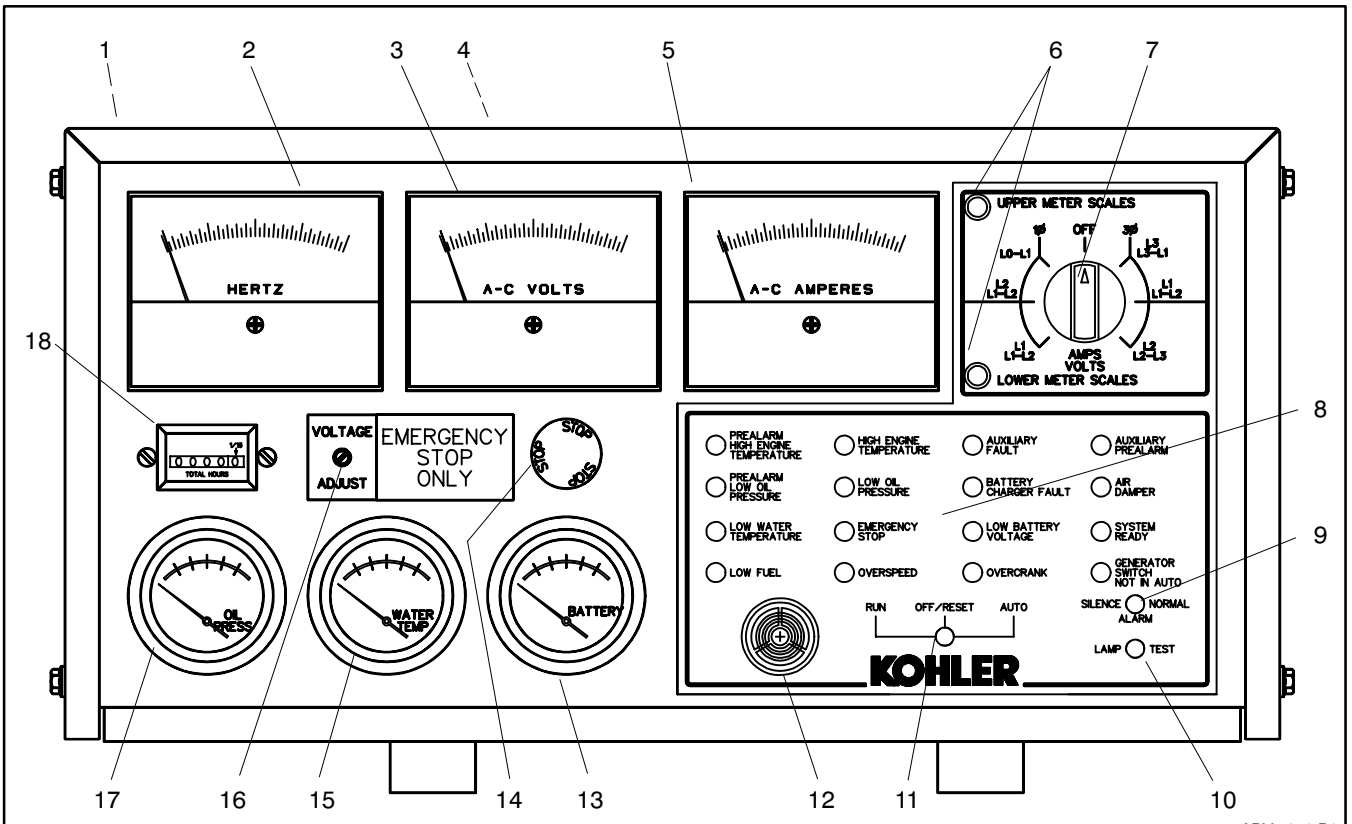
Operate the generator set under load once each week for one hour with an operator present.

The operator should perform all of the prestart checks before starting the exercise procedure. Start the generator set according to the starting procedure in the controller section of this manual. While the generator set is operating, listen for a smooth-running engine and visually inspect the generator set for fluid or exhaust leaks.

x:op:001:005

2.6 Decision-Maker™ 3+, 16-Light Microprocessor Controller Operation

The Decision-Maker™ 3+, 16-light microprocessor controller has a prime power mode of operation. See Section 2.6.6 for prime power mode operation. Figure 2-2 identifies the relay controller's indicators and controls and their functions.



1. Fuses (inside controller)
2. Frequency meter
3. AC voltmeter
4. Controller TB1 and TB2 terminal strips (on circuit board)
5. AC ammeter
6. Scale lamps (upper/lower)
7. Selector switch
8. Annunciator panel lamps
9. Alarm silence switch
10. Lamp test
11. Generator set master switch
12. Alarm horn
13. DC voltmeter
14. Emergency stop switch (if equipped)
15. Water temperature gauge
16. Voltage adjustment
17. Oil pressure gauge
18. Hourmeter

Figure 2-2 Decision-Maker™ 3+, 16-Light Microprocessor Controller

2.6.1 Controls and Indicators

The following table describes the controls and indicators located on the controller.

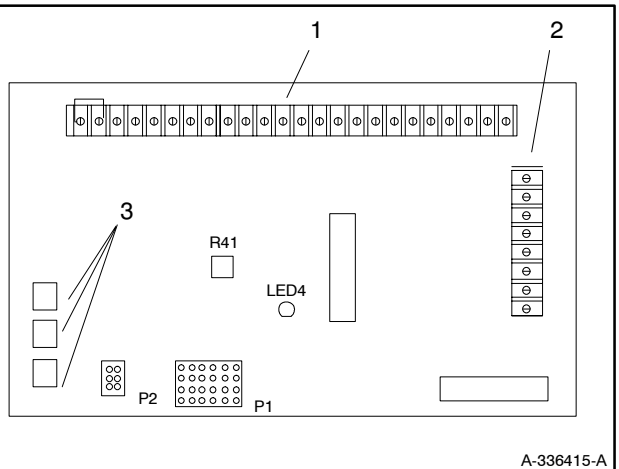
Name	Description
AC ammeter	Meter displays the AC output amperage. Use the selector switch to choose the phase current.
AC voltmeter	Meter displays the AC output voltage. Use the selector switch to choose the output lead circuits.
DC voltmeter	Meter displays the voltage of the starting battery(ies).
Alarm horn	Horn sounds if any fault or anticipatory condition exists. Place the generator set master switch in the AUTO position before silencing the horn. See the Controller Resetting Procedure later in this section.
Alarm silence switch	Switch disconnects the alarm during service (place the generator set master switch in the AUTO position before silencing the alarm horn). Restore the alarm horn switches at all locations (controller, remote annunciator, and audio/visual alarm) to normal positions after correcting the fault shutdown to avoid reactivating the alarm horn. See the Controller Resetting Procedure later in this section.
Auxiliary fault lamp	Lamp flashes or lights when the controller detects a fault. See the lamp conditions section following.
Frequency meter	Meter displays the frequency (Hz) of the generator set output voltage.
Generator set master switch	Switch functions as the controller reset and generator set operation switch.
High engine temperature lamp	Lamp illuminates if the generator set shuts down because of high engine temperature. Shutdown occurs 5 seconds after the engine reaches temperature shutdown range.
Hourmeter	Hourmeter records the generator set total operating hours for reference in maintenance scheduling.
Lamp test switch	Switch tests the controller indicator lamps.
Low oil pressure lamp	Lamp illuminates if the generator set shuts down because of low oil pressure. Shutdown occurs 5 seconds after the engine reaches oil pressure shutdown range.
Overcrank lamp	Lamp illuminates and cranking stops if the engine does not start after 45 seconds of continuous cranking or 75 seconds of cyclic cranking. Cranking stops and overcrank lamp lights after 15 seconds if the starter or engine does not turn (locked rotor). Overcrank lamp flashes if speed sensor signal is absent longer than one second. **NOTE:** The generator set controller's automatic restart function attempts to restart the generator set if the engine speed drops below 13 Hz (390 rpm). Continued decreased engine speed causes an overcrank condition.
Overspeed lamp	Lamp illuminates if the generator set shuts down because governed frequency on 50 and 60 Hz models exceeds 70 Hz.
Water temperature gauge	Gauge displays the engine coolant temperature.
Oil pressure gauge	Gauge displays the engine oil pressure.
Scale lamps (upper/lower)	Lamps indicate which AC voltmeter and/or ammeter scales to read.
Selector switch	Switch selects which generator set output circuits to measure. When switched to a position with two circuit labels, measures amperage on the lead shown in the upper label and measures voltage between the two leads shown in the lower label. The AC ammeter and voltmeter function only with the switch in the ON position.
Voltage adjustment potentiometer	Potentiometer fine-tunes (±5%) the generator set output voltage. Fine adjustment (5%) of generator output voltage level.

Name	Description
Auxiliary prealarm lamp	Lamp illuminates when customer-provided sensing devices activate the pump.
Emergency stop lamp	Lamp illuminates and the generator set shuts down when the operator energizes the optional emergency stop switch. The lamp needs the optional emergency stop switch to function.
Generator switch not in auto lamp	Lamp illuminates when the generator set master switch is in the RUN or OFF/RESET position.
Low fuel lamp	Lamp illuminates when the fuel level in the tank approaches empty. The lamp needs a low fuel sensor in the fuel tank to function.
High water temperature lamp	Lamp illuminates when the water temperature approaches shutdown range. The lamp needs an optional prealarm sender kit to function.
Prealarm high engine temperature lamp	Lamp illuminates when the engine coolant temperature approaches shutdown range. The lamp needs an optional prealarm sender kit to function.
Prealarm low oil pressure lamp	Lamp illuminates when the engine oil pressure approaches shutdown range. The lamp needs an optional prealarm sender kit to function.
System ready lamp	Lamp illuminates when the generator set master switch is in AUTO position and the system senses no faults.
Emergency stop switch	Switch, if activated, instantly shuts down the generator set in emergency situations. Use the emergency stop switch for emergency shutdowns only. Use the generator set master switch for normal shutdowns.

2.6.2 Fuses and Terminal Strips

The following table describes the controller circuit board fuses and controller terminal strips.

Name	Description
3-amp remote annunciator fuse	Fuse protects the remote annunciator circuit, A/V alarm, and isolated alarm kit, if equipped.
3-amp controller fuse	Fuse protects the controller circuit board, speed sensor, and lamp circuit board.
15-amp engine and accessories fuse	Fuse protects the engine/starting circuitry and accessories.
Controller TB1 terminal strip	Terminal strip provides connection points for customer-supplied sensing devices and generator set accessories such as the emergency stop switch, remote start stop/switch, audio/visual alarms, etc., to the controller. Figure 2-3 shows the location of the TB1 terminal strip on the controller circuit board. Refer to the wiring diagrams for information on connecting accessories to the TB1 terminal strip.
Controller TB2 terminal strip	Terminal strip provides connection points for crank mode selection (cyclic or continuous) and remote start/stop switch inputs of operation. Figure 2-3 shows the location of the TB2 terminal strip on the controller circuit board. Refer to the wiring diagrams for connection information.



1. TB1 terminal strip
2. TB2 terminal strip
3. Fuses

Figure 2-3 TB1 and TB2 Terminal Strips on Decision-Maker™ 3+ Controller Circuit Board

2.6.3 Auxiliary Fault Lamp Conditions

The following descriptions define the possible auxiliary fault lamp conditions.

Flashing Lamp Conditions

No AC Output. The auxiliary lamp flashes immediately if the controller senses no AC output while the generator set runs (except during the first 10 seconds after startup). The flashing stops and the light goes out when the controller senses AC output. The controller requires no manual reset.

Low Battery Voltage. The auxiliary lamp flashes if the battery power was reconnected or was low and then restored while the generator set master switch was in the RUN or AUTO position. A possible cause is a temporary low battery condition when the battery is weak or undersized for the application. To clear the low battery voltage condition, place the generator set master switch in the OFF/RESET position.

Continuous-On Lamp Conditions

Emergency Stop Switch Energized. Upon activation of the emergency stop switch, if equipped, the auxiliary lamp lights and the generator set shuts down immediately.

Emergency Stop Switch Reset. Resetting the optional emergency stop switch while the generator set master switch is in the AUTO or RUN position causes the auxiliary lamp to light. Place the generator set master switch in the OFF/RESET position to clear the auxiliary lamp ON condition.

Note: Auxiliary Delay Shutdown. The auxiliary lamp lights and the engine shuts down 5 seconds after the high oil temperature (P1-13) or auxiliary delay shutdown (P1-15) fault, if equipped, occurs. Auxiliary Delay Shutdown is inhibited during the first 30 seconds after crank disconnect.

Note: Overvoltage Shutdown. If a generator set is equipped with this kit, the auxiliary lamp lights and the engine shuts down immediately when an overvoltage condition occurs.

Note: Auxiliary Immediate Shutdown. The auxiliary lamp lights and the engine shuts down immediately when any customer-supplied sensing devices connected to auxiliary immediate shutdown ports (P1-17 and P1-18) activate them.

x:op:005:004

2.6.4 Starting the Generator Set

The following procedures describe starting the generator set.

Local Starting (Nonautomatic). Move the generator set master switch to the RUN position to start the generator set at the controller.

Automatic (Auto) Starting. Move the generator set master switch to the AUTO position to allow startup by the automatic transfer switch or remote start/stop switch (connected to controller terminals TB1-3 and TB1-4).

Note: The alarm horn sounds whenever the generator set master switch is not in the AUTO position.

Note: The transient start/stop function of the Decision-Maker™ 3+ controller prevents accidental cranking of the rotating engine. When the generator set master switch is momentarily placed in the OFF/RESET position, then quickly returned to RUN, the generator set slows to 249 rpm and then recranks before returning to its rated speed.

Note: The Decision-Maker™ 3+ controller's automatic restart function attempts to restart the generator set if the engine speed drops below 390 rpm (generator output frequency of 13 Hz). Continued decreased engine speed causes an overcrank fault condition.

Crank Mode Selection

The Decision-Maker™ 3+ controller cranks continuously for up to 45 seconds or cyclically for up to 75 seconds (crank 15 seconds, rest 15 seconds, crank 15 seconds, etc.) before overcrank shutdown. Select the crank mode (cyclic or continuous) on the controller circuit board terminal strip. For cyclic cranking, leave circuit board terminal TB2-9 open. For continuous cranking, attach a jumper between circuit board terminal TB2-9A (ground) and terminal TB2-9.

2.6.5 Stopping the Generator Set

The following procedures describe stopping the generator set.

Normal Stopping

1. **Cooldown.** Run the generator set at no load for 5 minutes to ensure adequate engine cooldown.
2. **Stopping.** Move the generator set master switch to the OFF/RESET position. The engine stops.

   Note: The generator set continues running during a 5-minute cooldown cycle if a remote switch or automatic transfer switch signals the engine to stop.

Emergency Stopping

Move the generator set master switch to the OFF/RESET position or activate the remote emergency stop, if equipped, for immediate shutdown. The controller AUXILIARY lamp lights and the generator set shuts down on activation of the emergency stop switch. The remote annunciator and/or A/V alarms, if equipped, signal an emergency stop.

2.6.6 Prime Power Mode Operation

The Decision-Maker™ 3+ controller operates in either the normal mode or the prime power mode. In prime power mode, the controller draws less current, minimizing the battery drain. Consider using the prime power mode for installations that do not have a battery charger.

Moving the generator set master switch to the OFF/RESET position disables all controller functions. Moving the generator set master switch to the AUTO position restores controller functions.

Enabling and Disabling the Prime Power Mode. Enable the prime power mode by connecting jumpers across the following terminals on terminal strip TB2 on the controller circuit board:

- TB2-1P and TB2-2P
- TB2-3P and TB2-4P
- TB2-3 and TB2-4

See Figure 2-3. Remove the jumpers listed above to disable the prime power mode.

Prime Power Starting. The prime power mode provides local starting only at the controller. When the generator set master switch is in the OFF/RESET position, the controller functions are inoperative. Move the generator set master switch to the AUTO position to start the generator set. Do not start the generator set with the master switch in the RUN position because the alarm horn will sound.

Note: Move the generator set master switch to the AUTO position to return controller functions to normal.

Prime Power Stopping. Move the generator set master switch to the OFF/RESET position to stop the generator set and power down the controller.

Note: The controller functions are inoperative when the generator set master switch is in the OFF/RESET position.

2.6.7 Fault Shutdowns

The generator set shuts down automatically under the following fault conditions and cannot be restarted until the fault condition is corrected. The system automatically resets when the problem is corrected or the generator set cools (if high engine temperature was the fault).

Name	Description
High engine temperature	Shutdown occurs 5 seconds after the fault. The high engine temperature shutdown does not function during the first 5 seconds after startup. **NOTE:** The high temperature shutdown functions only when the coolant level is in the operating range.
High exhaust temperature	Shutdown occurs 5 seconds after the fault. The high exhaust temperature shutdown does not function during the first 5 seconds after startup.
Low coolant level (water-cooled engines only)	Shutdown occurs 5 seconds after fault. The low coolant level shutdown does not function during the first 5 seconds after startup.
Low oil pressure	Shutdown occurs 5 seconds after the fault. The low oil pressure shutdown does not function during the first 5 seconds after startup. **NOTE:** The low oil pressure shutdown does not protect against low oil level. Check the engine oil level.
Overcrank	Shutdown occurs after 45 seconds of continuous cranking or 75 seconds of cyclic cranking (crank 15 seconds, rest 15 seconds, crank 15 seconds, etc.).
Overspeed	Shutdown occurs immediately when the governed frequency on 50 and 60 Hz models exceeds 70 Hz.
Overvoltage (optional)	The generator set shuts down and the auxiliary lamp lights when voltage is 15% or more over the nominal voltage for 2 seconds or longer. **NOTE:** Overvoltage can damage sensitive equipment in less than one second. Install separate overvoltage protection on on-line equipment requiring faster shutdown.

x:op:005:007

2.6.8 Controller Resetting Procedure (Following Fault Shutdown)

Use the following procedure to restart the generator set after a fault shutdown. Refer to Resetting the Emergency Stop Switch in this section to reset the generator set after an emergency stop.

1. Place the controller alarm horn silence switch in the SILENCE position to activate the A/V annunciator alarm horn and lamp, if equipped. Place the A/V annunciator alarm switch in the SILENCE position to stop the alarm horn. The A/V annunciator lamp stays lit. (The A/V alarm uses one lamp to indicate a fault shutdown; the respective fault lamp on the remote annunciator lights to indicate a fault condition.)
2. Disconnect the generator set from the load using the line circuit breaker or automatic transfer switch.
3. Correct the cause of the fault shutdown. See the Safety Precautions at the beginning of this section before proceeding.
4. Place the generator set master switch in the OFF/RESET position and then in the RUN position to start the generator set. The A/V annunciator alarm horn sounds and the lamp, if equipped, darkens.
5. Test operate the generator set to verify that the cause of the shutdown has been corrected.
6. Reconnect the generator set to the load via the line circuit breaker or automatic transfer switch.
7. Place the generator set master switch in the AUTO position for startup by a remote transfer switch or remote start/stop switch. Place the A/V annunciator alarm switch, if equipped, in the NORMAL position.
8. Place the generator set master switch in the AUTO position before silencing the alarm horn.

x:op:005:008

2.6.9 Resetting the Emergency Stop Switch

Use the following procedure to restart the generator set after an emergency stop switch shutdown. Refer to the Controller Resetting Procedure in this section to restart the generator set following a fault shutdown. The generator set does not crank until the operator completes the resetting procedure.

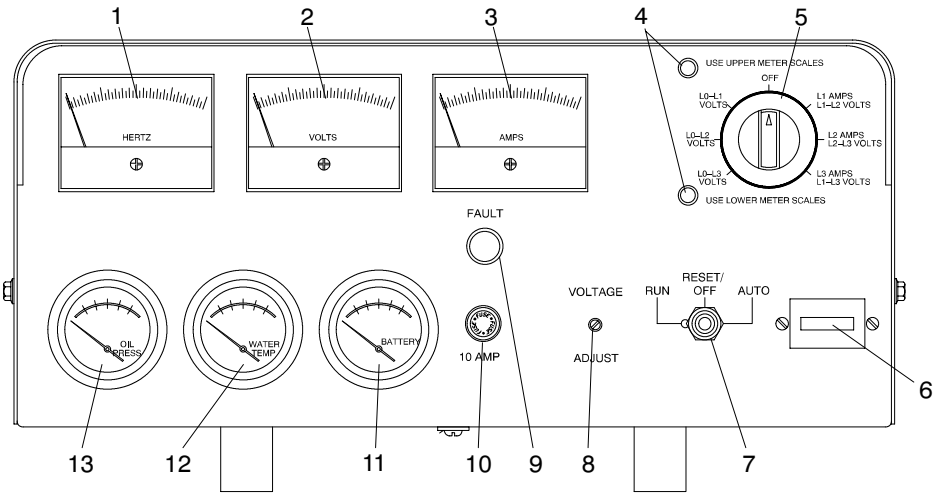
Note: The controller auxiliary lamp lights when the generator set master switch is in the RUN or AUTO position during the resetting procedure.

Procedure to Restart the Generator Set After an Emergency Stop Shutdown:

1. Determine the cause of the emergency stop and correct the problem(s).
2. Reset the controller emergency stop switch by rotating the switch clockwise until the switch springs back to the original position.
3. Toggle the generator set master switch to OFF/RESET and then to RUN or AUTO to restart the generator set.

2.7 Expanded Decision-Maker™ 1 Controller Operation

For identification of the expanded controller's indicators and controls and their functions, refer to Figure 2-4.



1. Frequency meter
2. AC voltmeter
3. AC ammeter
4. Scale lamps (upper/lower)
5. Selector switch
6. Hourmeter
7. Generator set master switch
8. Voltage adjustment potentiometer
9. Fault lamp
10. 10-amp controller fuse
11. DC voltmeter
12. Water temperature gauge
13. Oil pressure gauge

Figure 2-4 Expanded Decision-Maker™ 1 Controller

x:op:002:001

2.7.1 Controls and Indicators

The following table describes the controls and indicators located on the controller.

Name	Description
AC voltmeter	Meter displays the AC output voltage. Use the selector switch to choose the output lead circuits.
AC ammeter	Meter displays the AC output amperage. Use the selector switch to choose the phase currents.
DC voltmeter	Meter displays the voltage of the starting battery(ies).
Fault lamp	Lamp illuminates during engine shutdown if the engine shuts down because of one of the following faults: high engine temperature, low water level, low oil pressure, overcrank, or overspeed. See Section 2.7.4, Fault Shutdowns, for additional shutdown information.
Frequency meter	Meter displays the frequency (Hz) of the generator set output.
Generator set master switch	Switch functions as the controller reset and generator set operation switch.
Hourmeter	Hourmeter records the generator set total operating hours for reference in maintenance scheduling.
Oil pressure gauge	Gauge displays the engine oil pressure.
Scale lamps (upper/lower)	Lamps indicate which AC voltmeter and/or ammeter scales to read.
Selector switch	Switch selects the generator set output circuits to measure. When switched to a position with two circuit labels, measure amperage on the lead shown in the upper label and measure voltage between the two leads shown in the lower label. The AC ammeter and voltmeter function only with the switch in the ON position.
Voltage adjustment potentiometer	Potentiometer fine-tunes (±5%) the generator set output voltage.
Water temperature gauge	Gauge displays the engine coolant temperature.
10-amp controller fuse	Fuse protects the controller circuitry from short circuits and overloads.

x:op:002:002

2.7.2 Starting the Generator Set

The following procedures describe starting the generator set.

Local Starting. Move the generator set to the RUN position to immediately start the generator set.

Auto (Automatic) Starting. Move the generator set master switch to the AUTO position to allow startup by the automatic transfer switch or the remote start/stop switch (connected to controller terminals TB1-3 and TB1-4).

Note: The controller provides up to 30 seconds of continuous cranking before overcrank shutdown occurs.

2.7.3 Stopping the Generator Set

The following procedure describe how to stop the generator set.

Normal Stopping

1. **Cooldown.** Run the generator set at no load for 5 minutes to ensure adequate engine cooldown.
2. **Stopping.** Move the generator set master switch to the OFF/RESET position. The engine stops.

x:op:002:004

2.7.4 Fault Shutdowns

The generator set shuts down automatically under the following fault conditions and cannot be restarted until the fault condition is corrected. The system automatically resets when the problem is corrected or the generator set cools (if high engine temperature was the fault).

The fault lamp does not stay lit after the generator set shuts down on a fault condition.

Fault	Description
High engine temperature	Shutdown occurs 5 seconds after the fault. The high engine temperature shutdown does not function during the first 5 seconds after startup. **Note:** The high temperature shutdown functions only when the coolant level is in the operating range.
High exhaust temperature	Shutdown occurs 5 seconds after the fault. The high exhaust temperature shutdown does not function during the first 5 seconds after startup.
Low coolant level	Shutdown occurs 5 seconds after the fault. The low coolant level shutdown does not function during the first 5 seconds after startup.
Low oil pressure	Shutdown occurs 5 seconds after the fault. The low oil pressure shutdown does not function during the first 5 seconds after startup. **Note:** The low oil pressure shutdown does not protect against low oil level. Check the oil level at the engine.
Overcrank	Shutdown occurs after 30 seconds of continuous cranking. Shutdown occurs after 30 seconds if the engine or starter does not turn (locked rotor).
Overspeed	Shutdown occurs immediately when the governed frequency on the 50 and 60 Hz models exceeds 70 Hz.

x:op:002:005

2.7.5 Controller Resetting Procedure (Following Fault Shutdown)

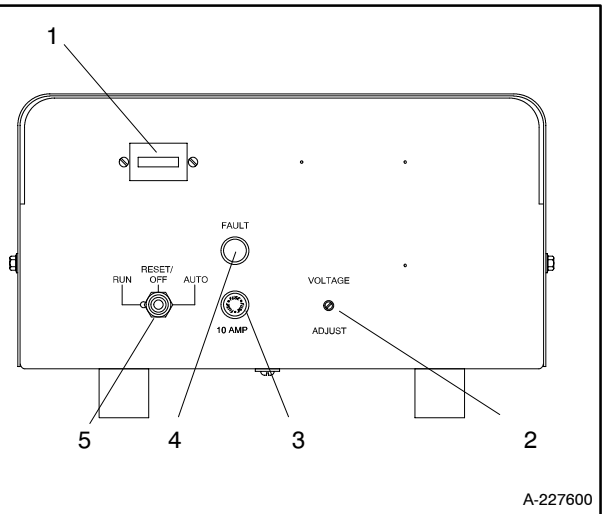
Use the following procedure to restart the generator set after a fault shutdown.

1. Disconnect the generator set from the load using the line circuit breaker or automatic transfer switch. See the Safety Precautions at the beginning of this section before proceeding.
2. Correct the cause of the fault shutdown. See the Safety Precautions at the beginning of this section before proceeding.
3. Start the generator set by moving the generator set master switch to RESET/OFF and then to RUN.
4. Verify that the cause of the shutdown has been corrected by test operating the generator set.
5. Reconnect the generator set to the load using the line circuit breaker or automatic transfer switch.
6. Move the generator set master switch to the AUTO position for startup by remote transfer switch or remote start/stop switch.

x:op:002:006

2.8 Standard Decision-Maker™ 1 Controller Operation

For identification of the standard basic controller's indicators and controls and their functions, refer to Figure 2-5.



1. Hourmeter
2. Voltage adjustment
3. 10-amp controller fuse
4. Fault lamp
5. Generator set master switch

Figure 2-5 Decision-Maker™ 1 Controller

x:op:004:001

2.8.1 Controls and Indicators

The following table describes the controls and indicators located on the controller.

Name	Description
Fault lamp	Lamp illuminates during engine shutdown if the engine shuts down because of one of the following faults: high engine temperature, low water level, low oil pressure, overcrank, or overspeed. See Section 2.8.4, Fault Shutdowns, for additional shutdown information.
Generator set master switch	Switch functions as the controller reset and generator operation switch.
Hourmeter	Hourmeter records the generator set total operating hours for reference in maintenance scheduling.
Voltage adjust potentiometer	Potentiometer fine-tunes (±5%) generator output voltage.
10-amp controller fuse	Fuse protects the controller circuitry from short circuits and overloads.

x:op:004:002

2.8.2 Starting the Generator Set

The following procedures describe starting the generator set.

Local Starting. Move the generator set master switch to the RUN position to immediately start the generator set.

Automatic (Auto) Starting. Move the generator set master switch to the AUTO position to allow startup by the automatic transfer switch or the remote start/stop switch (connected to controller terminals TB1-3 and TB1-4).

Note: The controller provides up to 30 seconds of continuous cranking before the overcrank shutdown occurs.

2.8.3 Stopping the Generator Set

The following procedure describe how to stop the generator set.

Normal Stopping

1. **Cooldown**. Run the generator set at no load for 5 minutes to ensure adequate engine cooldown.
2. **Stopping**. Move the generator set master switch to the OFF/RESET position. The engine stops.

x:op:004:004

2.8.4 Fault Shutdowns

The generator set shuts down automatically under the following fault conditions and cannot be restarted until the fault condition is corrected. The system automatically resets when the problem is corrected or the generator set cools (if high engine temperature was the fault).

Fault	Description
High engine temperature	Shutdown occurs 5 seconds after the fault. The high engine temperature shutdown does not function during the first 5 seconds after startup. **NOTE:** The high temperature shutdown functions only when the coolant level is in the operating range.
High exhaust temperature	Shutdown occurs 5 seconds after the fault. The high exhaust temperature shutdown does not function during the first 5 seconds after startup.
Low coolant level	Shutdown occurs 5 seconds after the fault. Low coolant level shutdown does not function during the first 5 seconds after startup.
Low oil pressure	Shutdown occurs 5 seconds after the fault. Low oil pressure shutdown does not function during the first 5 seconds after startup. **NOTE:** The low oil pressure shutdown does not protect against low oil level. Check the oil level at the engine.
Overcrank	Shutdown occurs after 30 seconds of continuous cranking. Shutdown occurs after 30 seconds if the engine or starter does not turn (locked rotor).
Overspeed	Shutdown occurs immediately when the governed frequency on 50 and 60 Hz models exceeds 70 Hz.

x:op:004:005

2.8.5 Controller Resetting Procedure (Following Fault Shutdown)

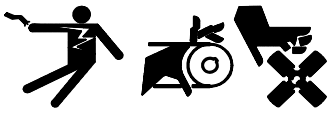
Use the following procedure to restart the generator set after a fault shutdown.

1. Disconnect the generator set from the load using the line circuit breaker or automatic transfer switch. See the Safety Precautions at the beginning of this section before proceeding.
2. Correct the cause of the fault shutdown. See the Safety Precautions at the beginning of this section before proceeding.
3. Start the generator set by moving the generator set master switch to RESET/OFF and then to RUN.
4. Verify that the cause of the shutdown has been corrected by test operating the generator set.
5. Reconnect the generator set to the load using the line circuit breaker or automatic transfer switch.
6. Move the generator set master switch to the AUTO position for startup by remote transfer switch or remote start/stop switch.

x:op:004:006

3.1 General Maintenance

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

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

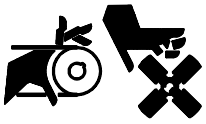
⚠ WARNING

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.

⚠ WARNING



Rotating parts.
Can cause severe injury or death.

Operate the generator set only when all guards, screens, and covers are in place.

Servicing the generator set when it is operating. Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Sound shield removal. Exposed moving parts can cause severe injury or death. The generator set must be operating in order to perform some scheduled maintenance procedures. Be especially careful if the sound shield has been removed, leaving the belts and pulleys exposed.
(Sound-shield-equipped models only)

NOTICE

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

NOTICE

Saltwater damage. Saltwater quickly deteriorates metals. Wipe up saltwater on and around the generator set and remove salt deposits from metal surfaces.

See the Safety Precautions and Instructions at the beginning of this manual before attempting to service, repair, or operate the generator set. Have an authorized distributor/dealer perform generator set service.

Engine Service. Perform generator set engine service at the intervals specified by the engine operation manual.

Generator Set Service. Perform generator set service at the intervals specified by the generator set operation manual.

If the generator set operates under dusty or dirty conditions, use *dry* compressed air to blow dust out of the alternator. With the generator set running, direct the stream of air in through the cooling slots at the alternator end.

Routine Maintenance. Refer to the following generator set service schedule, the engine service schedule, and the hourmeter located on the generator set controller to determine when to schedule routine maintenance. Service more frequently generator sets that are subject to extreme weather or dusty or dirty conditions.

Service Log. Use the Operating Hour Service Log located in the back of this manual to document performed services.

Service Schedule. Perform maintenance on each item in the service schedule at the designated intervals for the life of the generator set. For example, an item requiring service every 100 hours or 3 months also requires service after 200 hours or 6 months, 300 hours or 9 months, and so on.

x:sm:004:001

3.2 Generator Set Service Schedule

Perform Service at Intervals Indicated (X)	Reference Section	Daily	Every 50 Hrs. or 1 Month	Every 200 Hrs. or 3 Months	Every 400 Hrs. or 6 Months	Every 1000 Hrs. or Yearly
COOLING SYSTEM						
Check the seawater outlet and clean as necessary	3.4	X				
Check the function of the siphon break, if equipped	3.3.1			X		
Check/replace the seawater pump impeller *†	3.3.2				X (Check)	X (Replace)
EXHAUST SYSTEM						
Inspect the exhaust system components *†	3.4	X (Before operation)				
Check the exhaust gas condition. If the exhaust is blue or black, contact your local distributor/dealer	3.4	X (During operation)				
Clean the exhaust/water mixing elbow *†	3.4				X	
Inspect the complete exhaust system §	2.2					X
ENGINE AND MOUNTING						
Check for water, fuel, coolant, and oil leakage *†‡		X (After operation)				
Check the mounting bolts/vibromounts and tighten if necessary *					X	
GENERATOR						
Test run the generator set	2.5		X (Weekly)			
Blow dust out of the generator *†	3.1					X

* Requires removal of the sound shield, if installed
† Consult your local distributor/dealer for service
‡ Read the WARNING found at the beginning of the manual regarding moving parts
§ Should be performed by your local distributor/dealer

3.3 Cooling System

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.

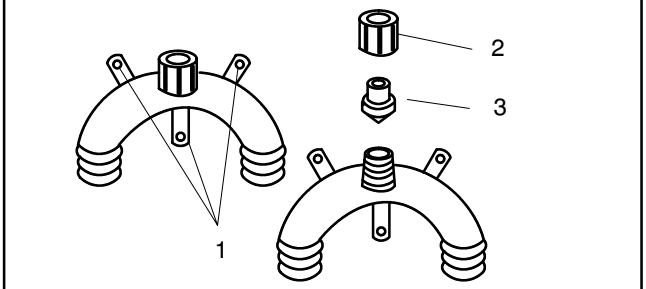
Checking the coolant level. Hot coolant can cause severe injury or death. Allow the engine to cool. Release pressure from the cooling system before removing the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise to the first stop. Remove the cap after pressure has been completely released and the engine has cooled. Check the coolant level at the tank if the generator set has a coolant recovery tank.

3.3.1 Siphon Break

A siphon break prevents seawater entry into the generator set's engine when the engine exhaust manifold outlet is less than 230 mm (9 in.) above the waterline of a fully loaded, docked or stationary craft. The siphon break may malfunction when the generator set operates while the craft is in contaminated waters or saltwater. Use the following procedure to inspect the siphon break at the intervals listed in the service schedule.

Siphon Break Inspection

1. Stop the generator set.
2. Remove the retaining cap and remove the reed valve for inspection. See Figure 3-1.
3. Use a mild detergent to remove residue and oxidation from the reed valve.
4. Clear blockage from the reed valve opening.
5. Replace the siphon break if the reed valve is cracked or if the reed valve material has hardened or deteriorated.
6. Install the reed valve into the mounting base with the valve downward. See Figure 3-1, item 3.
7. Install and only finger tighten the retaining cap. Do not overtighten it.



1. Mounting base
2. Retaining cap
3. Reed valve

Figure 3-1 Siphon Break

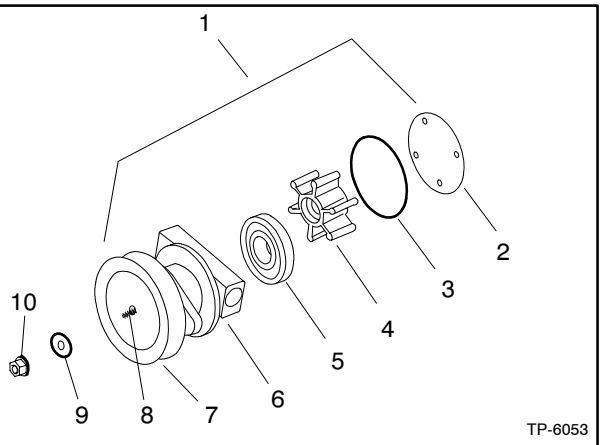
m:sm:003:007

3.3.2 Impeller Inspection and Replacement Procedure

The gear driven seawater pump is located on the service side of the generator set. Check and change the seawater pump impeller at the interval specified in the service schedule. Follow the instructions included with the impeller kit. If the instructions are not included with the kit, use the following procedure:

Impeller Inspection and Replacement Procedure:

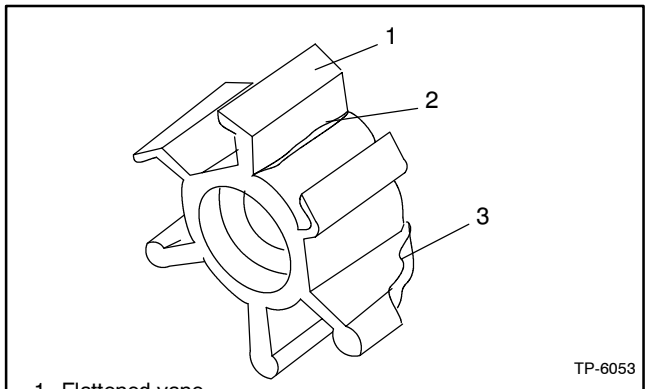
1. Close the seacock.
2. Remove the seawater pump coverplate. See Figure 3-2.



1. Seawater pump
2. Coverplate
3. Gasket
4. Impeller
5. Bearing
6. Housing
7. Pulley
8. Drive shaft
9. Washer
10. Nut

Figure 3-2 Seawater Pump, Typical

3. Remove the impeller.
4. Inspect the impeller for damaged, cracked, broken, missing or flattened vanes. The impeller vanes should be straight and flexible. See Figure 3-3. Replace the impeller if it is damaged.



1. Flattened vane
2. Crack
3. Broken vane

Figure 3-3 Worn Impeller

5. Lubricate the impeller with soapy water before installation.
6. Install the impeller.

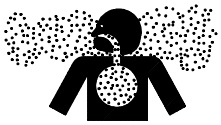
   Note: During installation push and rotate the impeller in the same direction as the engine rotation until it is thoroughly seated in the impeller housing.

7. Inspect the coverplate and gasket for corrosion and/or damage. Replace components as necessary.
8. Lubricate the gasket with silicon grease and attach the gasket and coverplate to the seawater pump housing.
9. Open the seacock.
10. Start the generator set and check for leaks.
11. Stop the generator set and repair leaks or replace damaged or worn components.

m:sm:003:008

3.4 Exhaust System

⚠ WARNING



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

The exhaust system must be leakproof and routinely inspected.

Inspecting the exhaust system. Carbon monoxide can cause severe nausea, fainting, or death. For the safety of the craft's occupants, install a carbon monoxide detector. Consult the boat builder or dealer for approved detector location and installation. Inspect the detector before each generator set use. In addition to routine exhaust system inspection, test the carbon monoxide detector per the manufacturer's instructions and keep the detector operational at all times.

At the interval specified in the service schedule, inspect the exhaust system. See Section 1 for the exhaust outlet location.

Inspection Points

Inspect the the exhaust system components (exhaust manifold, mixing elbow, exhaust line, hose clamps, silencer, and outlet flapper) for cracks, leaks, and corrosion.

- Check the hoses for softness, cracks, leaks, or dents. Replace the hoses as needed.
- Check for corroded or broken metal parts and replace them as needed.
- Check for loose, corroded, or missing clamps. Tighten or replace the hose clamps and/or hangers as needed.
- Check that the exhaust outlet is unobstructed.
- Visually inspect for exhaust leaks *(blowby)*. Check for carbon or soot residue on exhaust components. Carbon and soot residue indicates an exhaust leak. Seal leaks as needed.
- Ensure that the carbon monoxide detector is (1) in the craft, (2) functional, and (3) energized whenever the generator set operates.

x:op:001:002

3.5 Storage Procedure

Perform the following storage procedure before taking a generator set out of service for three months or longer. Follow the engine manufacturer's recommendations, if available, for fuel system and internal engine component storage.

x:sm:002:001

3.5.1 Lubricating System

Prepare the engine lubricating system for storage as follows:

1. Run the generator set for a minimum of 30 minutes to bring it to normal operating temperature.
2. Stop the generator set.
3. With the engine still warm, drain the oil from the crankcase.
4. Remove and replace the oil filter.
5. Refill the crankcase with oil suited to the climate.
6. Run the generator set for two minutes to distribute the clean oil.
7. Stop the generator set.
8. Check the oil level and adjust, if needed.

x:sm:002:002

3.5.2 Cooling System

Prepare the cooling system for storage as follows:

1. Check the coolant freeze protection using a coolant tester.
2. Add or replace coolant as necessary to ensure adequate freezing protection. Use the guidelines included in the engine operation manual.
3. Run the generator set for 30 minutes to redistribute added coolant.

x:sm:002:003

3.5.3 Fuel System

Prepare the fuel system for storage as follows:

Diesel-Fueled Engines

1. Fill the fuel tank with #2 diesel fuel.
2. Condition the fuel system with compatible additives to control microbial growth.
3. Change the fuel filter/separator and bleed the fuel system. See the service manual.

3.5.4 Exterior

Prepare the exterior for storage as follows:

1. Clean the exterior surface of the generator set.
2. Seal all engine openings except for the air intake with nonabsorbent adhesive tape.
3. To prevent impurities from entering the air intake and to allow moisture to escape from the engine, secure a cloth over the air intake.
4. Mask electrical connections.
5. Spread a light film of oil over unpainted metallic surfaces to inhibit rust and corrosion.

x:sm:002:006a

3.5.5 Battery

Perform battery storage after all other storage procedures.

1. Place the generator set master switch in the OFF/RESET position.
2. Disconnect the battery(ies), negative (–) lead first.
3. Clean the battery. Refer to the battery manufacturer's instructions for the battery cleaning procedure.
4. Place the battery in a cool, dry location.
5. Connect the battery to a float/equalize battery charger or charge it monthly with a trickle battery charger. Refer to the battery charger manufacturer's recommendations.
6. Maintain a full charge to extend battery life.

Section 4 Troubleshooting

This section contains generator set troubleshooting, diagnostic, and repair information.

Use the following chart as a quick troubleshooting reference. The table groups generator set faults and suggests likely causes and remedies. The table also refers you to more detailed information including sections of this manual, the generator set service manual (S/M), the generator set installation manual (I/M), and the engine service manual (Engine S/M) to correct the indicated problem.

Corrective action and testing often require knowledge of electrical and electronic circuits. To avoid additional problems caused by incorrect repairs, have an authorized service distributor/dealer perform service.

NOTICE

Fuse replacement. Replace fuses with fuses of the same ampere rating and type (for example: 3AB or 314, ceramic). Do not substitute clear glass-type fuses for ceramic fuses. Refer to the wiring diagram when the ampere rating is unknown or questionable.

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

x:gt:001:002a:

Trouble Symptoms										Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise			
Controller												
x										Controller master switch in the OFF/RESET position	Move the controller master switch to the RUN or AUTO position.	Section 2
x	x			x						Controller fuse blown	Replace the blown controller fuse. If the fuse blows again, troubleshoot the controller.†	Gen. S/M
x				x						Emergency stop switch activated, if equipped	Reset the emergency stop switch.	Section 2
x										Controller master or start/stop switch inoperative	Replace the controller master or start/stop switch.	—
				x						Controller fault	Troubleshoot the controller.†	Gen. S/M
x	x									Controller circuit board(s) inoperative	Replace the controller circuit board.	Gen. S/M
Cooling System												
						x		x		Air openings clogged	Clean the air openings.	—
						x				Impeller inoperative	Replace the impeller	Section 3
						x		x		Seawater strainer clogged or restricted	Clean the strainer.	Section 3
				x						High temperature shutdown	Allow the engine to cool down. Then troubleshoot the cooling system.	Eng. O/M
				x						Low coolant level shutdown, if equipped	Restore the coolant to normal operating level.	Eng. O/M
						x				Coolant level low	Restore the coolant to normal operating level.	Eng. O/M
						x				Thermostat inoperative	Replace the thermostat.	Eng. S/M
						x				Cooling water pump inoperative	Tighten or replace the belt. Replace the water pump.	Eng. O/M or S/M

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram

† Have an authorized service distributor/dealer perform this service.

Trouble Symptoms										Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise			
Electrical System (DC circuits)												
x	x									Battery connections loose, corroded, or incorrect	Verify that the battery connections are correct, clean, and tight.	—
x	x									Battery weak or dead	Recharge or replace the battery. The spec sheet provides recommended battery CCA rating.	Eng. O/M, S/S
x				x						Engine harness connector(s) not locked tight	Disconnect the engine harness connector(s) then reconnect it to the controller.	W/D
				x						Fault shutdown	Reset the fault switches and troubleshoot the controller.	Section 2
				x						High exhaust temperature switch inoperative	Replace the inoperative switch.	Gen. S/M or W/D
x	x									Starter/starter solenoid inoperative	Replace the starter or starter solenoid.	Eng. S/M
Engine												
	x	x			x			x		Air cleaner/backfire flame arrestor clogged	Clean or replace the filter element.	Eng. O/M
			x		x	x		x	x	Engine overload	Reduce the electrical load. See the generator set installation manual for wattage specifications.	I/M
									x	Exhaust system leak	Inspect the exhaust system. Replace the inoperative exhaust system components.†	Section 3, I/M
									x	Exhaust system not securely installed	Inspect the exhaust system. Tighten the loose exhaust system components.†	Section 3, I/M
		x	x		x			x		Governor inoperative	Adjust the governor.†	Gen. S/M
					x				x	Valve clearance incorrect	Adjust the valves.†	Eng. O/M
									x	Vibration excessive	Tighten all loose hardware.	—

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram

† Have an authorized service distributor/dealer perform this service.

Trouble Symptoms										Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise			
Fuel System												
	x			x						Fuel tank empty or fuel valve shut off	Add fuel and move the fuel valve to the ON position.	—
	x	x			x					Air in fuel system (diesel only)	Bleed the diesel fuel system.	Eng. O/M
	x	x			x					Fuel or fuel injectors dirty or faulty (diesel only)	Clean, test, and/or replace the inoperative fuel injector.†	Eng. S/M
	x	x			x			x		Fuel injection timing out of adjustment (diesel only)	Adjust the fuel injection timing.†	Eng. S/M
	x				x			x		Fuel feed or injection pump inoperative (diesel only)	Rebuild or replace the injection pump.†	Eng. S/M
Generator												
			x							AC output circuit breaker open	Reset the breaker and check for AC voltage at the generator side of the circuit breaker.	—
x										Transfer switch test switch in the OFF position	Move the transfer switch test switch to the AUTO position.	—
			x							Wiring, terminals, or pin in the exciter field open	Check for continuity.	Gen. S/M, W/D
			x							Main field (rotor) inoperative (open or grounded)	Test and/or replace the rotor.†	Gen. S/M
			x							Stator inoperative (open or grounded)	Test and/or replace the stator.†	Gen. S/M
									x	Vibration excessive	Tighten loose components.†	—
			x	x						Voltage regulator out of adjustment	Adjust the voltage regulator.	Gen. S/M
			x	x						Voltage regulator fuse blown	Replace the voltage regulator fuse, If the fuse blows again, troubleshoot the voltage regulator.	Gen. S/M
				x						Overspeed shutdown	Reset the controller. If the unit shuts down again, contact the distributor/dealer.	Section 2
x	x			x						Overcrank shutdown	Reset the controller. If the unit shuts down again, contact the distributor/dealer.	Section 2

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram

† Have an authorized service distributor/dealer perform this service.

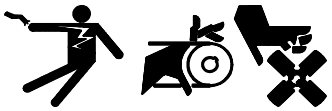
Trouble Symptoms										Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise			
Lube System												
						x	x		x	Oil level low	Restore the oil level. Inspect the generator set for oil leaks.	Eng. O/M
				x						Low oil pressure shutdown	Check the oil level.	Eng. O/M
	x	x					x		x	Crankcase oil type incorrect for ambient temperature	Change the oil. Use oil with a viscosity suitable for the operating climate.	Eng. O/M

* Sec./Section—numbered section of this manual; ATS—Automatic Transfer Switch; Eng.—Engine; Gen.—Generator Set; I/M—Installation Manual; O/M—Operation Manual; S/M—Service Manual; S/S—Spec Sheet; W/D—Wiring Diagram

† Have an authorized service distributor/dealer perform this service.

Notes

⚠ WARNING

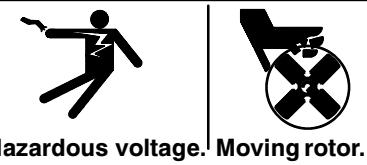


Accidental starting.
Can cause severe injury or death.

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

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

⚠ WARNING



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

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

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Open the main circuit breakers of all power sources before servicing the equipment. Configure the installation to electrically ground the generator set, transfer switch, and related equipment and electrical circuits to comply with applicable codes and standards. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

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.

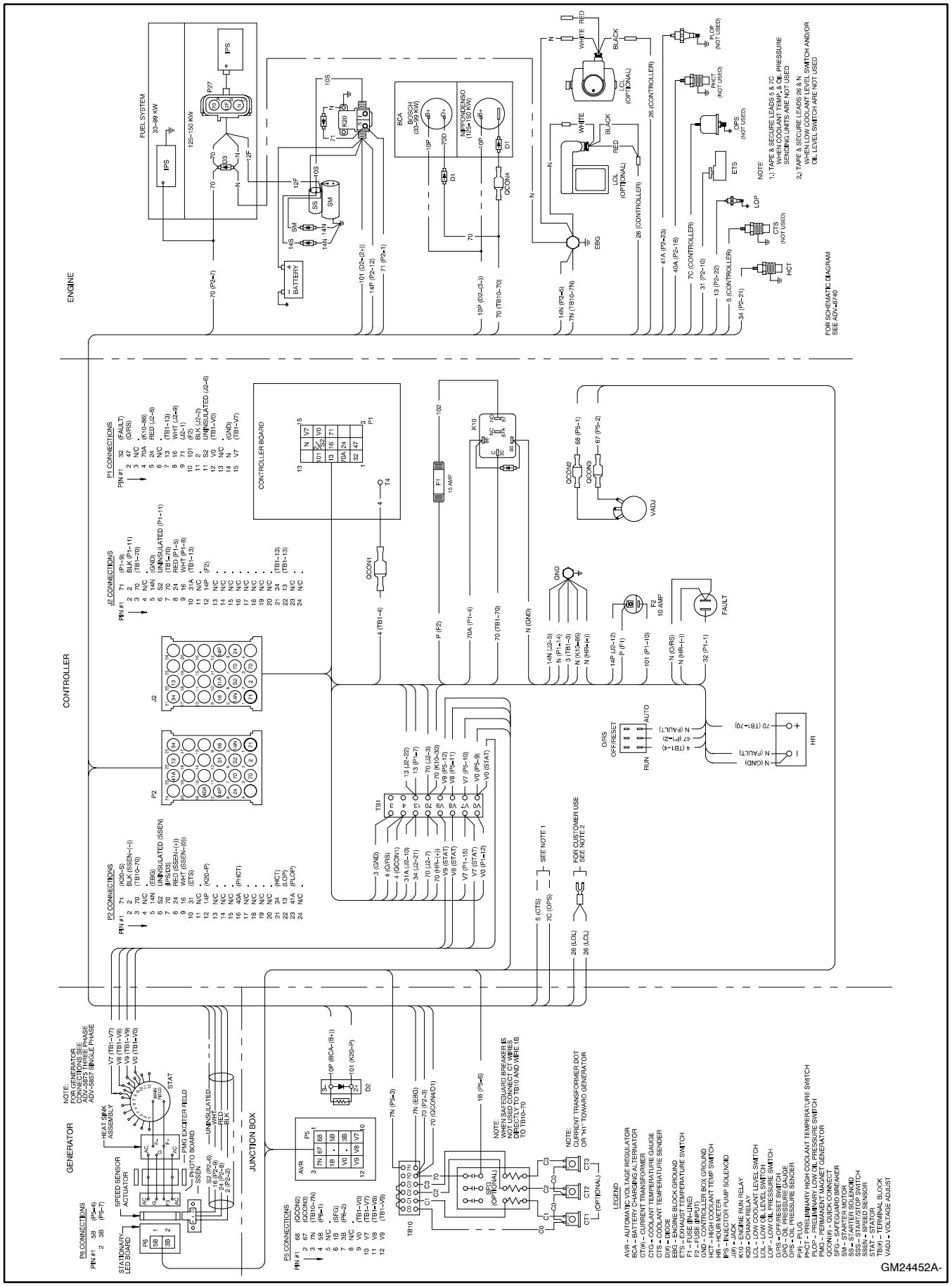


Figure 5-1 Wiring Diagram, Decision-Maker™ 1 Standard Controller (Sheet 1 of 3)

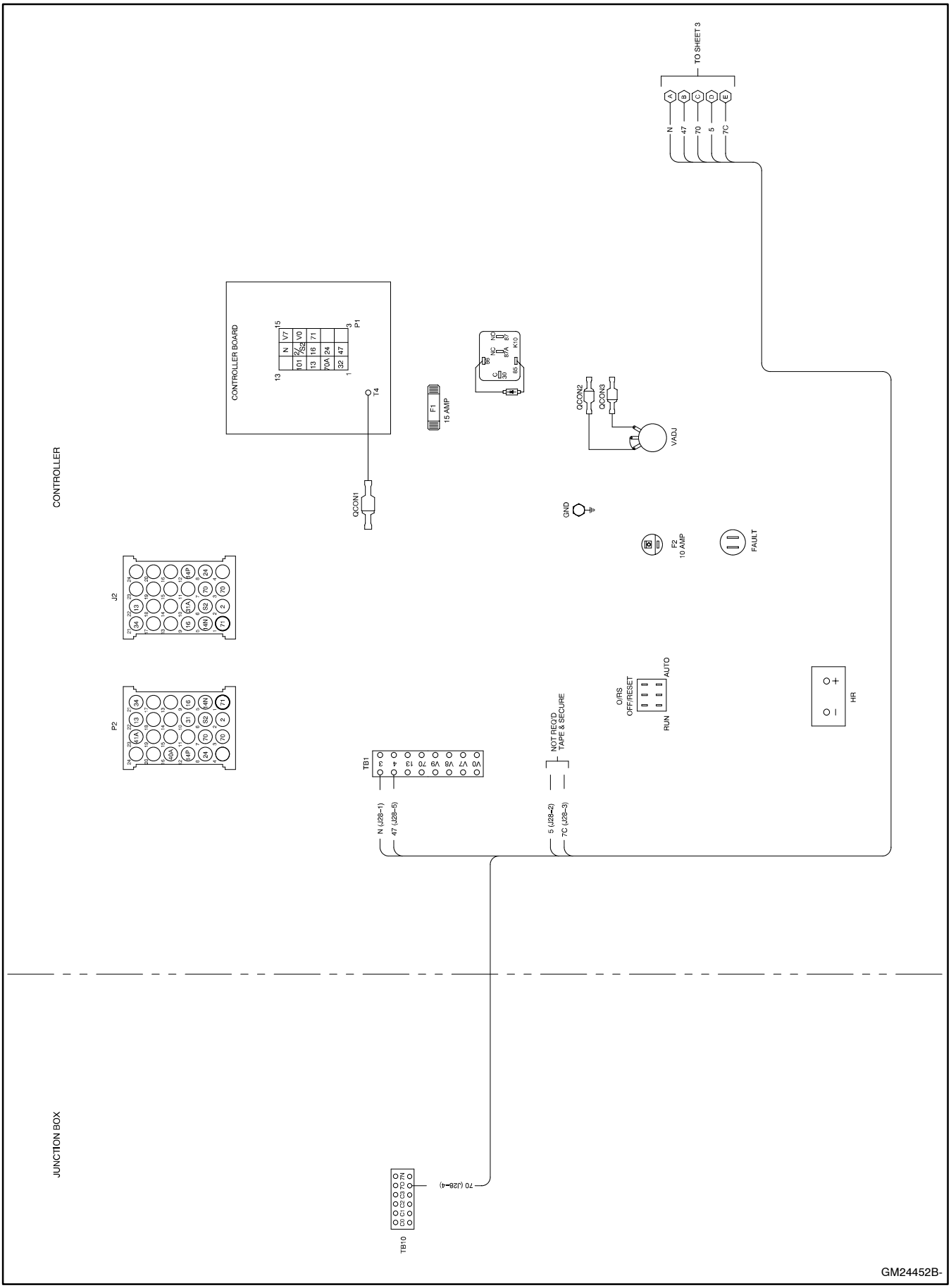


Figure 5-2 Wiring Diagram, Decision-Maker™ 1 Standard Controller, Remote Panel Options (Sheet 2 of 3)

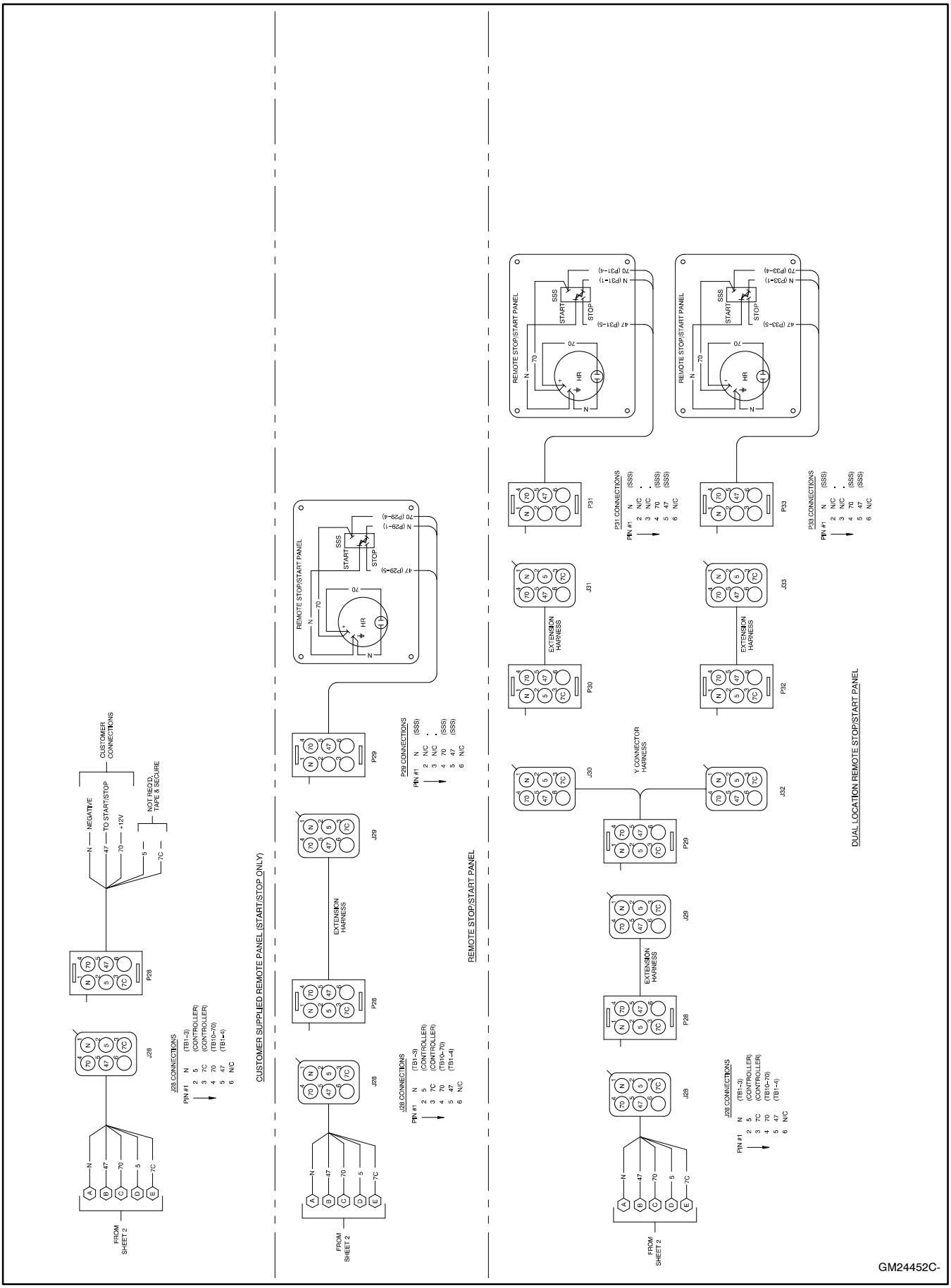


Figure 5-3 Wiring Diagram, Decision-Maker™ 1 Standard Controller, Remote Panel Options (Sheet 3 of 3)

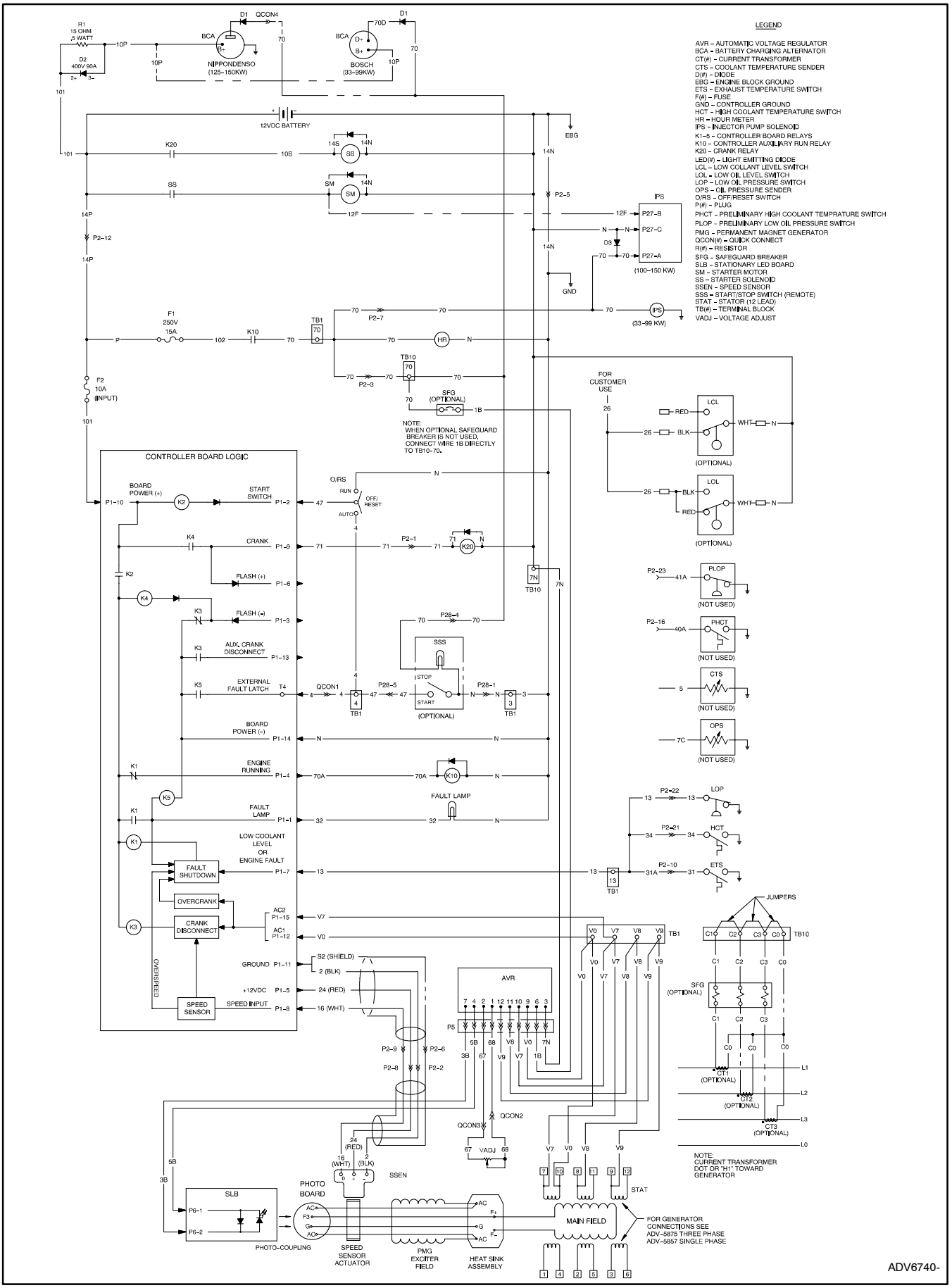


Figure 5-4 Wiring Diagram—Schematic, Decision-Maker™ 1 Standard Controller (Sheet 1 of 1)

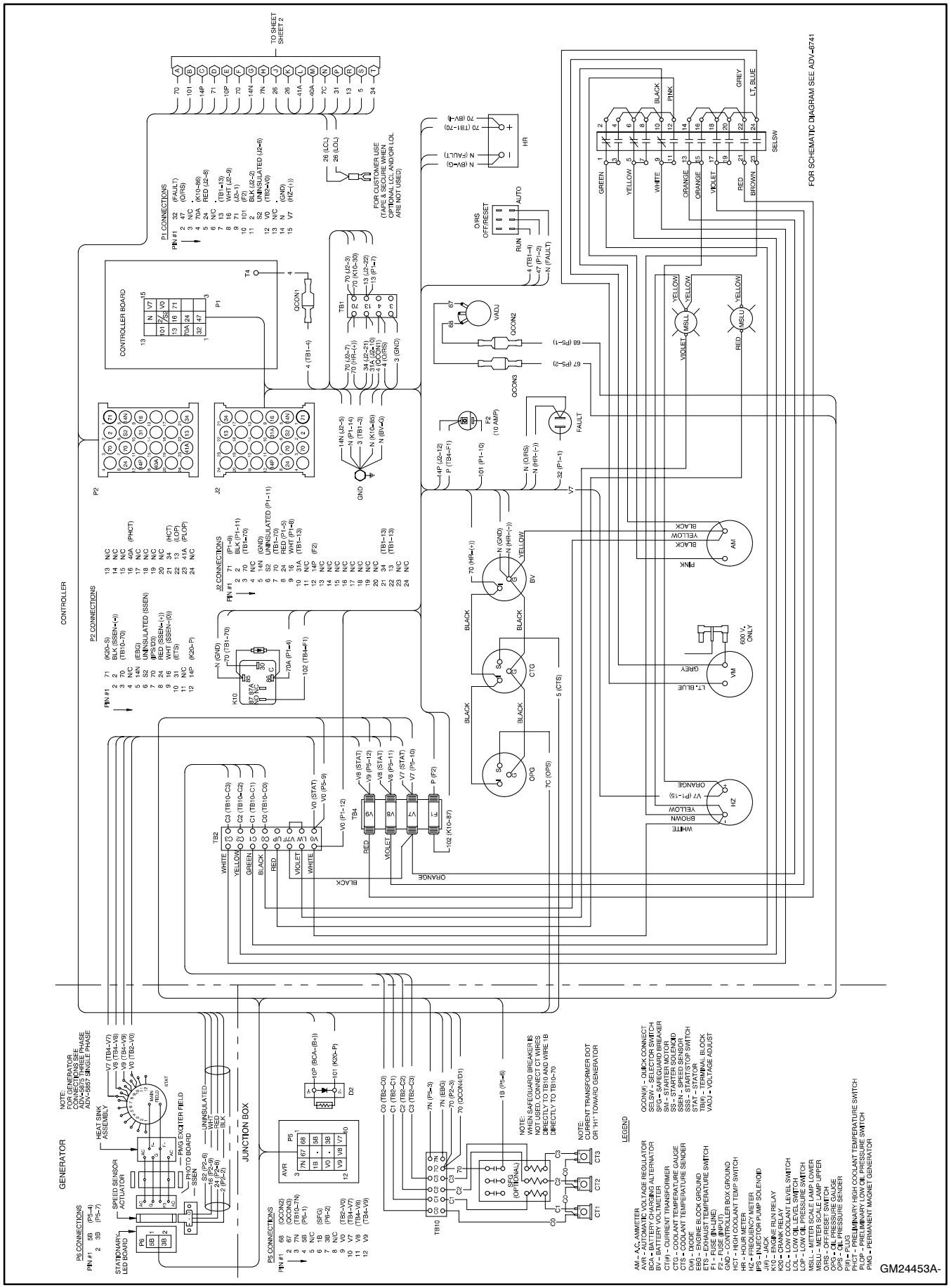


Figure 5-5 Wiring Diagram, Decision-Maker™ 1 Expanded Controller (Sheet 1 of 6)

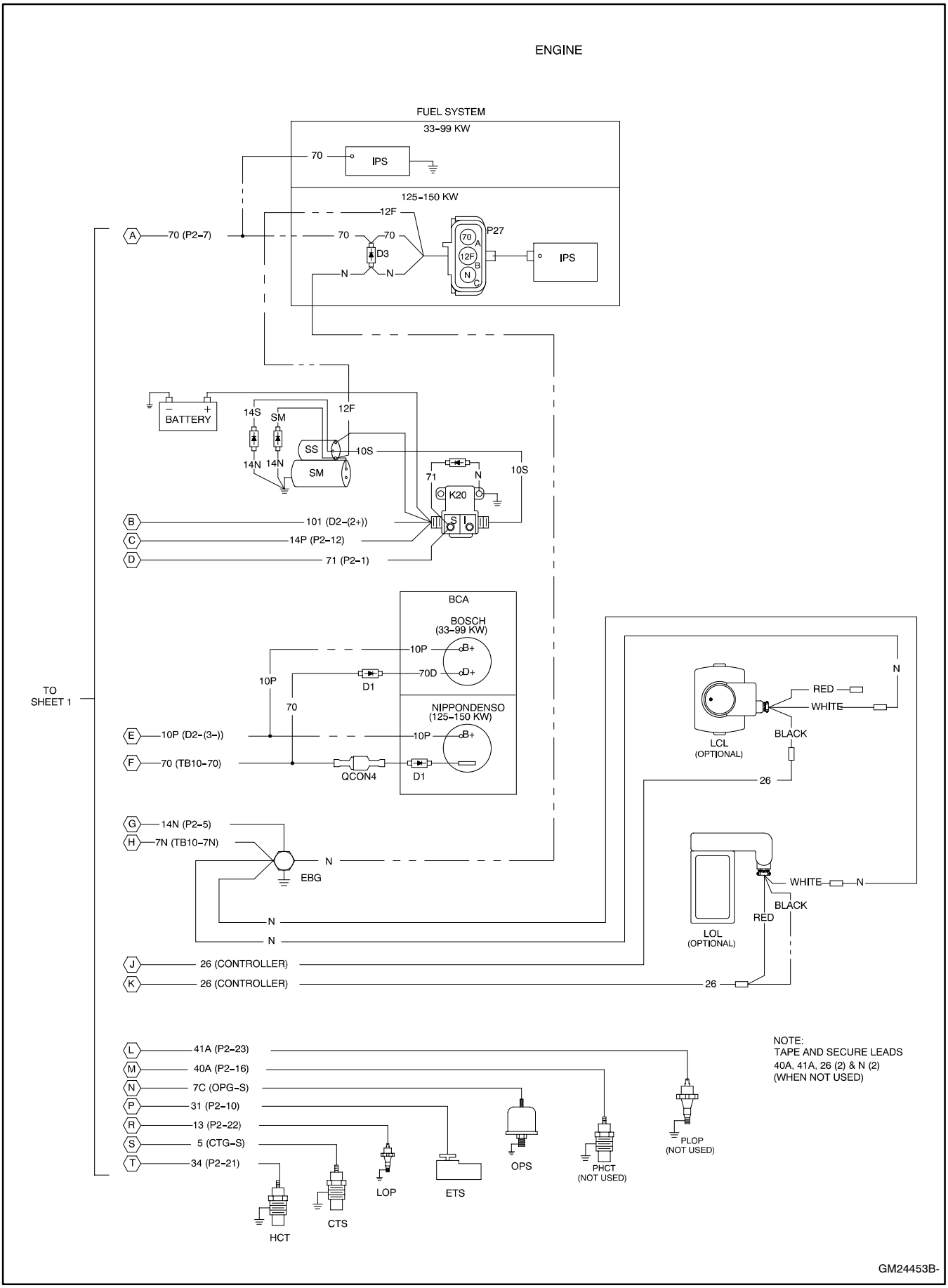


Figure 5-6 Wiring Diagram, Decision-Maker ™ 1 Expanded Controller (Sheet 2 of 6)

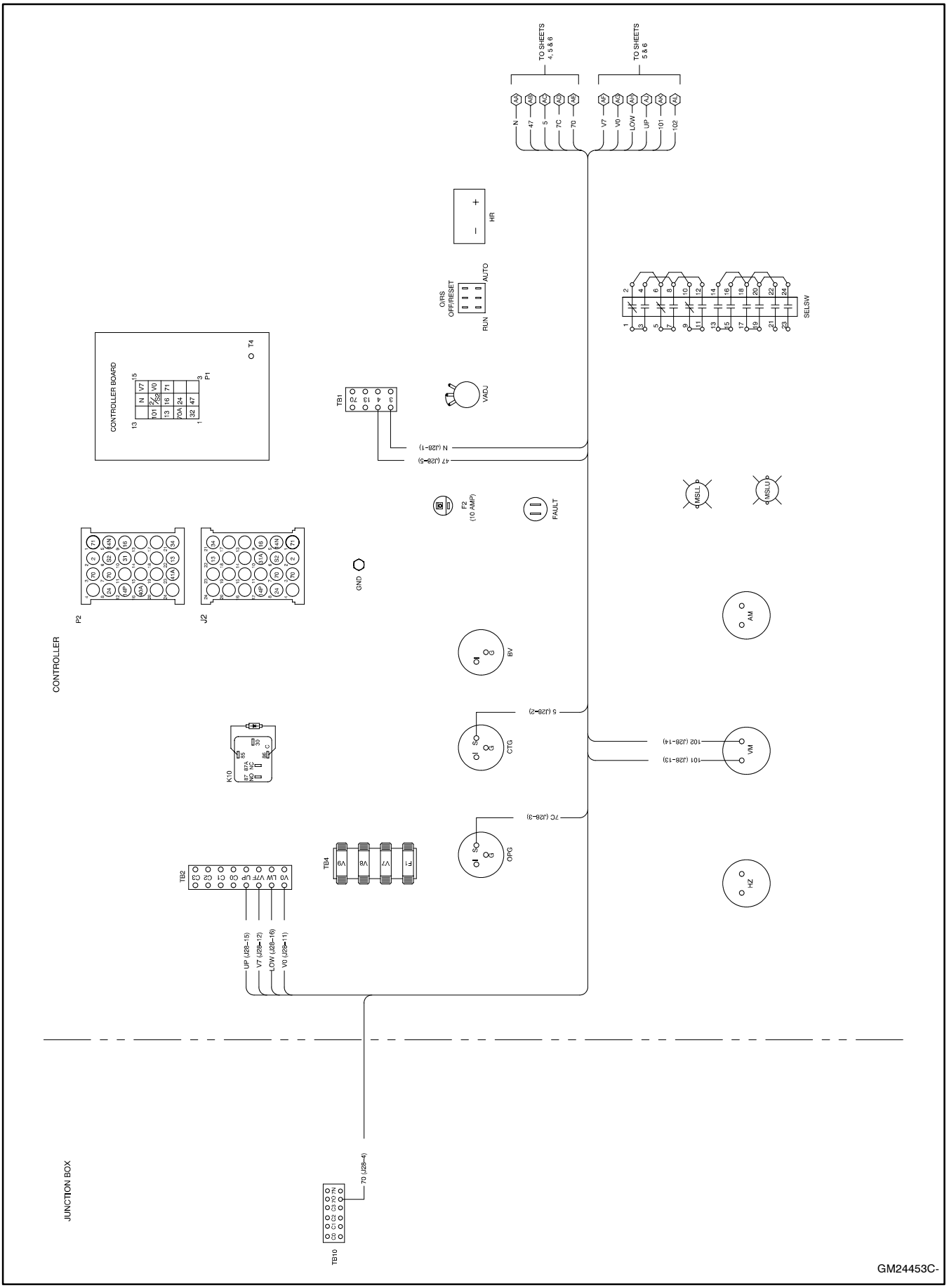


Figure 5-7 Wiring Diagram, Decision-Maker ™ 1 Expanded Controller, Remote Panel Options (Sheet 3 of 6)

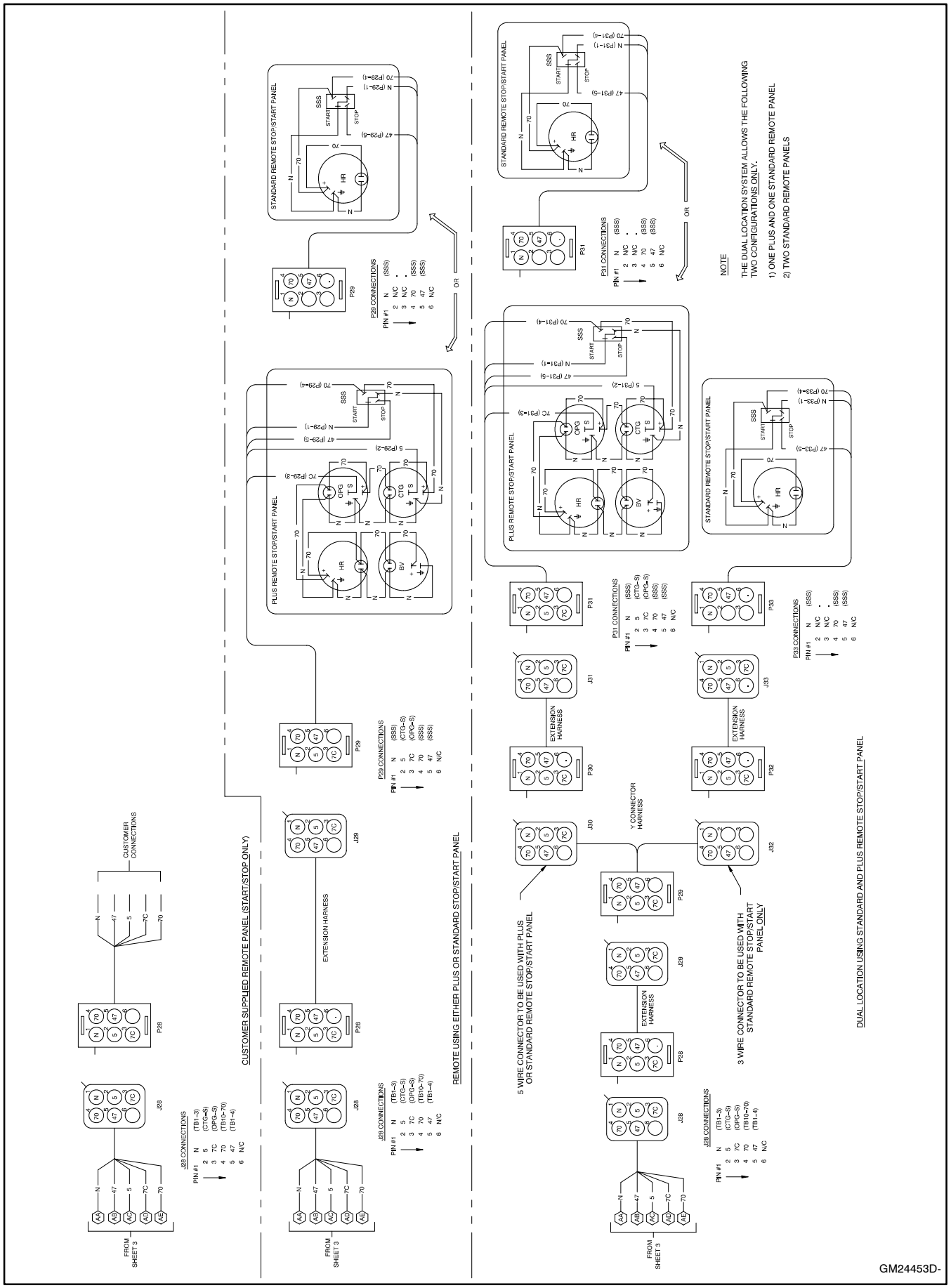


Figure 5-8 Wiring Diagram, Decision-Maker™ 1 Expanded Controller, Remote Panel Options (Sheet 4 of 6)

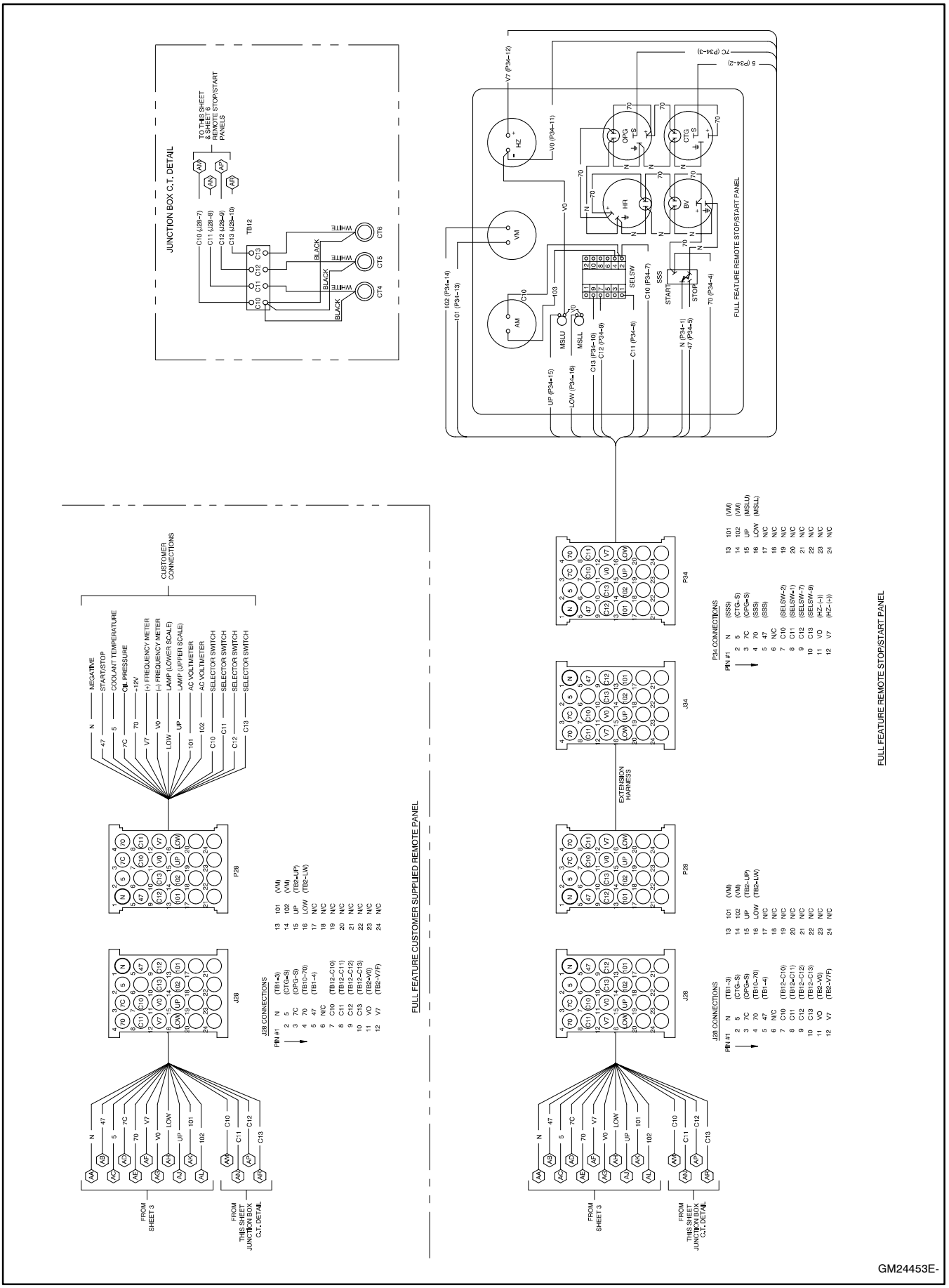


Figure 5-9 Wiring Diagram, Decision-Maker™ 1 Expanded Controller, Remote Panel Options (Sheet 5 of 6)

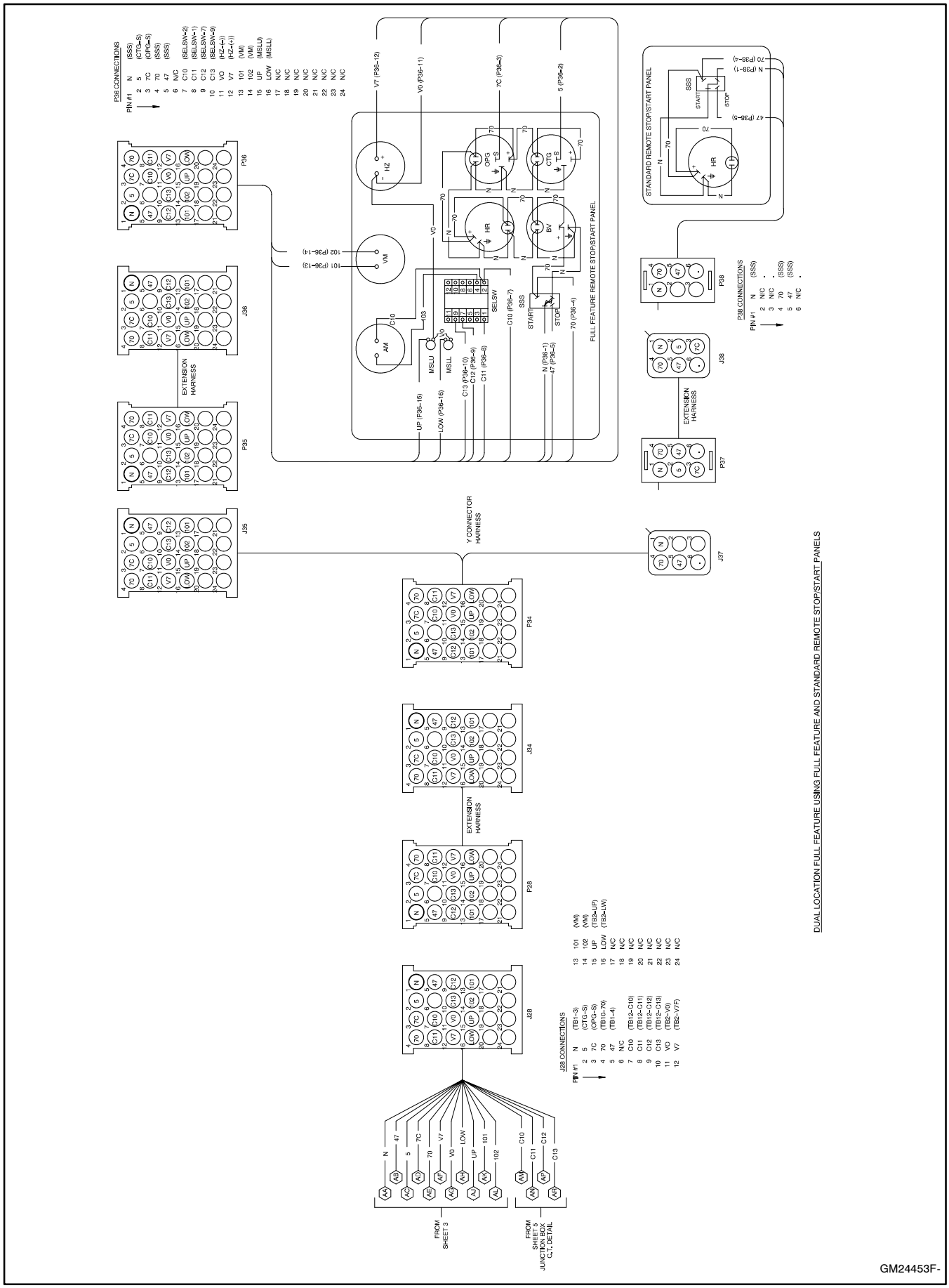


Figure 5-10 Wiring Diagram, Decision-Maker™ 1 Expanded Controller, Remote Panel Options (Sheet 6 of 6)

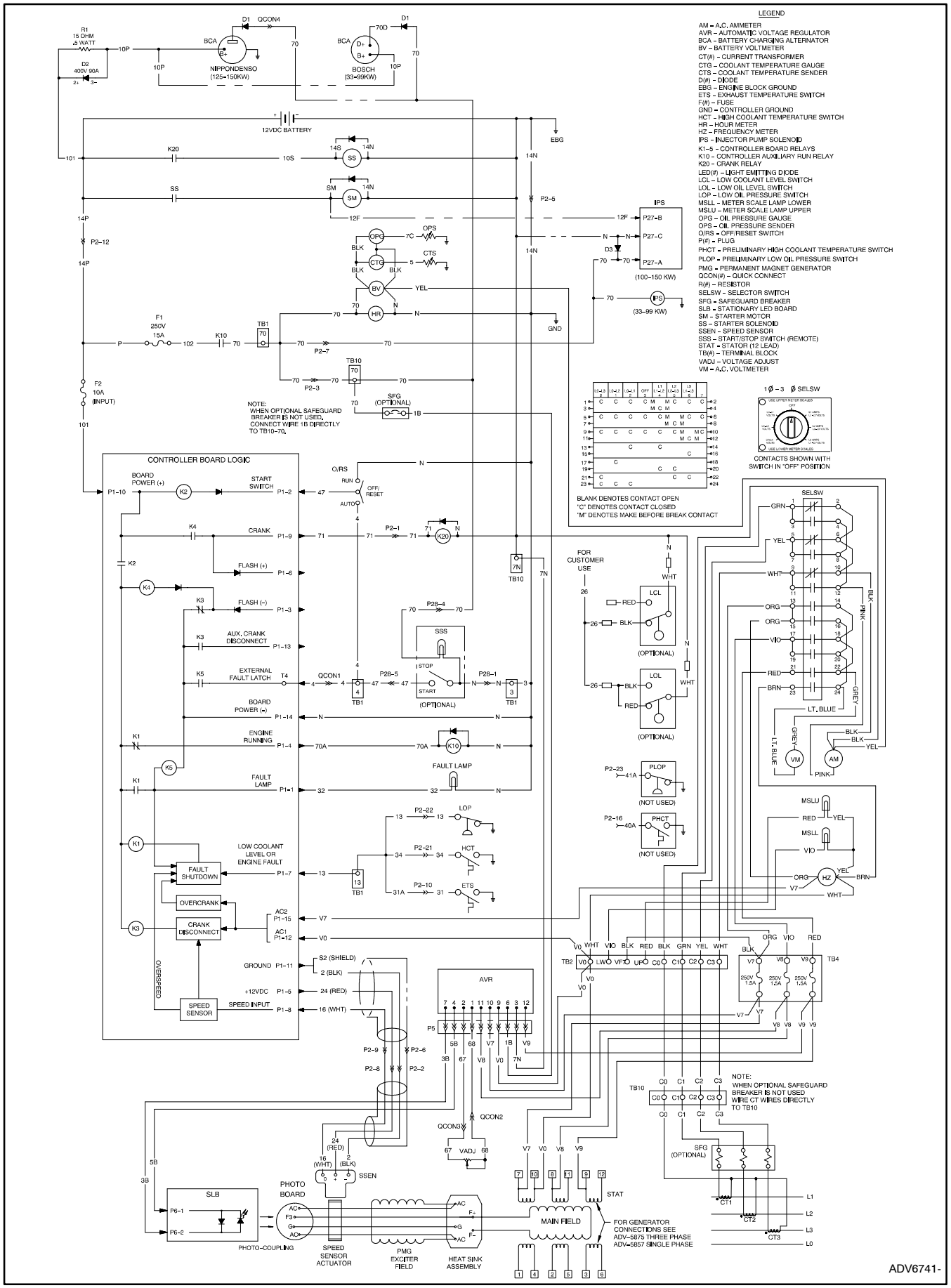


Figure 5-11 Wiring Diagram—Schematic, Decision-Maker™ 1 Expanded Controller (Sheet 1 of 1)

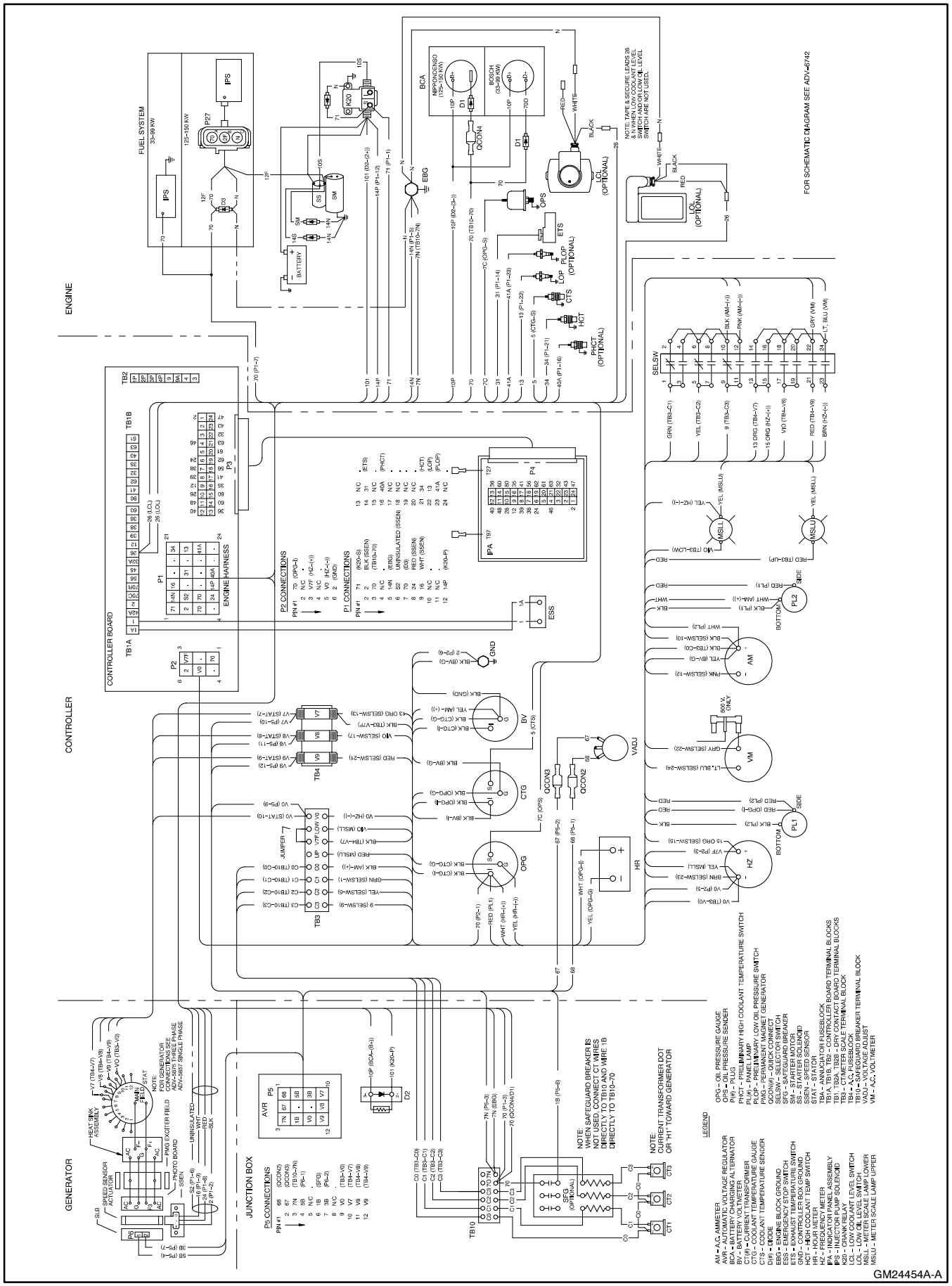


Figure 5-12 Wiring Diagram, Decision-Maker™ 3+ Controller (Sheet 1 of 7)

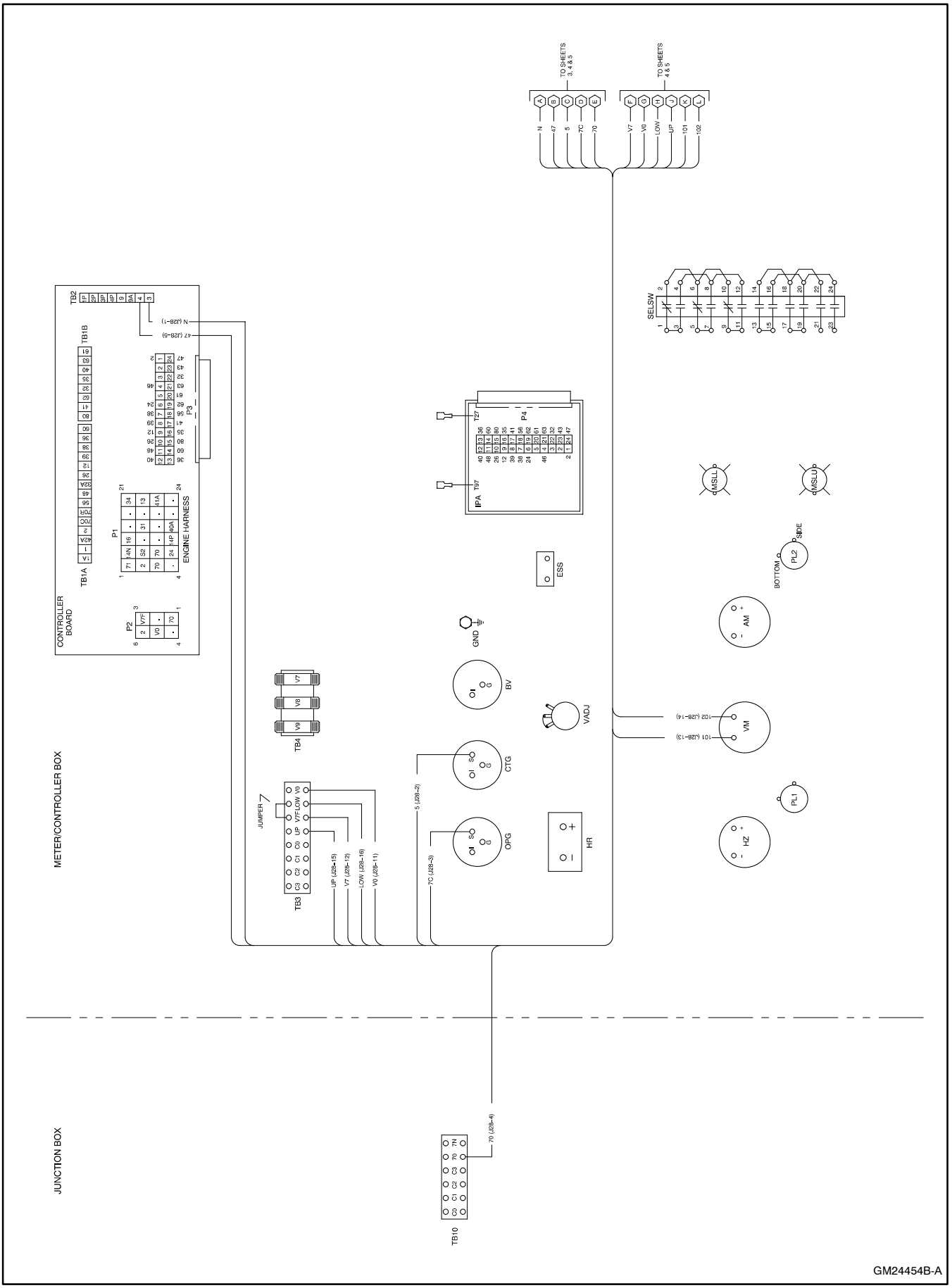


Figure 5-13 Wiring Diagram, Decision-Maker™ 3+ Controller, Remote Panel Options (Sheet 2 of 7)

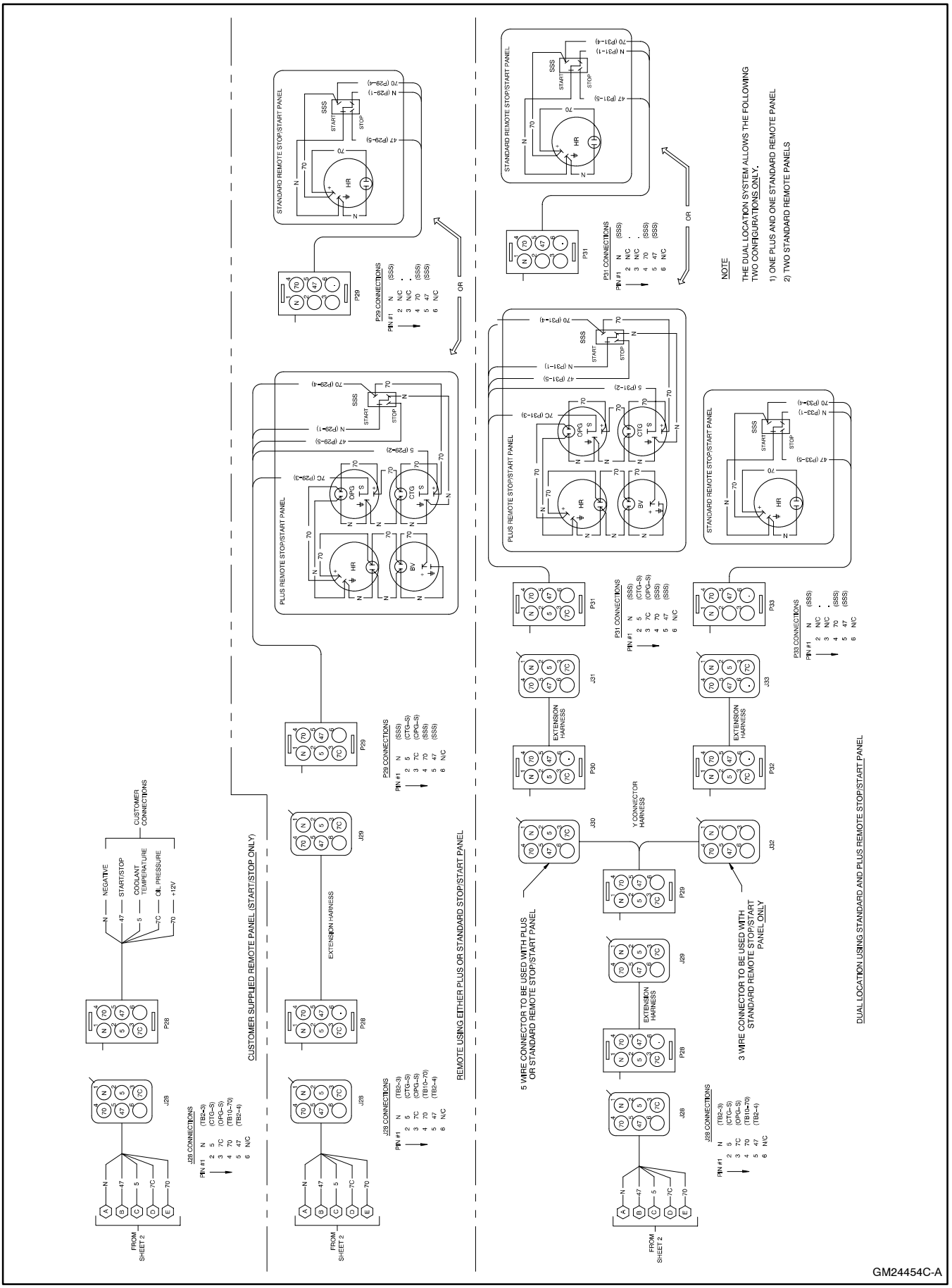


Figure 5-14 Wiring Diagram, Decision-Maker™ 3+ Controller, Remote Panel Options (Sheet 3 of 7)

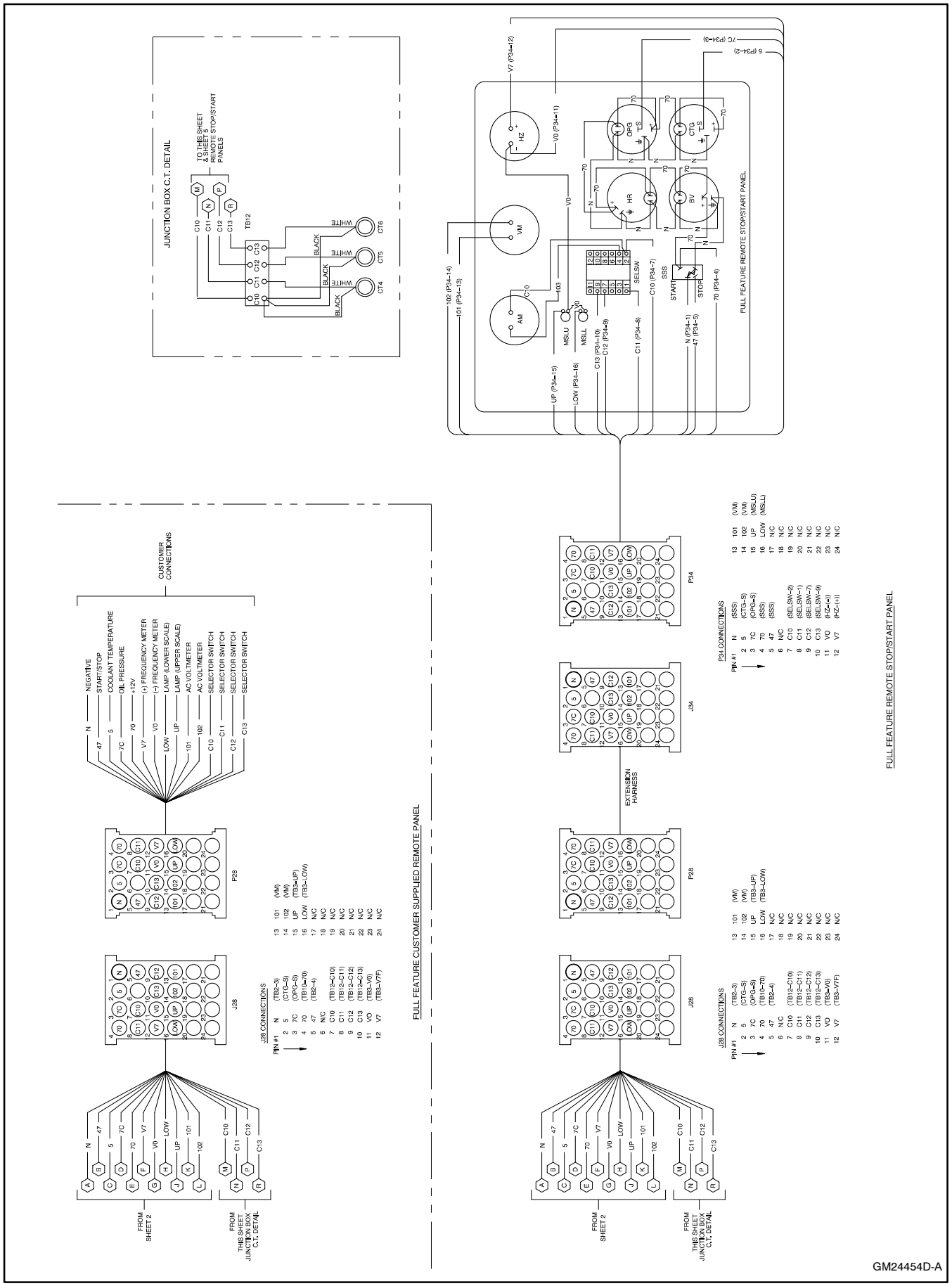


Figure 5-15 Wiring Diagram, Decision-Maker™ 3+ Controller, Remote Panel Options (Sheet 4 of 7)

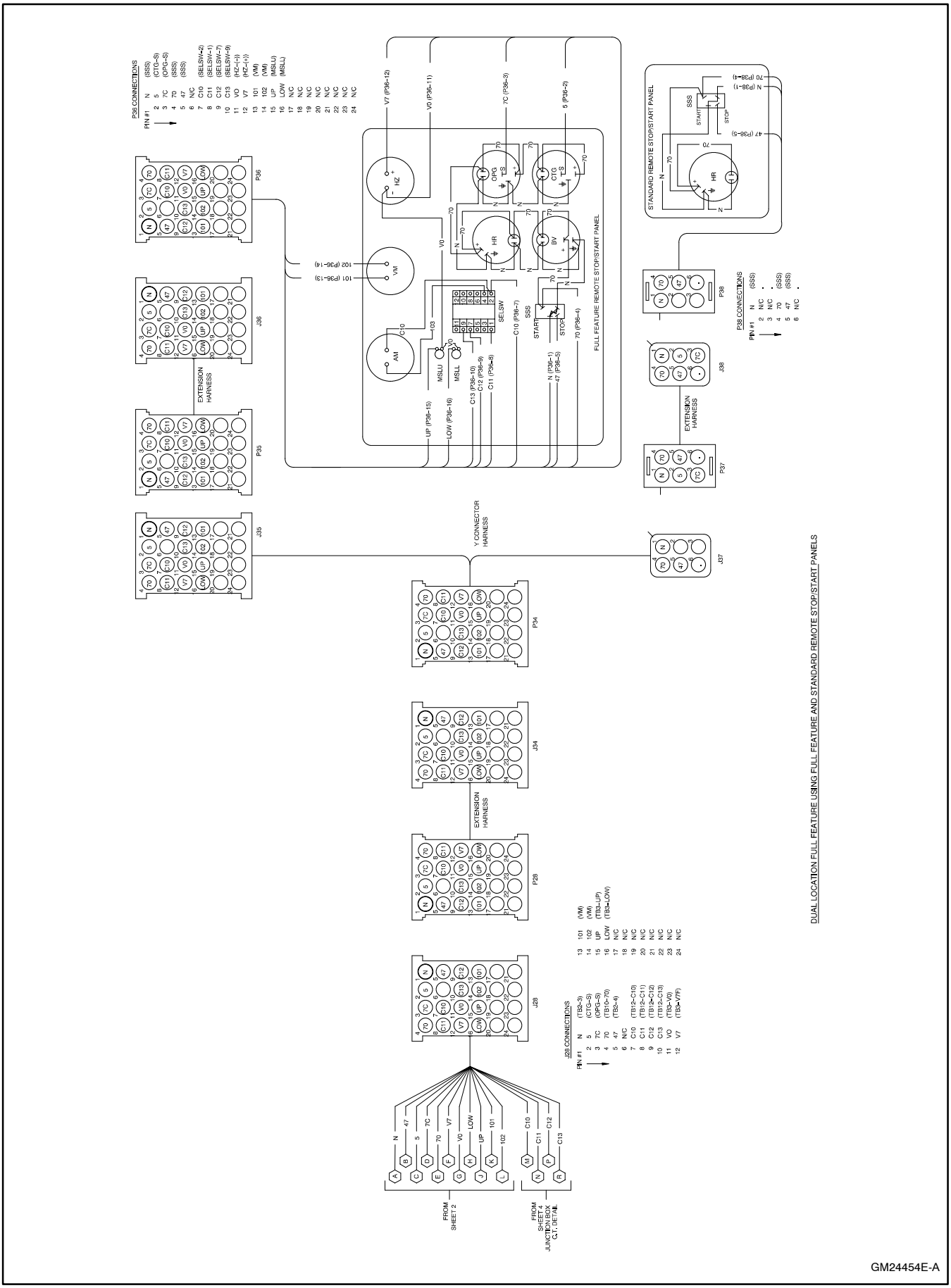


Figure 5-16 Wiring Diagram, Decision-Maker™ 3+ Controller, Remote Panel/Annunciator Options (Sheet 5 of 7)

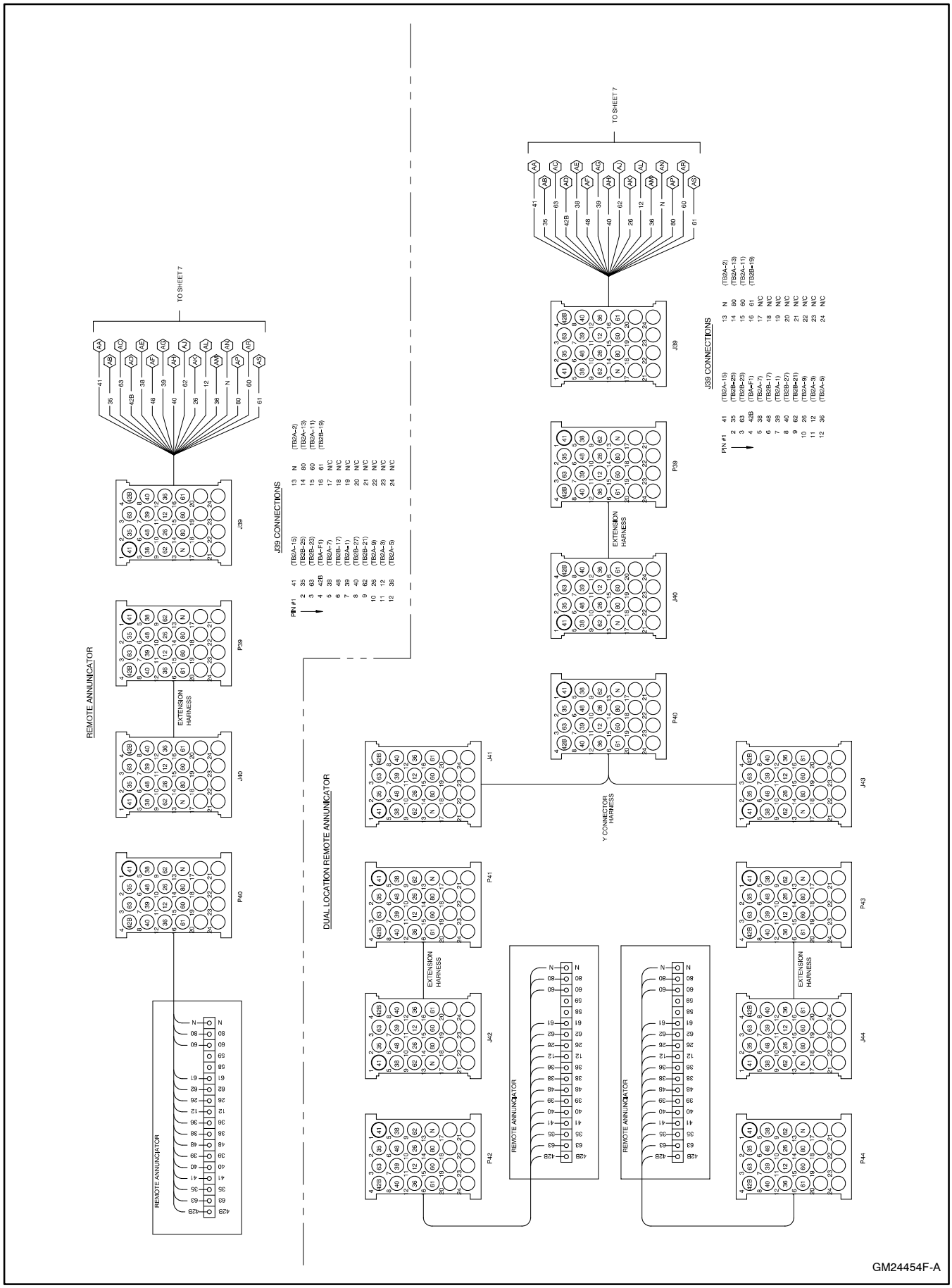


Figure 5-17 Wiring Diagram, Decision-Maker™ 3+ Controller, Remote Annunciator Options (Sheet 6 of 7)

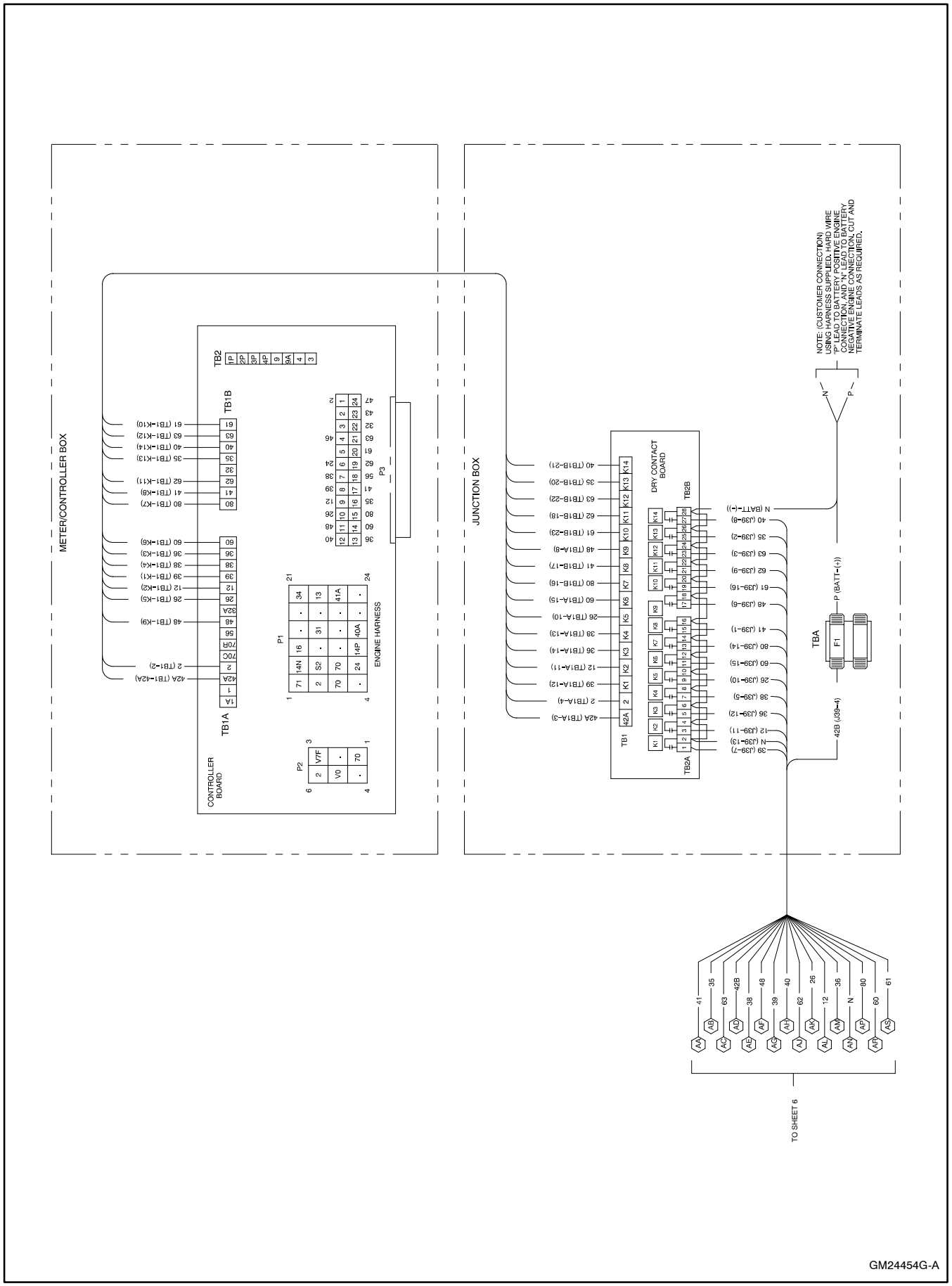


Figure 5-18 Wiring Diagram, Decision-Maker™ 3+ Controller, Remote Annunciator Options (Sheet 7 of 7)

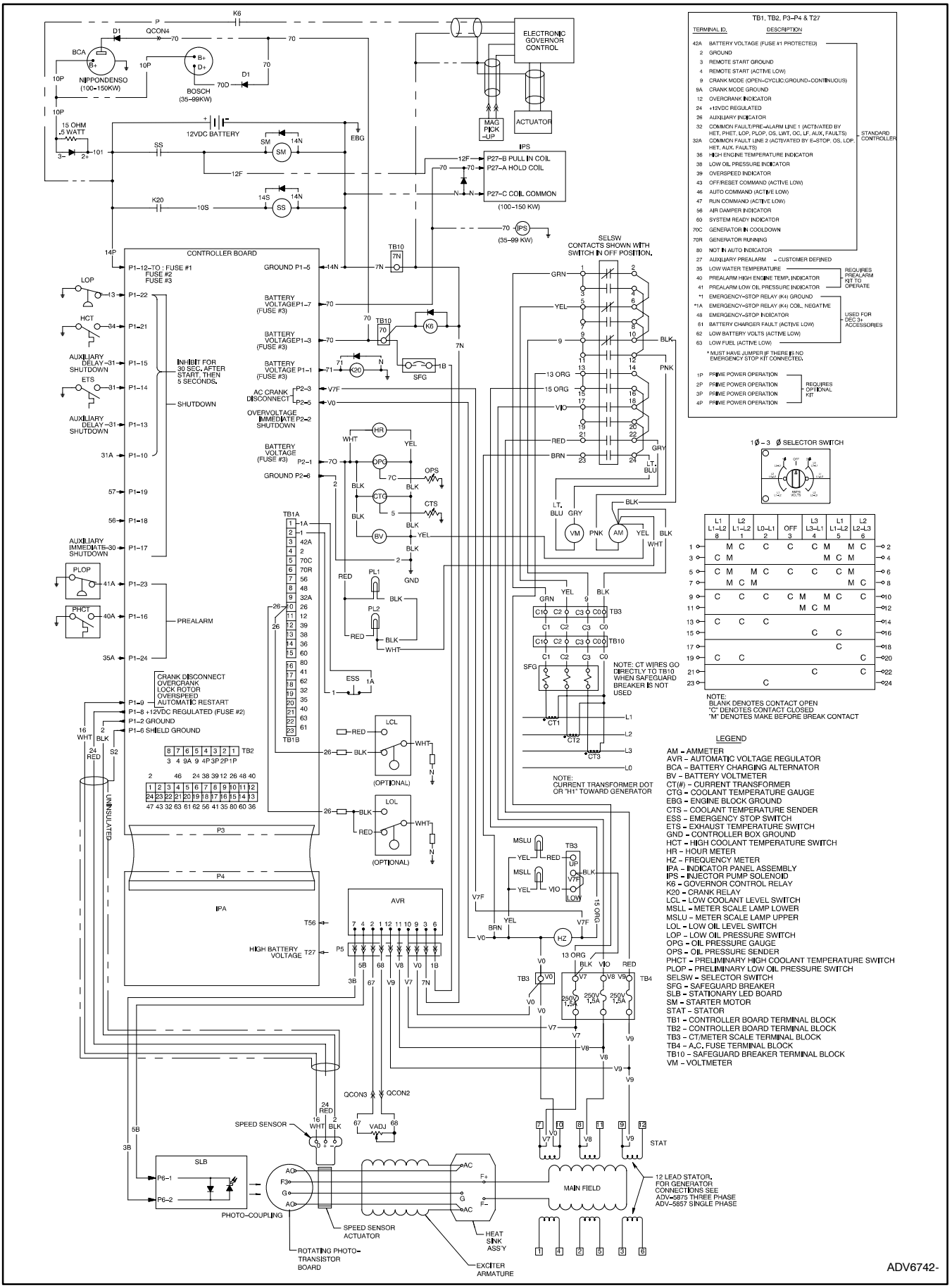


Figure 5-19 Wiring Diagram—Schematic, Decision-Maker™ 3+ Controller (Sheet 1 of 1)

Terminal	Purpose
1	Ground—emergency stop relay (K4)—connect emergency stop across terminals TB1-1 and 1A *
1A	Emergency stop relay (K4) coil; negative side—connect emergency stop across terminals TB1-1 and 1A *
2	Ground terminal
12	Overcrank (OC) indicator †
26	Auxiliary (AUX) indicator †
32	Common fault/prealarm line 1—A/V alarm or common fault relay activated by OC, 12; AUX, 26; LWT, 35; HET, 36; LOP, 38; OS, 39; PHET, 40; PLOP, 41; and LF, 63 faults
32A	Common fault/prealarm line 2—A/V alarm or common fault relay activated by AUX, 26; HET, 36; LOP, 38; OS, 39; and E-Stop, 48 faults
35	Low water temperature (LWT) indicator
36	High engine temperature (HET) indicator †
38	Low oil pressure (LOP) indicator †
39	Overspeed (OS) indicator †
40	Prealarm high engine temperature (PHET) indicator †
41	Prealarm low oil pressure (PLOP) indicator †
42A	Battery voltage (fuse #1 protected)—accessory power supply; customer may also provide separate accessory power source
48	Emergency stop (ES) indicator †
56	Air damper (AD) indicator, if equipped; standard on all 200–2000 kW Detroit Diesel-powered models
60	System ready indicator †
61	Battery charger fault—connect battery charger alarm contact to TB1-61 to activate fault lamp (active low) (if used)
62	Low battery volts—connect battery charger alarm contact to TB1-62 to activate fault lamp (active low) (if used)
63	Low fuel (LF) fault—connect fuel level sensor to TB1-63 to activate fault lamp (active low) (if used)
70C	Generator in cool down mode signal
70R	Generator in running mode signal
80	Not in auto indicator †

* Connect jumper across terminals 1 and 1A if emergency stop switch is not used.

† Use a remote annunciator and/or A/V alarm kit as an indicator with a dry contact kit connected to controller terminal strip TB1.

Note: Not all terminals are used for all generator sets (see appropriate wiring diagrams for specific generator set model).

Figure 5-20 Controller TB1 Terminal Strip (Decision-Maker™ 3+ Controller)

Terminal	Purpose
1P	Prime power operation
2P	Prime power operation
3	Remote start ground—connect transfer switch or remote start switch to TB2–3 and TB2–4
3P	Prime power operation
4	Remote start—connect transfer switch or remote start switch to TB2–3 and TB2–4
4P	Prime power operation
9	Crank mode selection (open: cyclic crank, ground: continuous crank); connect TB2–9 to TB2–9A for continuous cranking; leave TB2–9 open cyclic cranking; see starting instructions in Section 2, Operation.
9A	Crank mode ground

Note: To use prime power mode—place jumpers across TB2-1P to TB2-2P, TB2-3P to TB2-4P, and TB2-3 to TB2-4. To deactivate prime power mode—remove jumpers across TB2-1P to TB2-2P, TB2-3P to TB2-4P, and TB2-3 to TB2-4.

Figure 5-21 Controller TB2 Terminal Strip (Decision-Maker™ 3+ Controller)

Notes

Appendix A Abbreviations

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

A, amp	ampere
ABDC	after bottom dead center
AC	alternating current
A/D	analog to digital
ADC	analog to digital converter
adj.	adjust, adjustment
ADV	advertising dimensional drawing
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
API	American Petroleum Institute
approx.	approximate, approximately
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
A/V	audiovisual
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
CARB	California Air Resources Board
CB	circuit breaker
cc	cubic centimeter
CCA	cold cranking amps
ccw.	counterclockwise
CEC	Canadian Electrical Code
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)
conn.	connection
cont.	continued
CPVC	chlorinated polyvinyl chloride
crit.	critical
CRT	cathode ray tube
CSA	Canadian Standards Association
CT	current transformer
Cu	copper
cu. in.	cubic inch
cw.	clockwise
CWC	city water-cooled
cyl.	cylinder
D/A	digital to analog
DAC	digital to analog converter
dB	decibel
dBA	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, emer.	emergency (power source)
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. lbs.	foot pounds (torque)
ft./min.	feet per minute
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 temperature
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. lbs.	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)

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
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/min.	cubic meters per minute
mA	milliampere
man.	manual
max.	maximum
MB	megabyte (2^{20} bytes)
MCM	one thousand circular mils
MCCB	molded-case circuit breaker
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
m/sec.	meters per second
MTBF	mean time between failure
MTBO	mean time between overhauls
mtg.	mounting
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
pt.	pint
PTC	positive temperature coefficient
PTO	power takeoff
PVC	polyvinyl chloride
qt.	quart
qty.	quantity
R	replacement (emergency) power source
rad.	radiator, radius
RAM	random access memory
RDO	relay driver output
ref.	reference
rem.	remote
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
RTV	room temperature vulcanization
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
SPDT	single-pole, double-throw
SPST	single-pole, single-throw
spec, 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
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

Appendix B Operating Hour Service Log

Use the log below to keep a cumulative record of operating hours on your generator set and the dates required services were performed. Enter hours to the nearest quarter hour.

DATE RUN	OPERATING HOURS		SERVICE RECORD	
	HOURS RUN	TOTAL HOURS	SERVICE DATE	SERVICE

KOHLER®
POWER SYSTEMS

KOHLER CO. Kohler, Wisconsin 53044
Phone 920-565-3381, Fax 920-459-1646
For the nearest sales/service outlet in the
US and Canada, phone 1-800-544-2444
KohlerPowerSystems.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65)264-6422, Fax (65)264-6455

TP-6109 11/02b