
INSTALLATION INSTRUCTIONS

Original Issue Date: 10/99

Model: 20-2000 kW Generator Sets Equipped With Digital Controllers

Market: Industrial


Subject: GM10980-KP1, Modbus Module Kit


Introduction

These instructions cover installation and technical operation of the Modbus communication module for generator set controllers. The Modbus module allows a host computer or Modbus master to obtain information from the generator set controller or Modbus slave using the Modbus communication protocol.

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.


WARNING

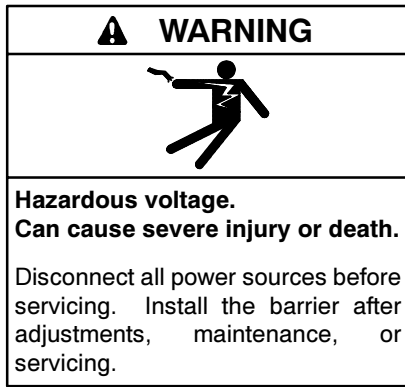


Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(600 volts and under)

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocutation 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.



(600 volts and under)

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 wristwatch, rings, and jewelry before servicing the equipment.

NOTICE

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

1. Specifications

The Modbus module has the following standard features.

- Monitor 20–2000 kW generator sets equipped with digital controllers by using industry-standard Modbus protocol.
- Modbus RTU (remote terminal unit) slave operation mode to maximize data throughput.
- DIP switches for selection of one of 31 Modbus addresses.
- RS-232 or RS-485 Modbus serial ports, baud rate selectable 9600 or 19200.
- Modbus connects to standard RJ11 telephone jacks.
- Serial communication to controller fixed at 9600 baud using RS-232 communication module.
- Operates from controller power supply or 10–30 VDC.
- Diagnostics LED and register for communication status and troubleshooting.
- Mounts within the generator set controller or generator junction box.
- Circuit board conformally coated for environmental protection.
- Temperature: –40° to 70°C (–40° to 158°F).
- Humidity: 5% to 95% noncondensing.
- Vibration: 5–10 Hz at 0.2 in. displacement and 100–200 Hz at 2 G's in 3 planes.
- Shock: 20 G's for 11 ms. in 3 planes.

2. Installation

Improper removal, installation, transportation, or storage can damage circuit boards containing sensitive electronic components. Observe the following guidelines when working with circuit boards or electronic components to avoid damage.

Circuit Board and Electronic Component Handling

- Store circuit boards or electronic components until installation in the anti-static, cushioned factory packaging in a clean environment away from moisture, vibration, static electricity, corrosive chemicals, solvents, and fumes.
- Disconnect all power sources before removing or installing circuit boards or electronic components.
- Wear an approved, grounded, anti-static wrist strap when handling circuit boards or electronic components.
- Carefully hold the circuit board by its edges and not by any of its components or electrical contacts.

- Do not bend or drop the circuit board, electronic components, or leads.
- Do not strike the circuit board or electronic components with a hard object.
- Clean a dusty or dirty circuit board with a vacuum cleaner or a dry brush.
- Except for the replacement of plug-in service parts, never attempt circuit board repairs or modifications.

2.1 Prepare the Module

1. Mount the Modbus module PCB assembly GM10937 on the mounting bracket GM10940 using 4 slotted round-head machine screws X-49-38. See Figure 2-1.
2. Connect the red, positive (+) and black, negative (-) DC power supply leads to the green terminal block H4 on the module. See Figure 2-1.
3. Set the DIP switches SW1, SW2, and SW3 on the Modbus module according to Figure 2-2, Figure 2-3, and Figure 2-4.

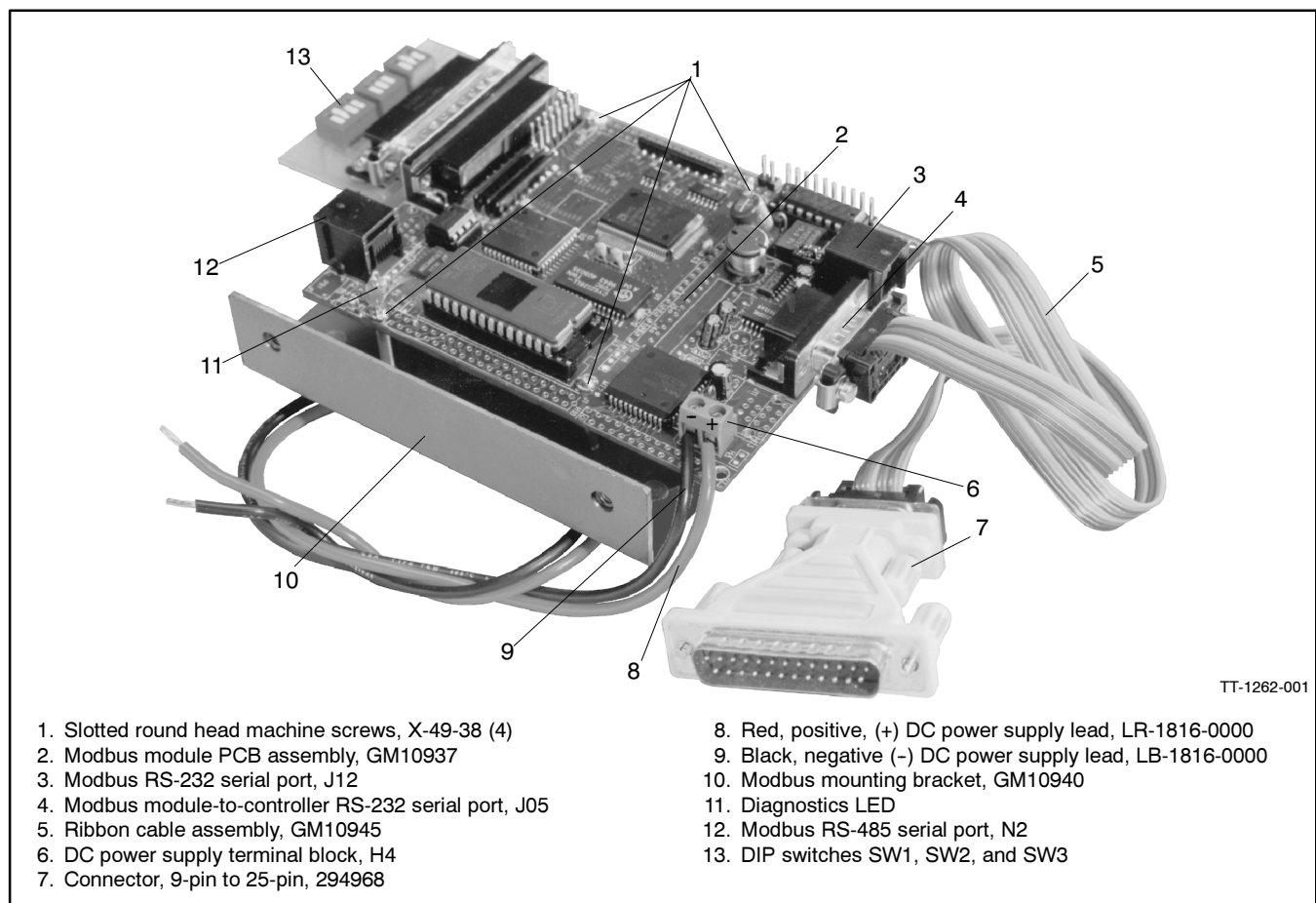


Figure 2-1 Modbus Module

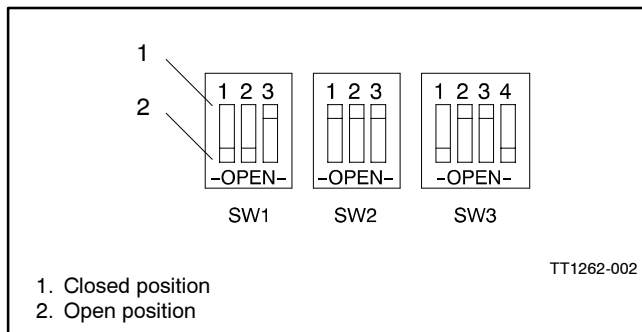


Figure 2-2 DIP Switches

SW1-			SW2-			SW3-			
1	2	3	1	2	3	1	2	3	4
O	C	Modbus Comm	A4 (16)	A3 (8)	A2 (4)	A1 (2)	A0 (1)	C	Modbus Baud

O = Open (0) , C = Closed (1)
 Modbus Comm: Open for RS-485, Closed for RS-232.
 A4-A0: Modbus slave address 1-31, A0 is LSB.
Note: Modbus slave address 0 is reserved.
 Modbus Baud: Open for 9600 baud, closed for 19200 baud.
Note: Communication from controller to Modbus module is fixed at 9600 baud.

Figure 2-3 Modbus Module DIP Switch Settings

Modbus Address	SW2			SW3	
	1	2	3	1	2
1	O	O	O	O	C
2	O	O	O	C	O
3	O	O	O	C	C
4	O	O	C	O	O
5	O	O	C	O	C
6	O	O	C	C	O
7	O	O	C	C	C
8	O	C	O	O	O
9	O	C	O	O	C
10	O	C	O	C	O
11	O	C	O	C	C
12	O	C	C	O	O
13	O	C	C	O	C
14	O	C	C	C	O
15	O	C	C	C	C
16	C	O	O	O	O
17	C	O	O	O	C
18	C	O	O	C	O
19	C	O	O	C	C
20	C	O	C	O	O
21	C	O	C	O	C
22	C	O	C	C	O
23	C	O	C	C	C
24	C	C	O	O	O
25	C	C	O	O	C
26	C	C	O	C	O
27	C	C	O	C	C
28	C	C	C	O	O
29	C	C	C	O	C
30	C	C	C	C	O
31	C	C	C	C	C

O = Open (0) , C = Closed (1)

Figure 2-4 DIP Switch Settings for Modbus Addresses

2.2 Mount and Connect the Module

1. Place the generator set master switch in the OFF position.
2. Disconnect power to the battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (-) lead first.
4. Remove the 5 screws that secure the controller enclosure cover and open the enclosure.
5. If the unit is equipped with a DDEC interface circuit board (DIB), perform the following steps. See Figure 2-5 and Figure 2-6.
 - a. Carefully pry the DIB away from each standoff on its mounting bracket.
 - b. Remove the DIB mounting bracket from the controller.
 - c. Install the DIB on the Modbus mounting bracket standoffs in the same manner it was installed on its old mounting bracket.
- d. Proceed to step 7.
6. If the unit is not equipped with a DDEC interface circuit board, carefully drill two mounting holes in the side panel of the controller. Do not allow metal chips to fall into the controller enclosure. Deburr holes and remove metal chips. See Figure 2-7.
7. Attach the Modbus module mounting bracket to the side of the controller using the two #4-40 x 0.500 in. slotted pan head machine screws, X-51-38. See Figure 2-8.
8. Connect the mating end of the ribbon cable assembly GM10945 to the module-to-controller RS-232 serial port J05. See Figure 2-1.
9. Remove the two screws at the top front of the controller to allow the front panel of the controller to swing down.
10. Connect the 9-pin to 25-pin connector 294968 between the loose mating end of the ribbon cable assembly and the RS-232 communication module installed on lower right of the inside of the controller's front panel. See Figure 2-8.

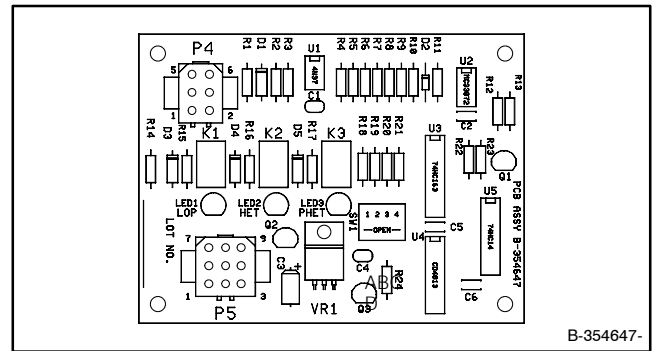


Figure 2-5 DDEC Interface Circuit Board (DIB)

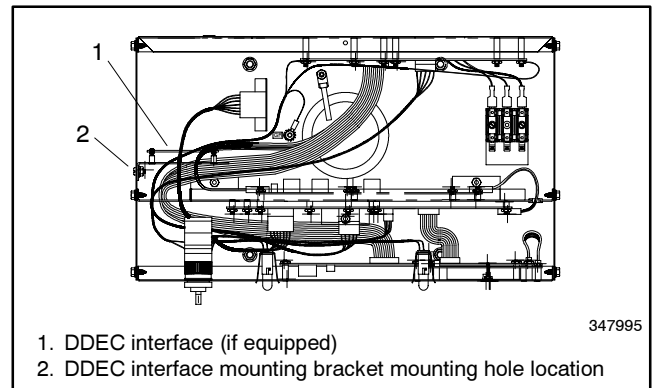


Figure 2-6 Top Controller View, DDEC Interface Circuit Board Installed

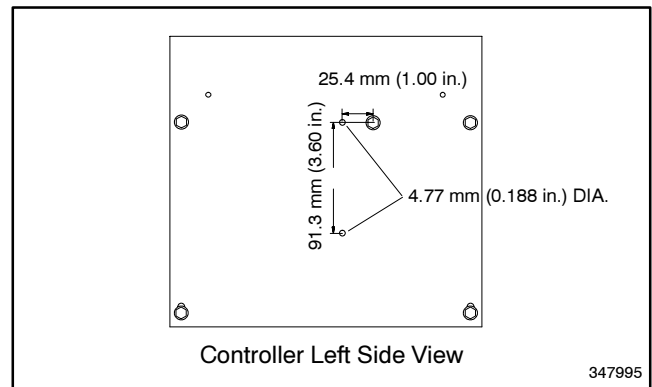


Figure 2-7 Mounting Hole Drill Pattern

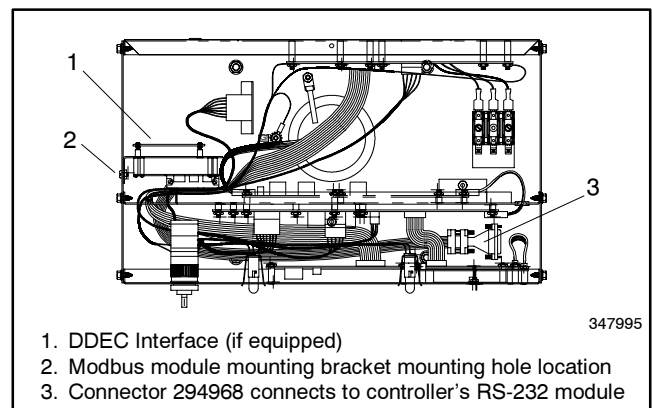


Figure 2-8 Top Controller View, Modbus Module Installed

11. Close the front panel of the enclosure and replace and tighten the four screws that hold the panel in place.
12. Remove the two screws at the top rear of the controller to allow the back panel of the controller to swing down.
13. Connect the red, positive (+) and black, negative (-) DC power supply leads from the Modbus module to the generator set controller terminal strip TB1. See Figure 2-9.
14. Connect the serial cables from the Modbus master to either the RS-232 serial port J12 or the RS-485 serial port N2 consistent with the serial communications mode. See Figure 2-9 for port pinouts. Maximum cable length for RS-232 connections is 15.2 m (50 ft.). Maximum cable length for RS-485 connections is 1220 m (4000 ft.). Use Belden 9842 2-pair, 4-conductor, full-shielded

twisted pair cable or equivalent for Modbus serial connections.

Note: Install communication conductors in raceways, cables, or conduit separate from AC power conductors.

15. Close the back panel of the enclosure and replace and tighten the four screws that hold the panel in place.
16. Replace the controller cover and replace and tighten the five screws that hold the cover in place.
17. Check that the generator master switch is in the OFF position.
18. Reconnect the generator set engine starting battery, negative (-) lead last.
19. Reconnect the power to the battery charger, if equipped.

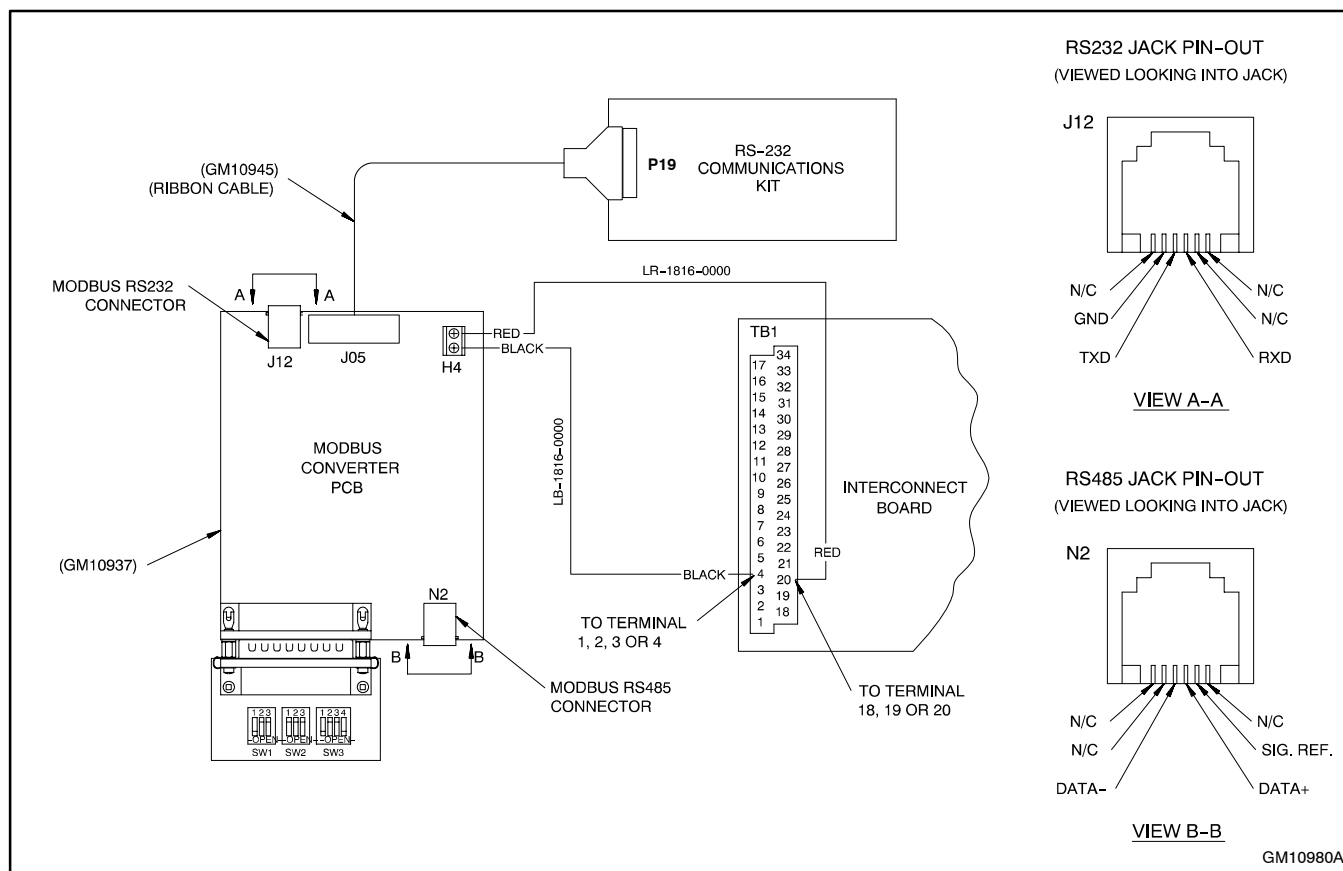


Figure 2-9 Wiring Diagram

2.3 Program the Controller

1. In the generator set controller's Programming Mode menu, set the Programming Mode to Local.
2. In the controller's Remote Control menu.
 - a. Select Online = Yes.
 - b. Select Remote Control Local = Yes.
 - c. Select Baud Rate = 9600.
3. In the controller's Programming Mode menu, set the Programming Mode to Local or Off, as it is not possible to program the controller remotely when the Modbus module is installed.

3. Technical Reference

Use the information in this section to apply the Modbus module in the application.

3.1 Communication

The Modbus protocol, initially developed by the Modicon Corporation, is a de facto industry communication standard. A complete discussion of the protocol such as data framing and error checking is beyond the scope of these instructions. See the applicable Modbus master application program documentation or other reliable technical information sources for Modbus protocol details.

The Modbus module communicates using the remote terminal unit (RTU) mode of the Modbus protocol and supports the Read Holding Registers command (command 03).

The Modbus module communicates with the connected device (generator set controller) using the device manufacturer's communication protocol. The Modbus module populates holding registers with data it has obtained from the device. An application program running on the Modbus master obtains device information by reading the Modbus module holding registers. The following sections indicate the type of data that can be read from each holding register.

3.2 Conventions

In the following sections all byte (8-bit) and word (16-bit) expressions are integers unless otherwise noted and are shown in decimal notation unless otherwise noted. Hexadecimal expressions begin with 0x. Characters are in the standard 8-bit ASCII character set and the first character starts in the low byte of the lowest holding register address. Unspecified bytes are undefined, such as the high (most significant) byte of holding registers that contain byte data in the low (least significant) byte.

3.3 Diagnostics

Diagnostic LED

A diagnostic LED is located on the Modbus module. See Figure 2-1. When the Modbus module initially receives power, the diagnostics LED lights during the module's internal boot sequence, turns off, then lights again and remains lit until the start of communication with the module by the Modbus master. When the Modbus master initiates communication with the module, the LED turns off, then lights if the communication was successful. If an error occurs, the LED remains off until the start of the next communication attempt when it lights again. Therefore, the diagnostics LED remains lit during successful communication.

If a generator set controller is connected to the Modbus module the diagnostics LED flashes twice during a 10-second interval when the setting of DIP switch SW1 is incorrect. A different number of flashes per second indicates an error condition.

Diagnostic Register (40001)

During normal system operation, Modbus Register 40001 provides diagnostic information. The register content is 0x0000 (zero) if the Modbus module is communicating normally with the connected device (generator set controller). The diagnostics register content changes to 0x0001 when the Modbus module loses communication with the device.

3.4 Software Revision Register (40300)

Modbus register 40300 provides the Modbus module software revision as a two-digit hexadecimal number in the lower byte. For example, register 40300 content is 0x10 indicates that the software revision is 1.0.

3.5 Generator Set Controller Data

Modbus Holding Register Mappings for Generator Set Controllers			
Parameter	Size	Type/Range/Units	Address
Status Summary			
Time	Word	min.	40002
Day of week	Byte (low)	0 = Sun, 3 = Mon, 6 = Tues, ...	40003
Month	Byte (low)	1-12	40004
Day	Byte (low)	1-31	40005
Year	Byte (low)	0-99	40006
Week	Byte (low)	1-5	40007
L1-to-L2 voltage	Word	VAC rms	40008
L2-to-L3 voltage	Word	VAC rms	40009
L3-to-L1 voltage	Word	VAC rms	40010
Frequency	Word	600 = 60.0 Hz	40011
L1-to-L0 voltage	Word	VAC rms	40012
L2-to-L0 voltage	Word	VAC rms	40013
L3-to-L0 voltage	Word	VAC rms	40014
System alert fault code	Byte (low)	See Section 3.6	40015
Engine speed	Word	RPM	40016
Coolant temperature	Word	°F	40017
Oil pressure	Byte (low)	PSI	40018
Battery voltage	Word	322 = 32.2 VDC	40019
L1 current	Word	A rms	40020
L2 current	Word	A rms	40021
L3 current	Word	A rms	40022
Power factor	Byte (low)	80 = 0.8 PF	40023
Total kW	Word	kW	40024
Percent max. kW	Word	978 = 97.8%	40025

Modbus Holding Register Mappings for Generator Set Controllers			
Parameter	Size	Type/Range/Units	Address
Flags			
Flag 1	Byte (low)	Bit 0-1 - Unused Bit 2 - Device Status 0 = Fault Reset 1 = Fault Set Bit 3 - Plant Exerciser 0 = Disabled 1 = Enabled Bit 4-5 - Programming Mode 00 = Off 01 = Remote 10 = Local Bit 6 - Unused Bit 7 - Controller ROM Version 0 = Version < 2.00 1 = Version >= 2.00	40033
Flag 2	Byte (low)	Bit 0-1 - Master Switch Position 00 = Open 01 = Auto 10 = Run 11 = Off Bit 2-3 - Generator Status 00 = Stopped 01 = Running 10 = Cranking Bit 4-5 - Programming Mode 00 = Off 01 = Remote 10 = Local Bit 6-7 - Starting Aid 00 = Off 01 = Run 10 = End	40034
Flag 3	Byte (low)	Bit 0 - Engine Start Bit 1 - Crank On Bit 2 - Crank Pause Bit 3 - Engine Cooldown Bit 4 - Engine Start Bit 5 - Crank On Bit 6 - Crank Pause Bit 7 - Engine Cooldown Engine Start: 00 = Off 01 = On 10 = End Crank On: 00 = Off 01 = On 10 = End Crank Pause: 00 = Off 01 = On 10 = End Engine Cooldown: 00 = Off 01 = On 10 = End	40035

Modbus Holding Register Mappings for Generator Set Controllers			
Parameter	Size	Type/Range/Units	Address
Flags, Continued			
Flag 4	Byte (low)	Bit 0 – Last Generator Run 0 = Unloaded 1 = Loaded Bit 1 – Auxiliary 1 Function 0 = Shutdown 1 = Warning Bit 2 – Auxiliary 2 Function 0 = Shutdown 1 = Warning Bit 3 – Auxiliary 3 Function 0 = Shutdown 1 = Warning Bit 4 – Auxiliary 4 Function 0 = Shutdown 1 = Warning Bit 5 – Unused Bit 6 – Connection 0 = Wye 1 = Delta Bit 7 – 1 or 3 Phase 0 = Single 1 = Three	40036
Setting Summary			
Engine start time	Word	sec.	40048
Crank on time	Word	sec.	40049
Crank pause time	Word	sec.	40050
Number of crank cycles	Byte (low)	NA	40051
Engine cooldown time	Word	sec.	40052
Overvoltage time	Word	sec.	40053
Undervoltage time	Word	sec.	40054
Starting aid time	Word	sec.	40055
Auxiliary 1 inhibit time	Word	sec.	40056
Auxiliary 1 delay time	Word	sec.	40057
Auxiliary 2 inhibit time	Word	sec.	40058
Auxiliary 2 delay time	Word	sec.	40059
Auxiliary 3 inhibit time	Word	sec.	40060
Auxiliary 3 delay time	Word	sec.	40061
Auxiliary 4 inhibit time	Word	sec.	40062
Auxiliary 4 delay time	Word	sec.	40063
Overvoltage value	Byte (low)	105-135%	40064
Undervoltage value	Byte (low)	70-95%	40065
Overfrequency value	Byte (low)	102-140% (Version >= 2.00 only)	40066
Underfrequency value	Byte (low)	80-98%	40067
Overspeed value	Byte (low)	55-70%	40068
Low battery voltage value	Byte (low)	100-250 (105 = 10.5 VDC)	40069
High battery voltage value	Word	145-330 (145 = 14.5 VDC)	40070
System voltage	Word	105-14600 VAC	40071
System frequency	Byte (low)	48-62 Hz.	40072
Kilowatt rating	Word	0-3000 kW	40073
Battery voltage	Byte (low)	12 or 24 VDC	40074

Modbus Holding Register Mappings for Generator Set Controllers			
Parameter	Size	Type/Range/Units	Address
Operational Summary			
Run time loaded, reset	1.5 Words (High, Mid, Low)	hrs.	40076
Run time unloaded, reset	1.5 Words (High, Mid, Low)	hrs.	40078
Days of operation, reset	Word	day	40080
Kilowatt-hours, reset	2 Words	kWh	40081
Number of starts, reset	Word	NA	40083
Start date, month, reset	Byte (low)	1-12	40084
Start date, day, reset	Byte (low)	1-31	40085
Start date, year, reset	Byte (low)	0-99	40086
Run time loaded, total	1.5 Words (High, Mid, Low)	hrs.	40087
Run time unloaded, total	1.5 Words (High, Mid, Low)	hrs.	40089
Days of operation, total	Word	day	40091
Kilowatt-hours, total	2 Words	kWh	40092
Number of starts, total	Word	NA	40094
Start date, month, total	Byte (low)	1-12	40095
Start date, day, total	Byte (low)	1-31	40096
Start date, year, total	Byte (low)	0-99	40097
Last start date, month	Byte (low)	1-12	40098
Last start date, day	Byte (low)	1-31	40099
Last start date, year	Byte (low)	0-99	40100
Last start time	Word	min.	40101
Duration of run	Word	min.	40102
Shutdown history #1, code	Byte (low)	See Section 3.6	40112
Shutdown history #1, month	Byte (low)	1-12	40113
Shutdown history #1, day	Byte (low)	1-31	40114
Shutdown history #1, year	Byte (low)	0-99	40115
Shutdown history #2, code	Byte (low)	See Section 3.6	40116
Shutdown history #2, month	Byte (low)	1-12	40117
Shutdown history #2, day	Byte (low)	1-31	40118
Shutdown history #2, year	Byte (low)	0-99	40119
Shutdown history #3, code	Byte (low)	See Section 3.6	40120
Shutdown history #3, month	Byte (low)	1-12	40121
Shutdown history #3, day	Byte (low)	1-31	40122
Shutdown history #3, year	Byte (low)	0-99	40123
Shutdown history #4, code	Byte (low)	See Section 3.6	40124
Shutdown history #4, month	Byte (low)	1-12	40125
Shutdown history #4, day	Byte (low)	1-31	40126
Shutdown history #4, year	Byte (low)	0-99	40127

Modbus Holding Register Mappings for Generator Set Controllers			
Parameter	Size	Type/Range/Units	Address
String Data			
Designation	9 Char, 5 Words	NA	40140
Load	20 Char, 10 Words	NA	40145
Location	20 Char, 10 Words	NA	40155
Model number	26 Char, 13 Words	NA	40165
Specification number	16 Char, 8 Words	NA	40178
Serial number	6 Char, 3 Words	NA	40186
Control Serial number	6 Char, 3 Words	NA	40189
User-Defined Functions Data			
Auxiliary 1 description	20 Char, 10 Words	NA	40204
Auxiliary 2 description	20 Char, 10 Words	NA	40214
Auxiliary 3 description	20 Char, 10 Words	NA	40224
Auxiliary 4 description	20 Char, 10 Words	NA	40234
Relay driver #1 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40264
Relay driver #2 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40265
Relay driver #3 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40266
Relay driver #4 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40267
Relay driver #5 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40268
Relay driver #6 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40269
Relay driver #7 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40270
Relay driver #8 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40271
Relay driver #9 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40272
Relay driver #10 code	Byte (low)	See Section 3.6 codes 0–27, 41,44, and 59	40273
Common fault #1 flag	Byte (low)	See Section 3.7	40274
Common fault #2 flag	Byte (low)	See Section 3.7	40275
Common fault #3 flag	Byte (low)	See Section 3.7	40276
Common fault #4 flag	Byte (low)	See Section 3.7	40277
Common fault #5 flag	Byte (low)	See Section 3.7	40278
Common fault #6 flag	Byte (low)	See Section 3.7	40279

3.6 Coded Byte Summary

The following tables summarize controller byte codes used by the controller to indicate various system conditions.

System History

System History Code Summary	
Code	Description
0	Defined common fault
1	Air damper
2	Overvoltage
3	Undervoltage
4	Underfrequency shutdown
5	Low coolant level
6	High oil temperature
7	Auxiliary 1
8	Auxiliary 2
9	Auxiliary 3
10	Auxiliary 4
11	Locked rotor
12	Internal error
13	EPS supplying load
14	Speed sensor fault
15	Load shed
16	KW overload
17	Underfrequency warning
18	High battery voltage
19	Coolant temperature signal loss
20	Oil pressure signal loss
21	Ground fault detected
22	Overcurrent
23	Time delay engine cooldown (TDEC) running
24	Time delay engine start (TDES) running
25	Generator running
26	NFPA 110 common alarm
27	Starting aid

Common Fault

Common Fault codes include System History codes 0–27 above and the following additional codes.

Common Fault Code Summary	
Code	Description
28	Low oil pressure shutdown
29	High coolant temperature shutdown
30	Overcrank
31	Overspeed
32	Emergency stop
33	Not in auto
34	System ready
35	Low battery voltage
36	Battery charger fault
37	Low fuel
38	High coolant temperature warning
39	Low oil pressure warning
40	Low coolant temperature
41	Weak battery
42	Load shed underfrequency
43	Load shed excess kW
44	Low AC output

System Alert Fault

System Alert fault codes are cleared at the controller with the Reset Menu Key. System Alert fault codes include the System History/Common Fault codes 0–44 above and the following additional codes:

System Alert Code Summary	
Code	Description
45	Overvoltage L1-L2
46	Overvoltage L2-L3
47	Overvoltage L3-L1
48	Overvoltage L1-L0
49	Overvoltage L2-L0
50	Overvoltage L3-L0
51	Undervoltage L1-L2
52	Undervoltage L2-L3
53	Undervoltage L3-L1
54	Undervoltage L1-L0
55	Undervoltage L2-L0
56	Undervoltage L3-L0
57	Master switch open
58	Power-down error
59	Overfrequency shutdown

3.7 Defined Common Fault Flag Summary

The following flag bits are set (1) when the condition corresponding to byte codes 1–44 or 59 in Section 3.6 is a component of the defined common fault signal, System History byte code 0.

Defined Common Fault Flag Summary	
Bit	Description
Common Fault Flag 1	
0	Air damper
1	Overvoltage
2	Undervoltage
3	Underfrequency shutdown
4	Low coolant level
5	High oil temperature
6	Auxiliary 1
7	Auxiliary 2
Common Fault Flag 2	
0	Auxiliary 3
1	Auxiliary 4
2	Locked rotor
3	Internal error
4	EPS supplying load
5	Speed sensor fault
6	Load shed
7	KW overload
Common Fault Flag 3	
0	Underfrequency warning
1	High battery voltage
2	Coolant temperature signal loss
3	Oil pressure signal loss
4	Ground fault detected
5	Overcurrent
6	Time delay engine cooldown (TDEC) running
7	Time delay engine start (TDES) running
Defined Common Fault Flag Summary, Continued	
Bit	Description
Common Fault Flag 4	
0	Generator running
1	NFPA 110 common alarm
2	Starting aid
3	Low oil pressure shutdown
4	High coolant temperature shutdown
5	Overcrank
6	Overspeed
7	Emergency stop

Common Fault Flag 5	
0	Not in auto
1	System ready
2	Low battery voltage
3	Battery charger fault
4	Low fuel
5	High coolant temperature warning
6	Low oil pressure warning
7	Low coolant temperature
Common Fault Flag 6	
0	Weak battery
1	Load shed under frequency
2	Load shed excess kW
3	Low AC output
4	Overfrequency shutdown

4. Parts List

GM10980-KP1

Parts List		
Kit: GM10980-KP1		
Qty.	Description	Part Number
1	PCB Assy, Modbus Converter	GM10937
1	Harness, 9-Pin Ribbon	GM10945
1	Bracket, PCB Mounting	GM10940
1	Lead	LB-1816-0000
1	Lead	LR-1816-0000
1	Connector, 9-pin to 25-pin	294988
2	Screw, slotted pan head machine, #8-32 x .375 in.	X-51-12
4	Screw, slotted round head machine, #4-40 x .500 in.	X-49-38