INSTALLATION INSTRUCTIONS

Original Issue Date: **8/01**
Model: **20–3250 kW Generator Sets**
Market: **Industrial, Residential, and Marine**
Subject: **Decision-Maker® 550 Controller**
Service Replacement Kits GM20722-1, -2, -3, and -4

Introduction

The 550 controller service replacement kit is available to replace a non-functional 550 controller. There are four controller service replacement kits available.

See Figure 1 for the different features/functions. See Figure 2 and Figure 3 for controller identification. Refer to Figure 6 for pulse converter circuit board identification.

Controller P/N	Selector Switch Type	Pulse Converter Circuit Board
GM20722-1	Rotary	No
GM20722-2	Key	No
GM20722-3	Rotary	Yes
GM20722-4	Key	Yes

Figure 1 Controller Service Replacement Kits

Use the following procedure to install the replacement controller. For features and operation of the 550 controller, see the operation manual in the literature kit.

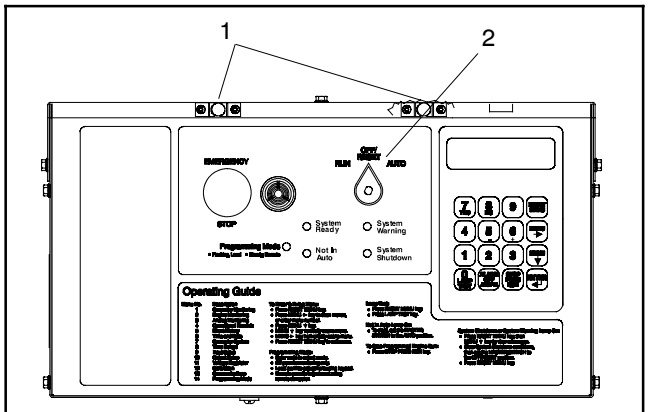
Note: Do not use this controller replacement installation instruction for upgrading software.

When replacing the 550 controller, three files must be resident for the 550 controller to function. Controller service replacement kits do not include the three files installed at the factory. The service technician *must* install the three files into the replacement 550 controller.

- **Application program** contains the software that controls system operation. The application file is preprogrammed in the 550 controller at the factory.

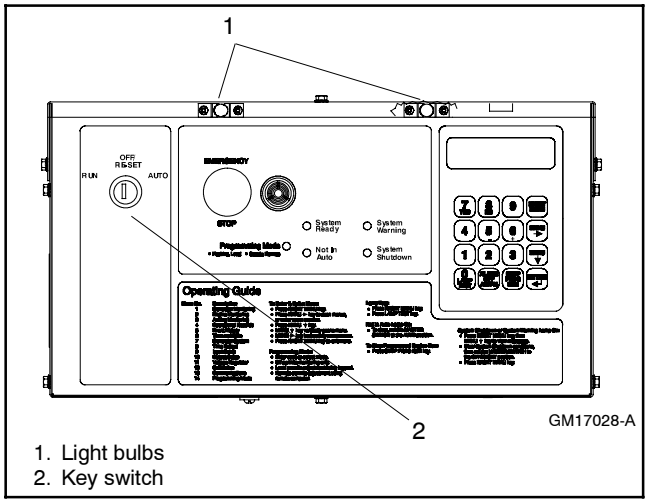
- **Personality profile** is specific to the engine and alternator and is preprogrammed in the 550 controller at the factory.

  A backup disk of the personality profile and application program is supplied with the literature packet shipped with the generator set. Typically, the distributor stores this disk for possible future use such as controller replacement or other circumstances requiring a backup.



1. Light bulbs
2. Rotary switch

Figure 2 Controller with Rotary Switch



1. Light bulbs
2. Key switch

Figure 3 Controller Front Panel with Key Switch

Note: If the personality disk is NOT available, request a replacement file from the generator set manufacturer using the generator set serial number or order number.

- **User parameters** unique to an installation include timer values, setpoints, generator set data such as kW and voltage, and input/output selections. These parameters are typically set up for or by the installer at the time of installation. Created user parameters are

typically documented and stored on the personality profile disk, a separate PC backup file, or written in the User-Defined Settings appendix in the 550 controller operation manual. *A copy of the User-Defined Settings form is included at the end of this document.*

Note: If the user parameters are included on the personality disk, the disk label should indicate Site Program—Yes.

Read the entire installation procedure and compare the kit parts with the parts list in this publication before beginning installation. Perform the steps in the order shown.

Always observe applicable local and national electrical codes.

Note: The following service kit procedure changes only the controller. If the generator set requires voltage reconnection and/or frequency adjustment, see the 550 Controller Operation Manual.

Installation Requirements

The following PC requirements are necessary for installing the controller service replacement kit.

- **Controller Application Program Software Version 2.70 or higher** from TechTools downloaded on your PC if not already installed.
- **Program Loader Software Version 2.9.3 or higher** from TechTools downloaded on your PC if not already installed.
- **Monitor III Software GM41141-KP1 or GM41141-KP2, Version 2.1.0 or higher.** Add the user parameters from a backup file and/or enter alphanumeric data. See the Monitor Software Operation Manual for additional items.

  Note: Monitor II software is no longer supported.
- **SiteTech™ Software Version 3.4.1 or higher** from Tech Tools downloaded on your PC if not already installed. See the SiteTech™ Software Operation Manual for additional items.
- **Null Modem RS-232 Cable** with a 9-pin male plug on the controller end, part no. GM16657, or kit PA-294992.

List of Related Literature

Separate literature contains communication and software information not provided in this manual. Figure 4 lists the available literature part numbers.

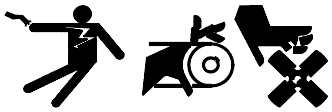
Communication and Software Manual Description	Literature Part No.
Generator Set/Controller Wiring Diagram Manual	Multiple Part Numbers Contact your Distributor/Dealer
550 Communications Spec Sheet	G6-50
Monitor III Converters, Connections, and Controller Setup	TT-1405
Monitor III Software Spec Sheet	G6-76
Monitor III Converter, Modbus®/Ethernet Spec Sheet	G6-79
Monitor III Software Operation Manual	TP-6347
Program Loader Software Installation	TT-1285
SiteTech™ Software Operation Manual	TP-6701
Modbus® Communications Protocol Operation Manual	TP-6113

Figure 4 Related Literature

Safety Precautions

Observe the following safety precautions while installing the kit.

⚠ 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.

Modbus® is a registered trademark of Schneider Electric.

⚠ 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 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.

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

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

Installation Procedure

1. Acquire the user parameters.

1.1 Choose one of the following methods to retrieve the user parameters:

- Backup file. If a backup file was previously made, obtain the parameters from this file. If a backup file was not previously made, create a backup if possible using the Monitor III software or SiteTech™ software. The existing controller must function in order to create the file.
- Paper form. Parameters should have been recorded on the User-Defined Settings form located in the appendix of the 550 controller operation manual or other similar form.
- Controller menu. Manually review the controller menu displays if possible and enter the parameter information in the 550 controller operation manual appendix, User-Defined Settings form.

1.2 Save the user parameter data for step 24.1.

2. Acquire display data from the old controller for entry in the new controller.

Certain data cannot be stored on electronic media for archival purposes and must be entered using a PC or the controller keypad.

When possible, make note of the following data from the old controller for entry in the new controller. If the old controller is not functional, the installer **must** determine and document this information for entry later in this procedure. See the appendix for the Controller User-Defined Settings form.

2.1 From Menu 4, Operational Records

2.1.1 Total Run Time Hours

2.1.2 Total Run Time Loaded Hours

2.1.3 Total Run Time Unloaded Hours

2.2 From Menu 7, Generator System

2.2.1 Metric Units, yes or no

2.3 From Menu 12, Calibration

2.3.1 Scale Aux. Analog Inputs. Repeat for each input 01–07

- Analog 01, scale value 1
- Analog 01, scale value 2

2.4 From Menu 13, Communication

2.4.1 Protocol KBUS

- KBUS online, yes or no
- Connection type
  - Local single, yes or no
  - Local LAN, yes or no
  - Local LAN conv, yes or no
  - Remote single, yes or no
  - Remote LAN, yes or no
  - Remote LAN conv, yes or no
- Primary port
  - RS-232, yes or no
  - RS-485 ISO1, yes or no
- Address (LAN connections)
- System ID (remote connections)
- BAUD rate
  - 1200
  - 2400
  - 9600

2.4.2 Protocol Modbus

- Modbus online, yes or no
- Connection type
  - Single, yes or no
  - Convertor, yes or no
- Primary port
  - RS-485
  - RS-232
- Address
- BAUD rate
  - 9600
  - 19200

2.5 From Menu 20, Factory Setup

- Final assembly date
- Final assembly clock number
- Model number
- Spec number
- Generator Set Serial number
- Temperature Sensor (P/N)

3. Acquire display data from the old controller for reference purposes.

When possible, write down the old controller display data in the appendix. This data is not required for the new controller but may be needed for future reference. If the old controller is not functional, the information is no longer retrievable.

4. Remove the generator set from service.

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

4.2 Disconnect the power to the battery charger, if equipped.

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

5. Disconnect the existing 550 controller electrical connections.

5.1 Remove the controller cover. If access to the interconnection circuit board on the rear panel and/or the main logic/communication circuit board on the front panel is difficult, partially disassemble the controller box. Remove the two controller panel top screws and center bottom screw and then loosen the bottom screw on each side to swing the controller panel down. See Figure 5.

Note: Clearly mark all disconnected leads from the controller with tape to simplify reconnection.

5.2 Disconnect the controller harness leads. Listed below are some common leads and plugs that require removal or disconnection. Items below in **bold** are shown in Figure 5 and Figure 6. These connections are typical and may not apply to all applications. See the corresponding wiring diagram found in the wiring diagrams manual.

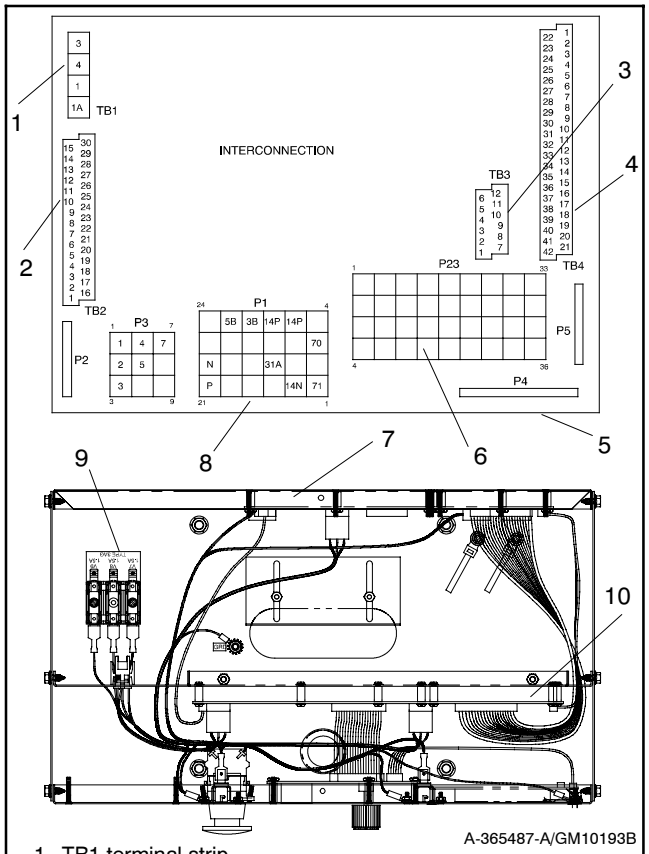
- AC fuse terminal block **TB5** leads V7, V8, and V9
- All external connections to terminal strips **TB1, TB2, TB3, and TB4**
- CT/meter scale terminal block lead V0
- P24 connector to the CT burden resistor board
- Plug **P1** on the burden resistor board and the Marathon excitation interface board
- Plug **P23** to the controller connection strip in the junction box
- Plug P22 to the engine wiring harness
- Plug **P18** remote communication connection (RS-232)
- Prime power kit
- Any other external leads to the controller

6. Remove the existing 550 controller components.

6.1 Remove the junction box panel(s) to gain access to the controller vibromount screws.

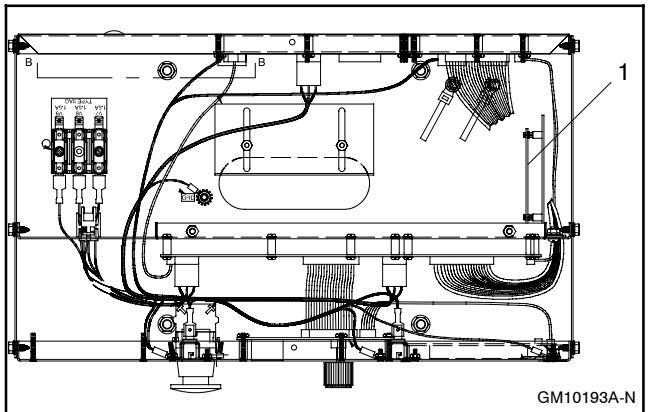
6.2 Remove the four controller vibromount screws and lift off the existing controller box top panel.

6.3 Lift off the existing 550 controller.



1. TB1 terminal strip
2. TB2 terminal strip
3. TB3 terminal strip
4. TB4 terminal strip
5. Interconnection circuit board (top view)
6. P23 connector
7. Interconnection circuit board mounted on the controller rear panel
8. P1 plug
9. TB5 terminal block (fuses)
10. P18 on main logic (microprocessor)/communication circuit board

Figure 5 Disconnecting Controller Circuit Board External Wiring Connections



1. P4/P5 Pulse converter circuit board

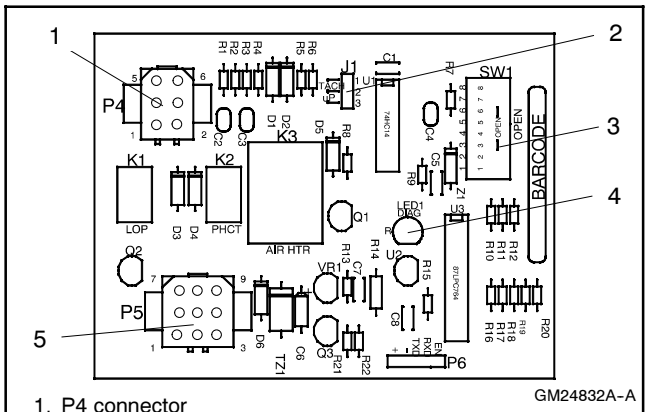
Figure 6 Pulse Converter Circuit Board Mounting in 550 Controller (top view)

7. Acquire information from the pulse converter circuit board (if equipped).

7.1 Refer to Figure 7 for the location of the pulse converter circuit board. This circuit board is typically used only on a limited number of generator set models.

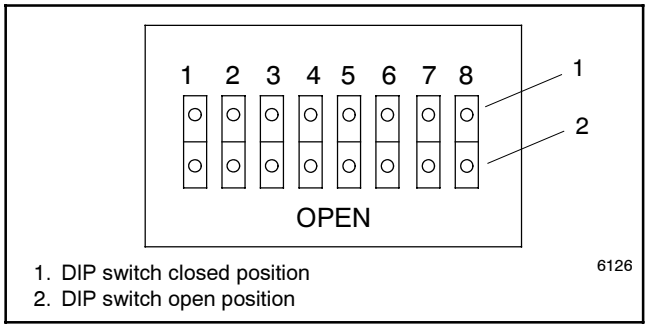
7.2 Determine the position of the J1 jumper (terminals 1-2 or 2-3). Record this information for later use.

7.3 Determine the open or closed position of the DIP switches 1-8. Record this information for later use.



1. P4 connector
2. J1 jumper (programming shunt)
3. 8-Position DIP switch
4. Diagnostic LED1
5. P5 connector

Figure 7 Pulse Converter Circuit Board GM24832



1. DIP switch closed position
2. DIP switch open position

Figure 8 DIP Switch Positions

8. Install the replacement 550 controller.

8.1 Place the replacement controller on the junction box top panel holes.

8.2 Align the controller vibromounts with the mounting holes and install four screws.

8.3 Change the controller's front display lamps, if required. See Figure 2 or Figure 3 for location. See Figure 9 for lamp identification. The factory ships the controller with 12-volt lamps. Replace the bulbs in the controller with the lamps provided in the replacement kit if the generator set has a 24-volt engine electrical system. Determine the engine electrical system voltage using the generator set nameplate information.

Lamp Part No.	Voltage	Bulb Part Number
255126	12	1892
283420	24	313

Figure 9 Lamp Identification

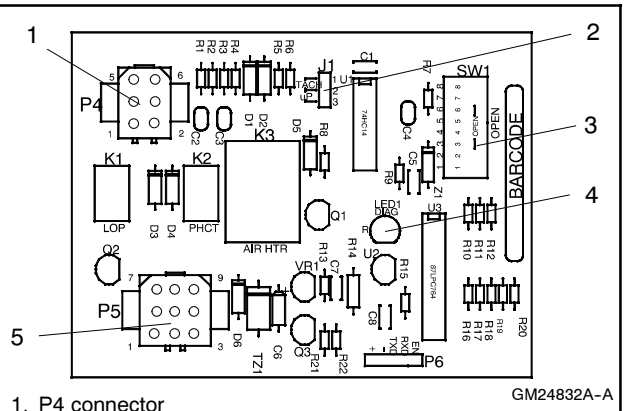
9. Set up the pulse converter circuit board (if equipped).

Refer to Appendix B, Pulse Converter Circuit Board for more details regarding set up and function.

9.1 Refer to Figure 6 for the location of the pulse converter circuit board. Refer to Figure 10 for components.

9.2 Set the position of the J1 jumper (terminals 1-2 or 2-3) based on the original controller settings.

9.3 Set the position of the DIP switches 1-8 to open or closed based on the original controller settings.



1. P4 connector
2. J1 jumper (programming shunt)
3. 8-Position DIP switch
4. Diagnostic LED1
5. P5 connector

Figure 10 Pulse Converter Circuit Board GM24832

10. Connect the replacement 550 controller.

10.1 Remove the controller cover. If access to the interconnection circuit board on the rear panel and/or the communication circuit board on the front panel is difficult, partially disassemble the controller box. Remove the two controller panel top screws and center bottom screw and then loosen the bottom screw on each side to swing the controller panel down. See Figure 5.

10.2 Reconnect the controller wiring that was previously removed. See the corresponding wiring diagram found in the wiring diagrams manual. Listed below are some common leads and plugs that may require reconnection. These connections are typical and may not apply to all situations.

- AC fuse terminal block **TB5** leads V7, V8, and V9
- All external connections to terminal strips **TB1, TB2, TB3, and TB4**
- CT/meter scale terminal block lead V0
- P24 connector to the CT burden resistor board
- Plug **P1** on the burden resistor board and the Marathon excitation interface board
- Plug **P23** to the controller connection strip in the junction box
- Plug P22 to the engine wiring harness
- Prime power kit
- Any other external leads to the controller

10.3 Swing the rear controller panel up and replace and tighten the screws, as necessary. Do not replace the controller cover at this time.

10.4 Replace the junction box panel(s) and screws.

11. Restore power to the generator set.

11.1 Check that the generator set master switch is in the OFF position.

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

11.3 Reconnect power to the battery charger, if equipped.

12. Install the program/data files.

12.1 Connect the PC serial port to the controller RS-232 port using a null modem RS-232 cable with a 9-pin male plug on the controller end. See TT-1285 for details.

12.2 Install the Program Loader program into the PC using the procedure outlined in TT-1285.

12.3 Insert the personality profile backup disk and load the data. See TT-1285 for details.

13. Establish the controller identity in Menu 20.

The controller displays the following error message: GENSET S/N WARNING.

This procedure includes instructions on how to unlock and lock the factory setup after entering menu 20. Use the down arrow key to go to the setup lock menu for determining the setup status.

Note: After completing the factory setup always **return the controller to the setup lock position** to prevent inadvertent program changes.

13.1 Press the RESET MENU key on the controller keypad.

13.2 Use the controller keypad to go to Menu 14, Programming Mode**,** and select **programming mode—local**. Use the information from the 550 controller operation manual as necessary.

Note: The factory default access code is the number 0.

13.3 Press the RESET MENU key on the controller keypad.

13.4 Use the controller keypad to go to Menu 20, Factory Setup. See Figure 11 for displays.

13.5 Arrow down to the SETUP LOCK display.

If the SETUP LOCK display indicates YES, go to step 13.6.

If the SETUP LOCK display indicates NO, go to step 13.7.

13.6 Unlock the setup.

13.6.1 Arrow down to the FINAL ASSEMBLY, CLOCK NO. display. Record the clock number on the controller display.

13.6.2 Arrow right to ENTER CODE display.

13.6.3 Use the controller keypad to enter the clock number previously recorded.

13.6.4 Press the ENTER key. Changes to Menu 20, Factory Setup, are now possible.

13.7 Initialize the EEPROM.

13.7.1 Arrow down to the CODE VERSION display.

13.7.2 Arrow right to the INITIALIZE EEPROM display.

13.7.3 Press the YES key to initialize the EEPROM.

13.7.4 Press the ENTER key.

13.8 Wait for completion of the system reset.

13.9 Go to Menu 20, Factory Setup. See Figure 11 for displays.

13.10 Change the final assembly date.

13.10.1 Arrow down to the FINAL ASSEMBLY DATE display.

13.10.2 Enter the final assembly date using the data recorded from the old controller, reference step 2.5. If data from the old controller is not available, keep the default setting.

13.10.3 Press the ENTER key if making a new entry.

13.11 Change the final assembly clock number.

13.11.1 Arrow down to the FINAL ASSEMBLY CLOCK NO. display.

13.11.2 Enter the final assembly clock number using the data recorded from the old controller. If data from the old controller is not available, keep the default setting.

13.11.3 Press the ENTER key if making a new entry.

13.12 Select the correct temperature sensor part number.

13.12.1 Arrow down to the TEMP SENSOR display.

13.12.2 Arrow right until the correct temperature sensor is shown.

13.12.3 Press the YES key.

13.12.4 Press the ENTER key if making a new entry.

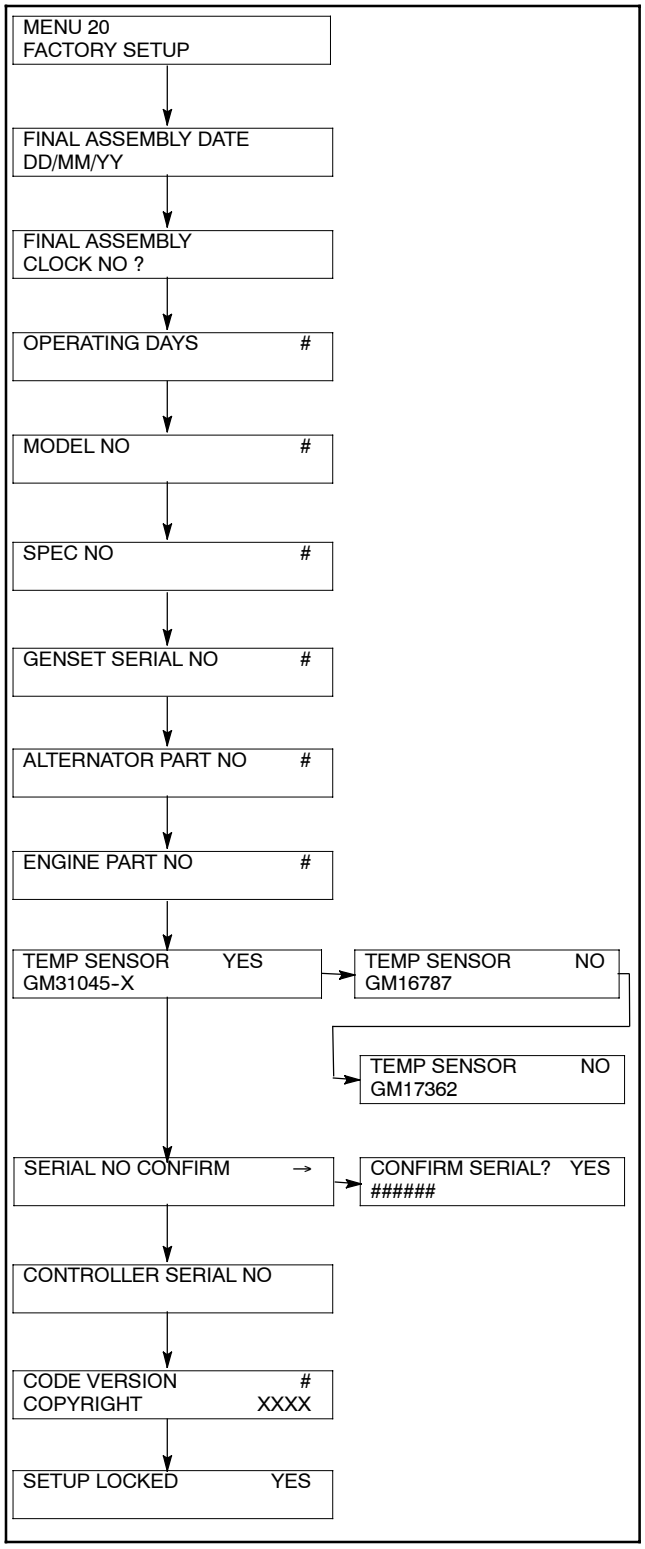


Figure 11 Menu 20, Factory Setup

13.13 Confirm the serial number.

13.13.1 Arrow down to the SERIAL NO. CONFIRM display.

13.13.2 Press YES, if the serial no. display matches the generator set nameplate serial number.

If the serial no. display does not match the generator set nameplate serial number, the wrong personality parameter file is installed. Refer to the Program Loader documentation for instructions on reloading the personality parameter file.

13.13.3 Press the ENTER key to complete the confirmation of the serial number.

14. Perform the Menu 13, Communications entries.

14.1 Press the RESET MENU key on controller keypad.

14.2 Use the controller keypad to go to Menu 13, Communications.

14.3 Complete the communication entries as necessary for remote programming. Use the information from the 550 controller operation manual as necessary.

15. Perform the Menu 14, Programming mode entries.

15.1 Press the RESET MENU key on controller keypad.

15.2 Use the controller keypad to go to Menu 14, Programming Mode**,** and select **programming mode—remote**. Use the information from the Monitor III software or SiteTech™ software.

16. Perform the Menu 20, Factory Setup entries using the Generator Info window.

Use the information from the Monitor III software operation manual or the SiteTech™ software operation manual.

16.1 Change the model number.

16.1.1 Go to the MODEL NO. display.

16.1.2 Enter the model number using the data recorded from the old controller or as shown on the generator set nameplate.

16.2 Change the spec (specification) number.

16.2.1 Go to the SPEC NO. display.

16.2.2 Enter the spec number using the data recorded from the old controller or as shown on the generator set nameplate.

17. Perform the Menu 14, Programming mode entries.

17.1 Press the RESET MENU key on the controller keypad.

17.2 Use the controller keypad to go to Menu 14, Programming Mode and select **programming mode—local**. Use the information from the 550 controller operation manual as necessary.

18. Perform the Menu 4, Operational Records

18.1 Press the RESET MENU key on controller keypad.

18.2 Use the controller keypad to go to Menu 4, Operational Records.

18.3 Enter the engine start countdown and run time as needed.

18.4 Complete the operational records entries as necessary. Use the information from the 550 controller operation manual as necessary.

19. Lock the Menu 20, Factory Setup entries.

19.1 Press the SETUP MENU key on the controller keypad.

19.2 Use the controller keypad to go to Menu 20, Factory Setup.

19.3 Arrow down to the SETUP LOCK display.

19.4 Press the YES key to lock the setup and prevent alterations to Menu 20, Factory Setup.

20. Enter the Menu 6, Time and Date, settings.

20.1 Press the RESET MENU key on the controller keypad.

20.2 Use the controller keypad to go to Menu 6, Time and Date. Use the information from the 550 controller operation manual as necessary to set the time and date.

21. Perform the Menu 7, Generator System, entries for English or metric displays.

21.1 Press the RESET MENU key on the controller keypad.

21.2 Use the controller keypad to go to Menu 7, Generator System. Use the information from the 550 controller operation manual as necessary to change Metric Unit, yes or no.

22. Perform the Menu 12, Calibration, entries.

22.1 See the 550 controller operation manual for disconnecting the ribbon connector. Disconnect ribbon connector P2 prior to zeroing out (resetting) the auxiliary analog inputs.

22.2 Press the RESET MENU key on the controller keypad.

22.3 Use the controller keypad to go to Menu 12, Calibration. Use the information from the 550 controller operation manual as necessary to scale AC analog inputs.

22.4 With the information previously recorded from step 2.3, scale the auxiliary analog inputs. Use the information from the 550 controller operation manual as necessary.

23. Perform the Menu 14, Programming Mode entries.

23.1 Press the RESET MENU key on the controller keypad.

23.2 Use the controller keypad to go to Menu 14, Programming Mode.

- Select **programming mode—remote** when adding user parameter from a backup disk or PC.
- Select **programming mode—local** for keypad entries. Use the information from the 550 controller operation manual as necessary.

24. Add the user parameters.

24.1 Choose one of the following methods to load the user parameters.

- Backup disk. Use a PC to load the data from the user parameter backup disk. Enable Menu 14, Programming Mode—Remote. See the information from the Monitor III software or SiteTech™ software manual.
- Paper form. Use a PC to enter the user parameter data from the filled-out 550 controller operation manual appendix, User-Defined Settings form, or other similar form. Enable Menu 14, Programming Mode—Remote. See the information supplied with the Monitor III software or SiteTech™ software manual.

- Controller menu. Use the controller keypad to manually enter the user parameter data from the filled-out 550 controller operation manual appendix, User-Defined Settings form. Enable Menu 14, Programming Mode—Local. Use the information from the 550 controller operation manual as necessary.

24.2 Create a new user parameter data backup file if any changes are made. See the Monitor III software or SiteTech™ software manual.

24.3 Disconnect the PC null modem RS-232 cable.

24.4 Install the P18 (RS-232) remote communication connection, as necessary.

24.5 Swing the front controller panel up and replace and tighten the screws, as necessary.

24.6 Replace the controller cover and hardware. Tighten all controller screws.

25. Restore the generator set to service.

25.1 Perform the Menu 13, Communication, entries.

25.1.1 Press the RESET MENU key on controller keypad.

25.1.2 Use the controller keypad to go to Menu 13, Communications.

25.1.3 With the information previously recorded from step 2.4, complete the communication entries as necessary for the application. Use the information from the 550 controller operation manual as necessary.

25.2 Perform the Menu 14, Programming Mode entries.

25.2.1 Press the RESET MENU key on controller keypad.

25.2.2 Use the controller keypad to go to Menu 14, Programming Mode.

25.2.3 Change the entries for the application as necessary.

25.3 The generator set system is now ready to function.

25.4 Move the generator set master switch to AUTO for startup by remote transfer switch or remote start/stop switch.

Parts List

550 Controller Service Replacement Kits

Kit: GM20722-1		
Qty.	**Description**	**Part Number**
1	Controller assembly with rotary switch and 12-volt lamps	GM10193-1
2	Lamps, 24-volt, no. 313	283420
1	Literature kit	GM20727-KP
1	550 Controller Setup and Application Manual	TP-6140
1	550 Controller Operation Manual	TP-6200
1	550 Controller Spec Sheet	G6-46

Kit: GM20722-2		
Qty.	**Description**	**Part Number**
1	Controller assembly with key switch and 12-volt lamps	GM10193-5
2	Lamps, 24-volt, no. 313	283420
1	Literature kit	GM20727-KP
1	550 Controller Setup and Application Manual	TP-6140
1	550 Controller Operation Manual	TP-6200
1	550 Controller Spec Sheet	G6-46

Kit: GM20722-3		
Qty.	**Description**	**Part Number**
1	Controller assembly with rotary switch and 12-volt lamps	GM10193-9
2	Lamps, 24-volt, no. 313	283420
1	Literature kit	GM20727-KP
1	550 Controller Setup and Application Manual	TP-6140
1	550 Controller Operation Manual	TP-6200
1	550 Controller Spec Sheet	G6-46

Kit: GM20722-4		
Qty.	**Description**	**Part Number**
1	Controller assembly with key switch and 12-volt lamps	GM10193-12
2	Lamps, 24-volt, no. 313	283420
1	Literature kit	GM20727-KP
1	550 Controller Setup and Application Manual	TP-6140
1	550 Controller Operation Manual	TP-6200
1	550 Controller Spec Sheet	G6-46

Menu 4 Operational Records	Menu 5 Event History	Menu 20 Factory Setup	

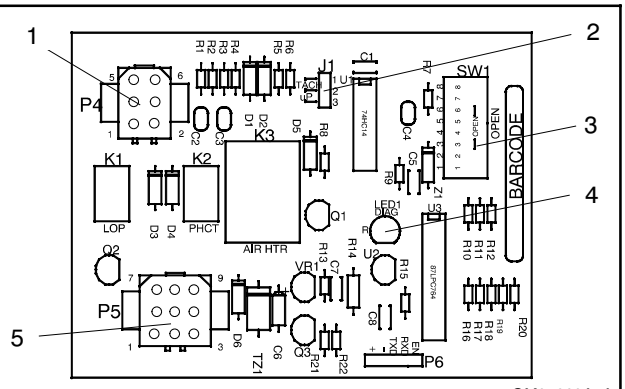
• Factory Test Date
• Total Run Time
• Total Run Time Loaded Hours
• Total Run Time Unloaded Hours
• Total Run Time kW Hours
• No. of Starts
• Engine Start Countdown
  ○ Run Time
• Records-Maintenance
  ○ Reset Records
• Run Time Since Maintenance Total Hours
• Run Time Since Maintenance Loaded Hours
• Run Time Since Maintenance Unloaded Hours
• Run Time Since Maintenance kW Hours
• Operating Days Last Maintenance
• No. of Starts Last Maintenance
• Last Start Date
• Length of Run (Un)loaded Hours
	• (Message Text)
	• (Scroll through up to 100 stored events)
		• Final Assembly Date
		• Final Assembly Clock No.
		• Model Number
		• Spec Number
		• Generator Set Serial number
		• Temperature Sensor (P/N)	

Appendix B Pulse Converter Circuit Board

Introduction

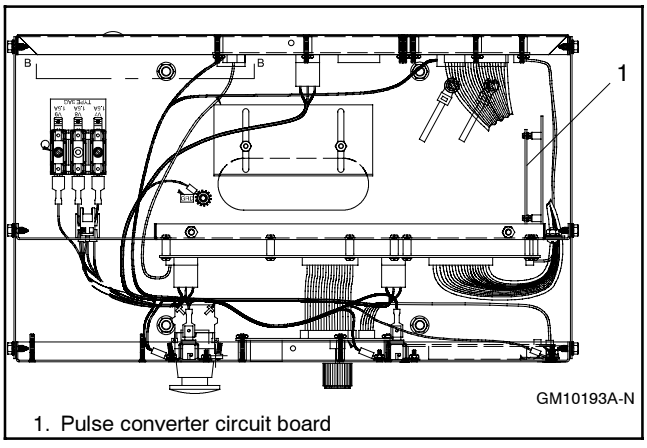
Use this information for pulse converter circuit board replacement. The pulse converter circuit board converts the engine speed sender signal to a 2-pulse output per engine revolution needed for the generator set controller.

Circuit board GM24832 uses an 8-position DIP switch to provide a 2-pulse output from flywheels with a tooth count between 15 and 255. See Figure 12 for the pulse converter circuit board. See Figure 6 for circuit board mounting location in the controller.



1. P4 connector
2. J1 jumper (programming shunt)
3. 8-Position DIP switch
4. Diagnostic LED1
5. P5 connector

Figure 12 Pulse Converter Circuit Board GM24832



1. Pulse converter circuit board

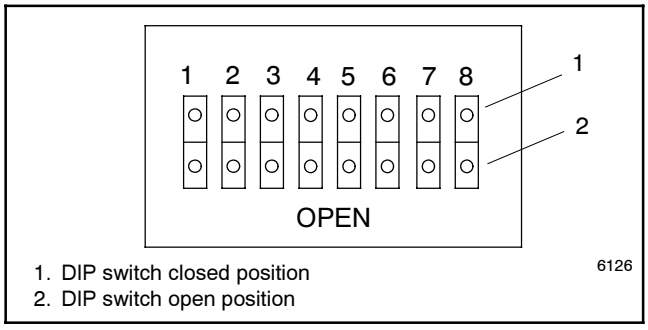
Figure 13 Pulse Converter Circuit Board Mounting in 550 Controller (top view)

DIP Switch

Service technicians should be aware that odd number tooth counts have an inherent percent error in engine speed calculations. An even number of flywheel teeth do not cause the percent error in speed. If the flywheel has an odd number of teeth, the circuit board logic uses a correction factor as follows:

(1 – [tooth count] / [tooth count + 1]) x 100 = correction value

Use the circuit board DIP switch, see Figure 14 to match the engine flywheel tooth number count. Refer to Figure 17 for determining DIP setting.



1. DIP switch closed position
2. DIP switch open position

Figure 14 DIP Switch Positions

Programming Shunt

Use programming shunt J1 across pins 1 and 2 on the circuit board to get a 1:1 output. The shunt provides a 1:1 output regardless of the DIP switch selection. The shunt is typically used with the 550 controller and is also intended as a diagnostic test during troubleshooting.

Place J1 across pins 2 and 3 for a 2-pulse output signal.

Tach Output

The circuit board has a secondary output (P5–4) that matches the input signal 1:1. Some generator set models use this connection to eliminate an engine speed sensor. See Figure 12 for P5–4 location. Refer to Figure 15 for models that use the tach feature.

Air Heater Control

The circuit board provides a 6-minute (±30 seconds) signal to activate the air heater after the start switch is toggled. If the start switch signal is interrupted during the 6 minutes, the air heater control signal is deenergized.

Anticipatory High Coolant Temperature (AHCT) and Low Oil Pressure (LOP) Relays

The circuit board provides dry contacts for AHCT (P5-8) and LOP (P5-7) inputs for some generator set models. Refer to Figure 16.

LED Indicator

The red LED will flash at 1 Hz rate if the DIP switch setting matches the engine flywheel tooth count and the generator set is running at 60 Hz. The LED indicator provides some diagnostic help. See Troubleshooting following.

Circuit Board Connections

Figure 15 shows generator set models implementing the pulse converter circuit board and Figure 17 indicates the pulse converter circuit board settings based on number of flywheel teeth.

Generator Set Model	No. of Flywheel Teeth	Comments	J1 Shunt Connection
200REOZV	NA	Tach feature	Pins 1–2
230/250 REOZV	NA	Tach feature and P5–9 air heater output feature	Pins 1–2
500REOZV	NA	Tach feature	Pins 1–2
NA not applicable			

Figure 15 Generator Set and Tach Output Feature

Figure 16 shows the connections made to the pulse converter circuit board. Some generator set models may not have all connections.

Plug-Pin	Connection
P4-1	Low oil pressure input signal
P4-2	Battery positive (+) lead 70
P4-3	Anticipatory high coolant temperature input signal
P4-4	Cable shield (ground)
P4-5	Magnetic pickup sensor low (ground)
P4-6	Magnetic pickup sensor high
P5-1	Magnetic pickup output signal shield (ground)
P5-2	Speed signal output signal
P5-3	Speed sensor ground
P5-4	Tach output signal
P5-5	Magnetic pickup output signal (ground)
P5-6	V+ Speed sensor
P5-7	Low oil pressure output signal
P5-8	Anticipatory high coolant temperature output signal
P5-9	Air heater output signal

Figure 16 Pulse Converter Circuit Board Connections

No. of Flywheel Teeth	DIP Switch Position							
	DIP 8 Switch Value=128	DIP 7 Switch Value=64	DIP 6 Switch Value=32	DIP 5 Switch Value=16	DIP 4 Switch Value=8	DIP 3 Switch Value=4	DIP 2 Switch Value=2	DIP 1 Switch Value=1
1	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open
2	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed
4	Closed	Closed	Closed	Closed	Closed	Open	Closed	Closed
8	Closed	Closed	Closed	Closed	Open	Closed	Closed	Closed
16	Closed	Closed	Closed	Open	Closed	Closed	Closed	Closed
32	Closed	Closed	Open	Closed	Closed	Closed	Closed	Closed
64	Closed	Open	Closed	Closed	Closed	Closed	Closed	Closed
128	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed
255	Open	Open	Open	Open	Open	Open	Open	Open

Figure 17 Pulse Converter Circuit Board Settings Based on Number of Flywheel Teeth

Appendix C User-Defined Settings

Use the table below to record user-defined settings during the generator set controller setup and calibration. The controller default settings and ranges provide guidelines. The table contains all faults with ranges and time delays including items that do not have adjustments. Not adjustable user-defined settings result when the controller logic does not allow changes or the values are engine limited.

Note: Inhibit time delay is the time delay period after crank disconnect.

Note: The engine ECM may limit the crank cycle even if the controller is set to a longer time period.

User-Defined Settings

Status Event or Fault	Refer to Menu	Digital Display	Relay Driver Output (RDO)	Range Setting	Default Selection	Inhibit Time Delay (sec.)	Time Delay (sec.)	User-Defined Settings
Access Code (password)	14			User-Selectable	0 (zero)			
AC Sensing Loss	10	AC SENSING LOSS	RDO-25 *					Not adjustable
Air Damper Control (if used) **	10							Not adjustable
Air Damper Indicator (if used), see D20 **								—
Air/Fuel Module (AFM) Engine Start Delay ‡	10	AFM ENG START DELAY		Fixed				Not adjustable
Air/Fuel Module (AFM) Remote Start ‡	10	AFM REMOTE START	RDO-25 ‡					Not adjustable
Air/Fuel Module (AFM) Shutdown (see D11) ‡								Not adjustable
Alternator Protection Shutdown	10	ALTERNATOR PROTECTION						Not adjustable
Analog Aux. Input 0	9	LOCAL BATT VDC		Fixed				Not adjustable
Analog Aux. Inputs A01–A07	9	USER-DEFINED A01–A07		Default Values with Warning Enabled: HI warning 90% LO warning 10% HI shutdown 100% LO shutdown 1%	30 sec. inhibit, 5 sec. delay	0–60	0–60	
Analog Aux. Input A01 (non-ECM only)	9	A01 COOLANT TEMP		Default Values with Warning Enabled: HI/LO warning and HI/LO shutdown are all engine dependent	30 sec. inhibit, 0 sec. delay warning, 5 sec. delay shutdown			Not adjustable
Analog Aux. Input A02 (non-ECM only)	9	A02 OIL PRESSURE		Default Values with Warning Enabled: HI/LO warning and HI/LO shutdown are all engine dependent (255 psi max.)	30 sec. inhibit, 0 sec. delay warning, 5 sec. delay shutdown			Not adjustable
Analog Aux. Input A03 ‡	9	A03 INTAKE AIR TEMP		Default Values with Warning Enabled: HI/LO warning are all engine dependent	30 sec. inhibit, 0 sec. delay warning			Not adjustable
Analog Aux. Input A04 *	9	A04 FUEL LEVEL		Default Values with Warning Enabled: HI/LO warning are engine dependent	30 sec. inhibit, 0 sec. delay warning			
Analog Aux. Input A04 ‡	9	A04 OIL TEMP		Default Values with Warning Enabled: HI/LO warning are engine dependent	30 sec. inhibit, 0 sec. delay warning			Not adjustable

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‡ Waukesha-powered models
§ Paralleling applications
** NFPA applications
†† DDC/MTU engine with MDEC/ADEC
‡‡ FAA only

Status Event or Fault	Refer to Menu	Digital Display	Relay Driver Output (RDO)	Range Setting	Default Selection	Inhibit Time Delay (sec.)	Time Delay (sec.)	User-Defined Settings
Analog Aux. Input A06 VSG (Volvo, GM, Doosan only)	9, 12	A06 ANALOG AUXILIARY IN			Volvo: 0.5V=1250 4.5V=8750 GM/Doosan 60 Hz: 0.5V=2375 4.5V=2625 50 Hz: 0.5V=2327 4.5V=2624			—
Analog Aux. Input A07	9, 11	A07 ANALOG VOLT ADJUST		±10% of system voltage over the range of 0.5–4.5 VDC				
Battery Charger Fault (see D01) **								—
Battle Switch (Fault Shutdown Override Switch)	9	BATTLE SWITCH		Fixed				Not adjustable
Block Heater Control ††	10	BLOCK HEATER CONTROL	RDO only					
Breaker Trip §	10	BREAKER TRIP	RDO-30					Not adjustable
Common Protective Relay Output §	10	COMMON PR OUTPUT	RDO-31 §					Not adjustable
Critical Overvoltage Shutdown	10	CRITICAL OVERVOLTAGE		Fixed	275 volts (L1–L2)			Not adjustable
Cyclic Cranking	8			1–6 crank cycles 10–30 sec. crank on 1–60 sec. pause	3 15 sec. 15 sec.			
Defined Common Faults (each input value is set separately)	10	DEFINED COMMON FAULT	RDO-18 (lead 32A)	Default shutdowns include: Emergency stop High coolant temp Low oil pressure Overcrank Overspeed	30 sec. inhibit, 5 sec. delay	0–60	0–60	
Detonation Shutdown (see D13) ‡								—
Detonation Warning (see D12) ‡								—
Digital Aux. Input D01–D21	9, 10	USER-DEFINED D01–D21			30 sec. inhibit, 5 sec. delay	0–60	0–60	
Digital Aux. Input D01 Battery Charger Fault **	9, 10	D01 BATTERY CHARGER FAULT	RDO-11 (lead 61)	Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D02 Low Fuel Warning **	9, 10	D02 LOW FUEL WARNING	RDO-08 (lead 63)	Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D03 Low Coolant Temperature **	9, 10	D03 LOW COOLANT TEMP	RDO-05 (lead 35)	Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D04 Field Overvoltage (M4, M5, or M7 alternator only)	9, 10	D04 FIELD OVERVOLTAGE		Fixed	1 sec. inhibit, 15 sec. delay			Not adjustable
Digital Aux. Input D05 Breaker Closed §	9, 10	D05 BREAKER CLOSED		Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D06 §	9, 10	D06 ENABLE SYNCH			20 sec. inhibit, 0 sec. delay			Not adjustable

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Status Event or Fault	Refer to Menu	Digital Display	Relay Driver Output (RDO)	Range Setting	Default Selection	Inhibit Time Delay (sec.)	Time Delay (sec.)	User-Defined Settings
Digital Aux. Input D09 Low Fuel Pressure Shutdown (125RZGGSG only)	9, 10	D09 LOW FUEL SHUTDOWN		Fixed	5 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D11 Air/Fuel Module (AFM) Shutdown ‡	9, 10	D11 AFM SHUTDOWN		Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D12 Detonation Warning ‡	9, 10	D12 DETON WARNING		Fixed	2 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D13 Detonation Sensing Module (DSM) Shutdown ‡	9, 10	D13 DETON SHUTDOWN		Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D13 Knock Detection Module (KDM) Shutdown ‡	9, 10	D13 KNOCK SHUTDOWN		Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D14 Low Coolant Level, (with LCL switch) **	9, 10	D14 LOW COOLANT LVL	RDO-19	Fixed	30 sec. inhibit, 5 sec. delay			Not adjustable
Digital Aux. Input D15 Remote Shutdown	9, 10	D15 REMOTE SHUTDOWN			0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D16 Remote Reset	9, 10							Not adjustable
Digital Aux. Input D17 VAR/PF mode	9, 10							Not adjustable
Digital Aux. Input D18 Voltage Lower	9, 10							Not adjustable
Digital Aux. Input D19 Voltage Raise	9, 10							Not adjustable
Digital Aux. Input D20 Air Damper Indicator (if used) **	9, 10	D20 AIR DAMPER	RDO-23 * (lead 56)	Fixed	0 sec. inhibit, 0 sec. delay			Not adjustable
Digital Aux. Input D21 Idle (speed) Mode Function	9, 10	D21 IDLE MODE ACTIVE	RDO-21	Fixed inhibit time	0 sec. inhibit, 60 sec. delay		0–600 or 9:99 for infinity	Not adjustable
ECM Red Alarm (was MDEC Yellow Alarm) ††	10	ECM RED ALARM						Not adjustable
ECM Yellow Alarm (was MDEC Yellow Alarm) ††	10	ECM YELLOW ALARM						Not adjustable
EEPROM Write Failure	10	EEPROM WRITE FAILURE						Not adjustable
Emergency Stop Shutdown	10	EMERGENCY STOP	RDO-14 (lead 48)					Not adjustable
Engine Cooldown (see Time Delay-)								—
Engine Derate Active	10	ENGINE DERATE ACTIVE						Not adjustable
(Engine) J1939 CAN Engine Shutdown	10	J1939 CAN SHUTDOWN						Not adjustable
Engine Stalled	10	ENGINE STALLED						Not adjustable
Engine Start (see Time Delay-)								—

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Status Event or Fault	Refer to Menu	Digital Display	Relay Driver Output (RDO)	Range Setting	Default Selection	Inhibit Time Delay (sec.)	Time Delay (sec.)	User-Defined Settings
EPS (Emergency Power System) Supplying Load	10	EPS SUPPLYING LOAD	RDO-22	Fixed	1% of rated line current			Not adjustable
Field Overvoltage (see D04)								Not adjustable
Fuel Level (see A04)								—
Fuel Valve Relay ‡	10	FUEL VALVE RELAY	RDO-23 ‡					Not adjustable
Generator Set Running	10		RDO-15 (lead 70R)					Not adjustable
Ground Fault Detected	10	GROUND FAULT						Not adjustable
High Battery Voltage	10	HIGH BATTERY VOLTAGE	RDO-13	14.5–16.5 V (12 V) 29–33 V (24 V)	16 V (12 V) 32 V (24 V)		10	
High Coolant Temperature Shutdown	10	HI COOL TEMP SHUTDOWN	RDO-03 (lead 36)			30	5	Not adjustable
High Coolant Temperature Warning	10	HI COOL TEMP WARNING	RDO-06 (lead 40)			30		Not adjustable
High Oil Temperature Shutdown	10	HI OIL TEMP SHUTDOWN				30	5	Not adjustable
High Oil Temperature Warning ‡ ††	10	HI OIL TEMP WARNING				30		Not adjustable
Idle (speed) Mode Function (see D21)								—
In Synch §	10	IN SYNCH	RDO-29 *					Not adjustable
Intake Air Temperature Shutdown ††	10	INTAKE AIR TEMP SDWN				30		Not adjustable
Intake Air Temp. Warning ††	10	INTAKE AIR TEMP WARN				30		Not adjustable
Intake Air Temp. Warning (see A03) ‡								—
Intake Air Temp. Shutdown (see A03)‡								—
Internal Fault Shutdown	10	INTERNAL FAULT						Not adjustable
J1939 CAN Shutdown (see Engine J1939 CAN Shutdown)								—
Knock Shutdown (see D13) ‡								—
kW Overload (see Load Shed)								—
Load Shed kW Overload ‡‡	10	LOAD SHED KW OVER	RDO-30 ‡‡	80%–120%	100% of kW rating with 5 sec. delay		2–10	
Load Shed Over Temperature †† (Activated by a High Coolant Temp. shutdown)	10	LOAD SHED OVER TEMPERATURE	RDO only					Not adjustable
Load Shed Underfrequency †	10	LOAD SHED UNDER FREQUENCY	RDO-31 †		59 Hz (60 Hz) 49 Hz (50 Hz)		5	Not adjustable

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Status Event or Fault	Refer to Menu	Digital Display	Relay Driver Output (RDO)	Range Setting	Default Selection	Inhibit Time Delay (sec.)	Time Delay (sec.)	User-Defined Settings
Locked Rotor Shutdown	10	LOCKED ROTOR						Not adjustable
Loss of ECM Communication (ECM only)	10	LOSS OF ECM COMM	RDO-26 *				4	Not adjustable
Loss of Field Shutdown §	10	SD LOSS OF FIELD						Not adjustable
Low Battery Voltage	10	LOW BATTERY VOLTAGE	RDO-12 (lead 62)	10–12.5 V (12 V) 20–25 V (24 V)	12 V (12 V) 24 V (24 V)	0	10	
Low Coolant Level (see D14) (with LCL switch) **								—
Low Coolant Temperature (see D03) **								—
Low Coolant Temperature Shutdown ††	10	LOW COOLANT TEMP SHUTDOWN						Not adjustable
Low Fuel (Level or Pressure) Warning (see D02) **								—
Low Fuel Pressure Shutdown (see D09) (125RZGGSG only)								—
(Low) Oil Pressure Shutdown	10	OIL PRESSURE SHUTDOWN	RDO-04 (lead 38)			30	5	Not adjustable
(Low) Oil Pressure Warning	10	OIL PRESSURE WARNING	RDO-07 (lead 41)			30		Not adjustable
Maintenance Due	10	MAINTENANCE DUE						Not adjustable
Master Not In Auto (Generator Set Switch)	10	MASTER NOT IN AUTO	RDO-09 (lead 80)					Not adjustable
Master Switch Error	10	MASTER SWITCH ERROR						Not adjustable
Master Switch to Off	10	MASTER SWITCH TO OFF						Not adjustable
Master Switch Open	10	MASTER SWITCH OPEN						Not adjustable
NFPA 110 Fault **	10	NFPA 110 FAULT	RDO-10 (lead 32)					Not adjustable
No Air Temperature Signal Warning ‡	10	NO AIR TEMP SIGNAL				30	4	Not adjustable
No Coolant Temperature Signal	10	NO COOL TEMP SIGNAL				30	4	Not adjustable
No Oil Pressure Signal	10	NO OIL PRESSURE SIGNAL				30	4	Not adjustable
No Oil Temperature Signal Warning ‡	10	NO OIL TEMP SIGNAL				30	4	Not adjustable
Overcrank Shutdown	8, 10	OVER CRANK	RDO-02 (lead 12)	0–6 Cycles	3 Cycles			
Overcurrent	10	OVER CURRENT			110%		10	Not adjustable

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Status Event or Fault	Refer to Menu	Digital Display	Relay Driver Output (RDO)	Range Setting	Default Selection	Inhibit Time Delay (sec.)	Time Delay (sec.)	User-Defined Settings
Over Current VR (voltage restraint) Shutdown§	10	SD OVER CURRENT VR						Not adjustable
Overfrequency Shutdown	7, 10	OVER FREQUENCY	RDO-28	102%–140%	110% Std. 103% FAA		10	
Over Power Shutdown §	10	SD OVER POWER			102% Stdby 112% Prime			Not adjustable
Overspeed Shutdown	7, 10	OVER SPEED	RDO-01 (lead 39)	65–70 Hz (60 Hz) 55–70 Hz (50 Hz)	70 (60 Hz) 70 (50 Hz)		0.25	
Overvoltage Shutdown	7, 8, 10	OVER VOLTAGE	RDO-20 (lead 26)	105%–135% of nominal	115% 2-sec time delay† 135% 10-sec time delay§		2–10	
Password (see Access Code)								—
Pre Lube Relay ‡	10	PRE LUBE RELAY	RDO-26 ‡				4	Not adjustable
Remote Reset (see D16)								—
Remote Shutdown (see D15)								—
Reverse Power Shutdown §	10	SD REVERSE POWER						Not adjustable
Speed Sensor Fault	10	SPEED SENSOR FAULT	RDO-24					Not adjustable
Starting Aid (see Time Delay Starting Aid)								—
System Ready	10		RDO-17 (lead 60)					Not adjustable
Time Delay Engine Cooldown (TDEC)	8, 10	DELAY ENG COOLDOWN	RDO-16 (lead 70C)	00:00–10:00 min:sec	5:00			
Time Delay Engine Start (TDES)	8, 10	DELAY ENG START		00:00–5:00 min:sec	00:01			
Time Delay Starting Aid	8, 10			0–10 sec.				
Underfrequency	7, 10	UNDER FREQUENCY	RDO-29 ‡	80%–97%	97% FAA 90%† 80%§		10	
Undervoltage Shutdown	7, 8, 10	UNDER VOLTAGE	RDO-27	70%–95%	85% 10-sec time delay† 70% 30-sec time delay§		5–30	
Variable Speed Governor (VSG) (see A06)								—
VAR/PF Mode (see D17)								—

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Status Event or Fault	Refer to Menu	Digital Display	Relay Driver Output (RDO)	Range Setting	Default Selection	Inhibit Time Delay (sec.)	Time Delay (sec.)	User-Defined Settings
Voltage Lower (see D18)								—
Voltage Raise (see D19)								—
Weak Battery	10	WEAK BATTERY			60% of nominal		2	

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