

Systems Operation Troubleshooting Testing and Adjusting

3516B Engine EMCP3

7RN1-Up (Engine)



Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "DANGER", "WARNING" or "CAUTION". The Safety Alert "WARNING" label is shown below.



The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

Operations that may cause product damage are identified by "NOTICE" labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. If a tool, procedure, work method or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that the product will not be damaged or be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Caterpillar dealers have the most current information available.



When replacement parts are required for this product Caterpillar recommends using Caterpillar replacement parts or parts with equivalent specifications including, but not limited to, physical dimensions, type, strength and material.

Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

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Testing and Adjusting

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Systems Operation Section

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General Information

SMCS Code: 4490

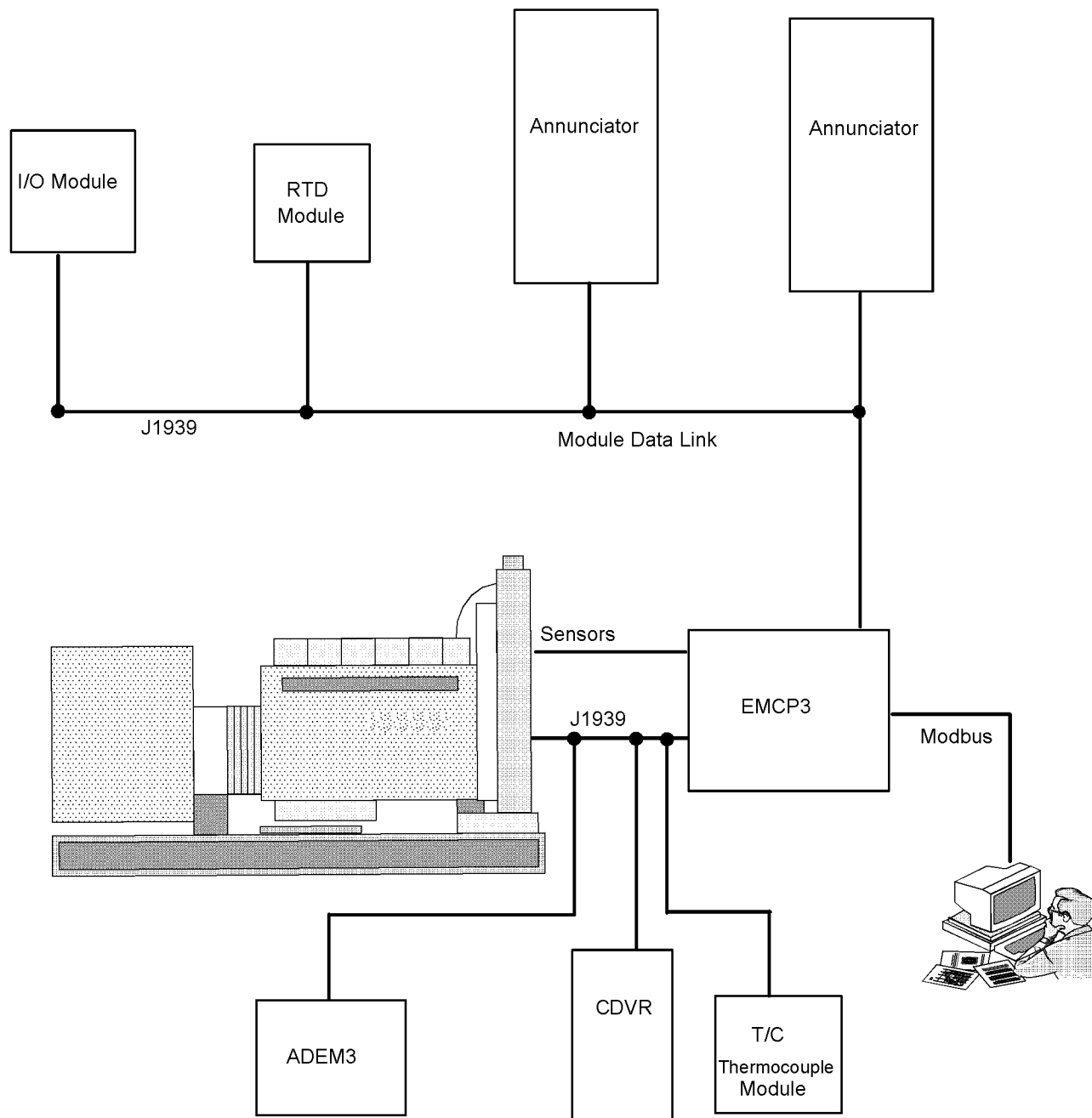


Illustration 1
Block diagram of a generator set with EMCP3 and ADEM 3 EUI Engine

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Note: The engine ECM (ADEM3) that is shown in illustration 1 is only present on EUI engines.

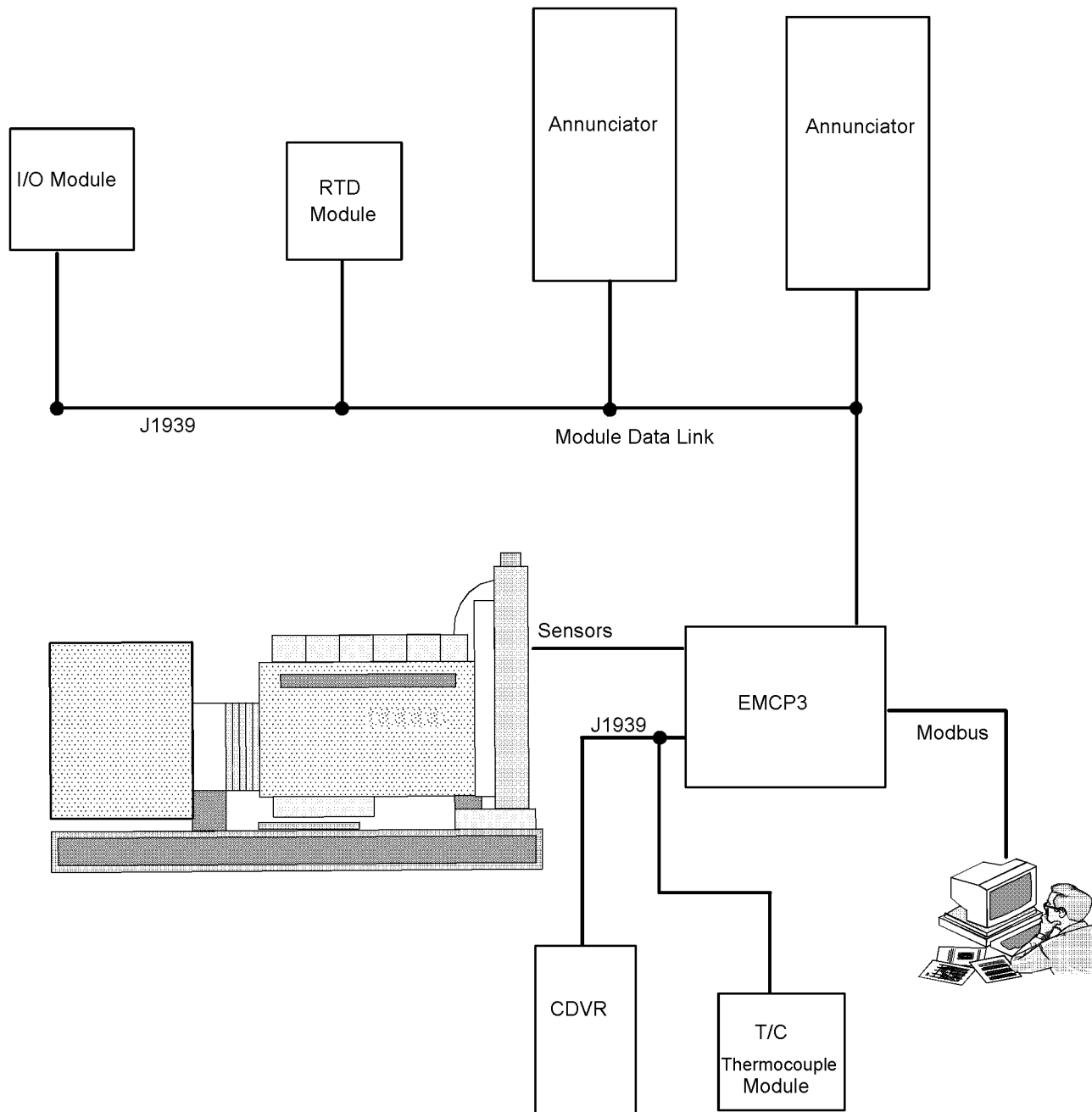


Illustration 2
Block diagram of a generator set with EMCP3 and MUI Engine

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Electronic Control Module (Generator Set)

SMCS Code: 4490

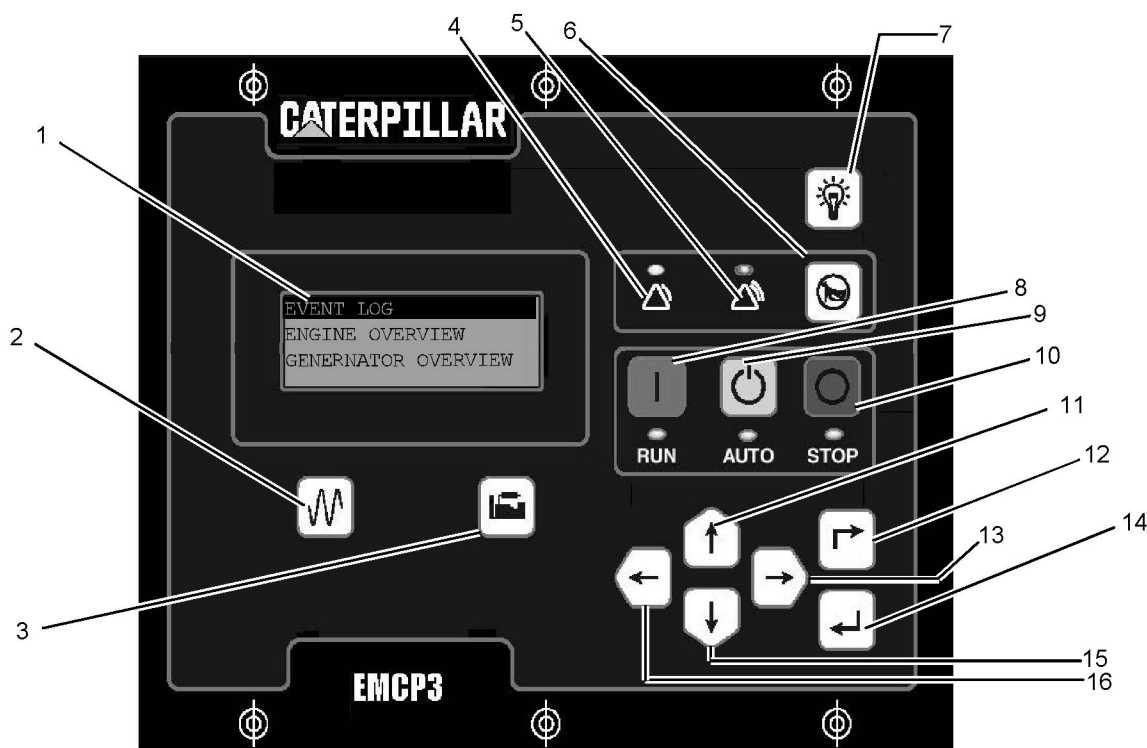


Illustration 3

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- (1) Display Screen
- (2) AC Overview Key
- (3) Engine Overview Key
- (4) Yellow Warning Lamp
- (5) Red Shutdown Lamp
- (6) Acknowledge/Horn Silence Key

- (7) Lamp Test Key
- (8) Run Key
- (9) Auto Key
- (10) Stop Key
- (11) Up Key
- (12) Escape Key

- (13) Right Key
- (14) Enter Key
- (15) Down Key
- (16) Left Key

Navigation Keys

AC Overview – The “AC Overview” key (2) will navigate the display to first screen of AC information. The “AC Overview” information contains various AC parameters that summarize the electrical operation of the generator set.

Engine Overview – The “Engine Overview” key (3) will navigate the display to the first screen of engine information. The “Engine Overview” information contains various engine parameters that summarize the operation of the generator set.

Lamp Test – Pressing and holding the “Lamp Test” key (7) will cause all of the LED’s and the display screen pixels to turn on solid until the key is released.

Alarm Acknowledgment Silence – Pressing the “Acknowledge” key (6) will cause the horn relay output to turn off and silence the horn. Pressing the key will also cause any yellow or red flashing lights to turn off or to become solid depending on the active status of the alarms. The “Acknowledge” key may also be configured to send out a “Global Alarm Silence” on “J1939 Data Link” which will silence horns on annunciators.

RUN – Pressing the “RUN” key (8) will cause the engine to enter the “RUN” mode.

AUTO – Pressing the “AUTO” key (9) will cause the engine to enter the “AUTO” mode.

STOP – Pressing the “STOP” key will cause the engine to enter the “STOP” mode.

Up – The “Up” (11) key is used to navigate up through the various menus or monitoring screens. The “Up” key is also used during setpoint entry. During numeric data entry the Up key is used in order to increment the digits (0-9). If the setpoint requires selection from a list, the “Up” key is used to navigate UP through the list.

Down – The “Down” key (15) is used to navigate down through the various menus or monitoring screens. The “Down” key is also used during setpoint entry. During numeric data entry the “Down” key is used in order to decrement the digits (0-9). If the setpoint requires selection from a list, the “Down” key is used to navigate DOWN through the list.

Left – The “Left” key (16) is used during setpoint adjustment. During numeric data entry, the “Left” key is used to choose which digit is being edited. The “Left” key is also used during certain setpoint adjustments to select or deselect a check box. If a box has a check mark inside the box, pressing the “Left” key will cause the check mark to disappear, disabling the function. If the box does not have a check mark inside the box, pressing the “Left” key will cause a check mark to appear, enabling the function.

Right – The “Right” key (13) is used during setpoint adjustment. During numeric data entry, the “Right” key is used to choose which digit is being edited. The “Right” key is also used during certain setpoint adjustments to select or deselect a check box. If a box has a check mark inside the box, pressing the “Right” key will cause the check mark to disappear, disabling the function. If the box does not have a check mark inside the box, pressing the “Right” key will cause a check mark to appear, Enabling the function.

Alarm Indicators

Yellow Warning Light – A flashing yellow light indicates that there are unacknowledged active warnings. A solid yellow light indicates that there are acknowledged warnings active. If there are any active warnings the yellow light will change from flashing yellow to solid yellow after the Alarm Acknowledge key is pressed. If there are no longer any active warnings, the yellow light will turn off after the “Acknowledge” key is pressed.

Red Shutdown Light – A flashing red light indicates that there are unacknowledged active shutdown events. A solid red light indicates that there are acknowledged shutdown events active. If there are any active shutdown events the red light will change from flashing red to solid red after the Alarm Acknowledge key is pressed. Any condition that has caused a shutdown event must be manually reset. If there are no longer any active shutdown events, the red light will turn off.

Digital Inputs

Note: There are 8 digital inputs on “EMCP 3.2” and “3.3”. There are 6 digital inputs on “EMCP 3.1.”

Digital Input #1 – Digital Input #1 is used for the emergency stop. This input should be wired to GROUND through an Emergency Stop switch. The input can be set to activate on an active high (normally closed contact) or an active low (normally open contact). Activating the emergency stop input will cause the generator set to stop immediately.

Digital Input #2 – Digital Input #2 is used for remotely starting and stopping the generator set. This input should be wired to GROUND through a Remote Initiate switch. The input can be set to activate on an active high (normally closed contact) or an active low (normally open contact). If the input is active and the engine mode switch is in AUTO, the engine will attempt to start and run. Once the input becomes inactive the engine will enter into cooldown (if programmed) and then stop.

The remainder of the inputs can be configured. The main purpose for the other “Digital Inputs” is to add additional monitoring capabilities of the parameters for the engine or generator. The inputs can be configured by going to the “Event Input Functions” parameter under the “Setpoints” menu. The “Digital Inputs” parameter can only be set to “Active High” or “Active Low” in order to initiate a High Warning, Low Warning, High Shutdown, Low Shutdown or Status.

The inputs can be set to:

Pressures

- Air Filter Differential Pressure
- Engine Oil Pressure
- Fire Extinguisher Pressure
- Fuel Filter Differential Pressure
- Oil Filter Differential Pressure
- Starting Air Pressure

Temperatures

- Ambient Air Temp
- Engine Coolant Temp
- Engine Oil Temp
- Exhaust Temp
- Right Exhaust Temp
- Left Exhaust Temp

Levels

- Engine Coolant Level
- Engine Oil Level
- Fuel Level
- Remote Fuel Level

Other

- Air Damper Closed
- ATS in Normal Position
- ATS in Emergency Position
- Battery Charger Failure
- Generator Breaker Closed
- Utility Breaker Closed
- Fuel Leak
- Generator Bearing #1 Temp
- Other #1
- Other #2
- Other #3
- Other #4
- Other #5

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Electrical Converter (Pulse Width Modulated) (For EUI Engines and PEEC Engines Only)

SMCS Code: 4490

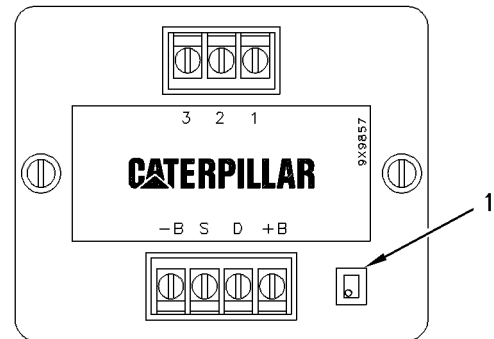


Illustration 4

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Analog to PWM Converter
(1) Droop potentiometer.

The electrical converter is used to change the analog signal of the speed potentiometer into a pulse width modulated signal. The engine electronics can now recognize the PWM signal. The electrical converter is mounted on the subpanel within the control panel.

The electrical converter continuously generates two PWM signals, speed and droop. The duty cycle of the speed cycle varies from 2 to 95% in proportion to the signal that is being received from the speed potentiometer. This is adjusted by the operator. The duty cycle of the droop signal varies from 2 to 95% in proportion to the signal that is being received from the droop potentiometer on the electrical converter. This is adjusted by the service personnel. The base frequency of the PWM signals are constant at 415 Hz to 528 Hz.

The electrical converter is supplied operating power at the terminals for the throttle position sensor. "B-" and "B+" is provided at the terminals. The terminal "1" is an input and the terminal connects to terminal "3" of the speed potentiometer. The terminal "2" is an input and the terminal connects to terminal "2" (wiper) of the speed potentiometer. The terminal "3" of the electrical converter is an input and the terminal connects to terminal "1" of the speed potentiometer. The terminal "S" of the electrical converter is an output and the terminal provides a speed signal to the engine electronic control. The terminal "D" of the electrical converter is an output and the terminal provides a droop signal to the engine electronic control.

Each of the 20 inputs have sensor diagnostics in order to detect open or short circuits that go to the thermocouple sensors. Overtemperature warnings and shutdowns, as well as undertemperature warnings are detected by comparing the measured temperature to the low warning and the high warning and the high shutdown temperature setpoints stored in the module. All of these diagnostic messages are broadcast on the "J1939" data link. The "EMCP3" controller reads these messages and annunciates and/or performs engine shutdown appropriately. Any of the inputs can be disabled to prevent unnecessary diagnostic faults."

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Thermocouple Module

SMCS Code:

General Information

The Thermocouple Module is capable of reading twenty inputs from "Type-J" or "Type-K" thermocouples. The Thermocouple Module is also capable of generating diagnostics. The diagnostics that are generated by the Thermocouple Module are maintained in non-volatile memory. Storing the diagnostics in non-volatile memory will make the diagnostics available following a power loss.

The thermocouple module will read the inputs and then calculates the temperature in "Celcius". The thermocouple module will then broadcast the information onto the "J1939" data link. The "EMCP3" will read the information from the thermocouple module and display the information on the display screen. This eliminates the need for a pyrometer or similar separate display unit.

Diagnostics

Table 2 shows the Thermocouple Module diagnostics.

The Thermocouple Module is capable of storing twenty diagnostics log entries. Each of the log entries have a format as shown in Table 1. The log can be viewed from the EMCP3.

Table 1

Diagnostic Log Entry Format Table	
Description	
Suspect Parameter Number (SPN) ⁽¹⁾	
Failure Mode Indicator (FMI) ⁽²⁾	
Time of Last Occurrence	
Date of Last Occurrence	
Time of First Occurrence	
Date of First Occurrence	
Engine Run Hours First Occurrence	
Engine Run Hours Last Occurrence	
Number of Occurrences	
Security to Clear Log Entry	

(1) Refer to Table 3 for possible code numbers.

(2) Refer to Table 2 for possible code numbers.

Table 2

Thermocouple Module Diagnostics - FMI Codes	
Description	FMI
Thermocouple Input Sensor #n Open Circuit	5
Thermocouple Input Sensor #n Short Circuit	4
Thermocouple Input #n High Temperature Warning	15
Thermocouple Input #n High Temperature Shutdown	0
Thermocouple Input #n Low Temperature Warning	17

Monitoring Features

The Thermocouple Module monitors twenty “Type-J” or “Type-K” thermocouple inputs. All monitored values are available on the communication link as read-only information. Temperatures are configured to indicate the “SAE J1939” Suspect Parameter Number (SPN) transmitted by each temperature input.

Each input is fully configurable and can be set to any one SPN that is listed in Table 3. The display units are selectable at the “EMCP3” controller as either Fahrenheit or Celcius.

Table 3 shows the SPNs that are available for configuration of temperature inputs.

Table 3

SPNs Available for Configuration of Temperature Inputs	
SPN	Description
172	Air Inlet Temperature

(continued)

(Table 3, contd)

1122	Alternator Bearing 1 Temperature
1123	Alternator Bearing 2 Temperature
1124	Alternator Winding 1 Temperature
1125	Alternator Winding 2 Temperature
1126	Alternator Winding 3 Temperature
171	Ambient Air Temperature
441	Auxiliary Temperature 1
442	Auxiliary Temperature 2
1800	Battery 1 Temperature
1801	Battery 2 Temperature
1212	Engine Auxiliary Coolant Temperature
110	Engine Coolant Temperature
52	Engine Intercooler Temperature
175	Engine Oil Temperature 1
1135	Engine Oil Temperature 2
1137	Exhaust Gas Port 1 Temperature
1138	Exhaust Gas Port 2 Temperature
1139	Exhaust Gas Port 3 Temperature
1140	Exhaust Gas Port 4 Temperature
1141	Exhaust Gas Port 5 Temperature
1142	Exhaust Gas Port 6 Temperature
1143	Exhaust Gas Port 7 Temperature
1144	Exhaust Gas Port 8 Temperature
1145	Exhaust Gas Port 9 Temperature
1146	Exhaust Gas Port 10 Temperature
1147	Exhaust Gas Port 11 Temperature
1148	Exhaust Gas Port 12 Temperature
1149	Exhaust Gas Port 13 Temperature
1150	Exhaust Gas Port 14 Temperature
1151	Exhaust Gas Port 15 Temperature
1152	Exhaust Gas Port 16 Temperature
1153	Exhaust Gas Port 17 Temperature
1154	Exhaust Gas Port 18 Temperature
1155	Exhaust Gas Port 19 Temperature
1156	Exhaust Gas Port 20 Temperature
173	Exhaust Gas Temperature
2434	Left Manifold Exhaust Gas Temperature
2433	Right Manifold Exhaust Gas Temperature
174	Fuel Temperature
105	Intake Manifold 1 Temperature

(continued)

(Table 3, contd)

1131	Intake Manifold 2 Temperature
1132	Intake Manifold 3 Temperature
1133	Intake Manifold 4 Temperature
1802	Intake Manifold 5 Temperature
1803	Intake Manifold 6 Temperature
1157	Main Bearing 1 Temperature (engine)
1158	Main Bearing 2 Temperature (engine)
1159	Main Bearing 3 Temperature (engine)
1160	Main Bearing 4 Temperature (engine)
1161	Main Bearing 5 Temperature (engine)
1162	Main Bearing 6 Temperature (engine)
1163	Main Bearing 7 Temperature (engine)
1164	Main Bearing 8 Temperature (engine)
1165	Main Bearing 9 Temperature (engine)
1166	Main Bearing 10 Temperature (engine)
1167	Main Bearing 11 Temperature (engine)
176	Turbo Oil Temperature
1172	Turbocharger 1 Compressor Inlet Temperature
1180	Turbocharger 1 Turbine Inlet Temperature
1184	Turbocharger 1 Turbine Outlet Temperature
1173	Turbocharger 2 Compressor Inlet Temperature
1181	Turbocharger 2 Turbine Inlet Temperature
1185	Turbocharger 2 Turbine Outlet Temperature
1174	Turbocharger 3 Compressor Inlet Temperature
1182	Turbocharger 3 Turbine Inlet Temperature
1186	Turbocharger 3 Turbine Outlet Temperature
1175	Turbocharger 4 Compressor Inlet Temperature
1183	Turbocharger 4 Turbine Inlet Temperature
1187	Turbocharger 4 Turbine Outlet Temperature

Configurability

The Thermocouple Module will remain fully functional during single setpoint configuration and while communicating through the communication link. The Thermocouple Module will also operate normally if the communication link is terminated.

All configured values and error codes are stored in non-volatile memory. When the Thermocouple Module is de-energized, all parameter values and error codes are retained.

The Thermocouple Module is configured by using the Caterpillar service Tool on the primary data link. This can be accessed by plugging into the service connector on the side of the engine. The primary data link can also be accessed by plugging into the "CAN1" connector inside the control enclosure. This service tool has the capability to configure any settable parameter. Each thermocouple's input has the configuration parameters that are shown in Table 4.

Table 4

Configuration Parameters for Each Input		
Description	Default Value	Range
Input #n – Suspect Parameter Number (SPN)	0	Any SPN listed in Table 3
Input #n - Type	Not Installed	Not Installed Type-J Type-K
Input #n – High Temperature Shutdown Threshold	95	Range = 0 to 1735 C
Input #n – High Temperature Warning Threshold	85	Range = 0 to 1735 C
Input #n – Low Temperature Warning Threshold	-200	Range = -200 to 800 C
Input #n – High Temperature Shutdown Delay Time	1	Range = 0 to 120 seconds
Input #n – High Temperature Warning Delay Time	1	Range = 0 to 120 seconds
Input #n – Low Temperature Warning Delay Time	1	Range = 0 to 120 seconds

Specifications

- Only “Type-J” and “Type-K” thermocouples can be used with the Thermocouple Module.
- The operating voltage range is 9 VDC to 32 VDC. The nominal voltage is 12 - 24 VDC. The overvoltage capability is 32 VDC for one hour at 85 °C (185 °F).
- The ambient operating temperature range is –40 °C (–40 °F) to 120 °C (248 °F). If the ambient temperatures exceed 85 °C (185 °F), the Thermocouple Module may deviate in accuracy +/- 1°C. If the ambient temperature exceeds 120 °C (248 °F), the Thermocouple Module may not return to proper operation.
- The ambient storage temperature is –50 °C (–58 °F) to 125 °C (257 °F).

Inputs

The Discrete I/O Module has twelve inputs with four return channels. Each of the inputs can be configured to signal one of many possible event ID's. The Caterpillar Service Tool is used to configure the Discrete I/O Module inputs.

Inputs that generate a warning message will auto-reset whenever the input returns to a non-active state. Inputs that generate a shutdown message will continue until the input returns to a non-active state and a reset message is received on the J1939 Data Link.

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Discrete Input/Output Module

SMCS Code:

General Information

The Discrete Input/Output (I/O) Module is a module capable of reading twelve discrete inputs. The Discrete I/O Module is capable of setting eight relay outputs. The Discrete I/O Module can be mounted on the genset package or can be mounted remote from the genset package.

Table 5

Configuration Parameters for Each Input		
Setpoint Parameter	Range	Default
Input #nn Active State Configuration	Active Low Active High	Active State Low
Input #nn Time Delay	120 sec	0 sec
Input #nn Suspect parameter Number (SPN)	Any SPN listed in Table 7	N/A
Input #nn Failure Mode Identifier (FMI)	Any FMI listed in Table 6	N/A

Table 6

Failure Mode Identifier (FMI) Codes for Inputs	
FMI Number	Description
0	High Shutdown
1	Data Valid but Below Normal Operational Range - Most Severe Level
15	High Warning
17	Low Warning
31 ⁽¹⁾	Condition Exists

⁽¹⁾ Use of this Selection is limited.

Table 7

Supported SPNs			
SPN	SPN Description	Input	Output
38	Fuel Level-Secondary Tank	X	X
82	Starting Air Pressure		X
94	Fuel Press		X
95	Fuel Filter Differential Pressure		X
96	Fuel Level (Primary Tank)	X	X
98	Engine Oil Level		X
99	Oil Filter Differential Pressure		X
100	Engine Oil Pressure		X
101	Crankcase Pressure		X
107	Air Filter Differential Pressure		X
110	Engine Coolant Temperature		X

(continued)

(Table 7, contd)

Supported SPNs			
SPN	SPN Description	Input	Output
111	Engine Coolant Level	X	X
137	Extiguisher System Press	X	X
168	Battery Voltage		X
171	Ambient Air Temperature		X
172	Inlet Air Temperature		X
173	Exhaust Temperature		X
174	Fuel Temp		X
175	Engine Oil Temperature		X
190	Engine Overspeed		X
970	Emergency Stop Shutdown		X
1122	Generator Bearing Temperature #1		X
1124	Generator Winding Temperature #1		X

(continued)

(Table 7, contd)

Supported SPNs			
SPN	SPN Description	Input	Output
1125	Generator Winding Temperature #2		X
1126	Generator Winding Temperature #3		X
1237	Emergency Shutdown Override Mode Active Warning	X	X
1239	Ruptured Fuel Basin-Primary Tank	X	X
1664	Engine Failure to Start Shutdown		X
2436	Generator Frequency		X
2440	Generator Voltage		X
2456	Generator Reactive Power (VAR)		X
2448	Generator AC Current		X
2452	Generator Reverse Power (kW)		X
628	Voltage Regulator Failure		X
2648	Service Interval Warning		X
4000	Air Shutoff Damper Close	X	X
4001	ATS in Normal Position	X	X
4002	Gen Supplying Load	X	X
4003	Battery Charger Failure	X	X
4004	Gen Breaker Closed	X	X
4005	Utility Breaker Closed	X	X
4006	Engine in Cooldown		X

(continued)

(Table 7, contd)

Supported SPNs			
SPN	SPN Description	Input	Output
4007	Generator Control Not in Auto		X
4008	Unexpected Engine Shutdown		X
User Defined Input #1	Range 701-716	X	
User Defined Input #2	Range 701-716	X	
User Defined Input #3	Range 701-716	X	
User Defined Input #4	Range 701-716	X	
User Defined Input #5	Range 701-716	X	
User Defined Input #6	Range 701-716	X	
User Defined Input #7	Range 701-716	X	
User Defined Input #8	Range 701-716	X	
User Defined Input #9	Range 701-716	X	
User Defined Input #10	Range 701-716	X	
User Defined Input #11	Range 701-716	X	
User Defined Input #12	Range 701-716	X	

Outputs

The Discrete I/O Module has eight relay outputs. Each output can be configured to signal one of many possible Event ID's. The Caterpillar Service Tool is used to configure the Discrete I/O Module outputs. Each output can be configured for either general or specific events.

For general events, each output activates whenever any "Alarm Condition", "Shutdown Condition", or "Alarm and/or Shutdown Condition " exists.

For specific events, each output activates when the diagnostic message contains the SPN and FMI combination that matches the SPN and FMI combination that is programmed for that particular output. This includes events such as High or Low alarms, Shutdowns, or Condition Exists.

Configurability

The Discrete I/O Module maintains functionality (with no loss in performance) during single setpoint configuration and while communicating through the communications link. The Discrete I/O Module retains all configured values in non-volatile memory.

The Discrete I/O Module is configured by using the Caterpillar service Tool on the accessory data link. The accessory data link can also be accessed by plugging into the "CAN2" connector inside the control enclosure. This service tool has the capability to configure any settable parameter.

Specifications

The operating voltage range is 9 VDC to 32 VDC. The nominal voltage is 12 VDC or 24 VDC (external power supplies). The I/O Module has a maximum current draw of 400 mA (+50mA per energized relay at 12 VDC). The output relay contacts are rated for 2A @ 277 VAC, 5A @120 VAC and 5A @ 30 VDC.

The ambient operating temperature is -40°C to 70°C..

i02014957

Resistive Temperature Device Module

SMCS Code:

General Information

The Resistive Temperature Device (RTD) Module is a temperature scanner capable of reading eight Platinum RTD inputs. The eight Platinum RTD inputs can have two, three, or four-wire configurations. The RTD Module is also capable of generating diagnostics. The diagnostics that are generated by the RTD Module are maintained in non-volatile memory. Storing the diagnostics in non-volatile memory will make the diagnostics available following a power loss.

The Resistive Temperature Device (RTD) Module will read the inputs and then calculates the temperature in "Celcius". The RTD Module will then broadcast the information onto the "J1939" data link. The "EMCP3" will read the information from the RTD Module and display the information on the display screen.

Diagnostics

The RTD Module is capable of storing the twenty diagnostic log entries. Each of the log entries have a format as shown in Table 8. The log can be viewed from the EMCP3.

Each of the 8 inputs have sensor diagnostics in order to detect open or short circuits that go to the RTD sensors. Overtemperature warnings and Shutdowns as well as Undertemperature warnings are detected by comparing the measured temperature to the Low Warning, the High Warning, the High Shutdown temperatures stored in the module. All of these diagnostic messages are broadcast on the "J1939" data link. The "EMCP3" controller reads these messages and annunciates and/or performs engine shutdown appropriately. any of the inputs can be disabled in order to prevent unnecessary diagnostic faults.

Table 8

Diagnostic Log Entry Format Table	
Description	
Suspect Parameter Number (SPN) ⁽¹⁾	
Failure Mode Indicator (FMI) ⁽²⁾	
Time of Last Occurrence	
Date of Last Occurrence	
Time of First Occurrence	
Date of First Occurrence	
Engine Run Hours First Occurrence	
Engine Run Hours Last Occurrence	
Number of Occurrences	
Security to Clear Log Entry	

(1) See Table 10 for possible code numbers.

(2) See Table 9 for possible code numbers.

Table 9 shows the RTD Module diagnostics.

Table 9

RTD Module Diagnostics - FMI Codes	
Description	FMI
RTD Input Sensor #n Open Circuit	5
RTD Input Sensor #n Short Circuit	4
RTD Input #n High Temperature Warning	15
RTD Input #n High Temperature Shutdown	0
RTD Input #n Low Temperature Warning	17

Monitoring Features

The RTD Module monitors eight Platinum RTD inputs. All monitored values are available on the communication link as read-only information. Temperatures are configured to indicated the SAE J1939 Suspect Parameter Number (SPN) transmitted by each temperature input.

Each input is fully configurable and can be set to any one SPN that is listed in Table 10. The display units are selectable at the "EMCP3" controller as either Fahrenheit or Celcius.

Table 10 shows the SPNs that are available for configuration of temperature inputs.

Table 10

SPNs Available for Configuration of Temperature Inputs	
SPN	Description
172	Air Inlet Temperature
1122	Alternator Bearing 1 Temperature

(continued)

(Table 10, contd)

1123	Alternator Bearing 2 Temperature
1124	Alternator Winding 1 Temperature
1125	Alternator Winding 2 Temperature
1126	Alternator Winding 3 Temperature
171	Ambient Air Temperature
441	Auxiliary Temperature 1
442	Auxiliary Temperature 2
1800	Battery 1 Temperature
1801	Battery 2 Temperature
1212	Engine Auxiliary Coolant Temperature
110	Engine Coolant Temperature
52	Engine Intercooler Temperature
175	Engine Oil Temperature 1
1135	Engine Oil Temperature 2
1137	Exhaust Gas Port 1 Temperature
1138	Exhaust Gas Port 2 Temperature
1139	Exhaust Gas Port 3 Temperature
1140	Exhaust Gas Port 4 Temperature
1141	Exhaust Gas Port 5 Temperature
1142	Exhaust Gas Port 6 Temperature
1143	Exhaust Gas Port 7 Temperature
1144	Exhaust Gas Port 8 Temperature
1145	Exhaust Gas Port 9 Temperature
1146	Exhaust Gas Port 10 Temperature
1147	Exhaust Gas Port 11 Temperature
1148	Exhaust Gas Port 12 Temperature
1149	Exhaust Gas Port 13 Temperature
1150	Exhaust Gas Port 14 Temperature
1151	Exhaust Gas Port 15 Temperature
1152	Exhaust Gas Port 16 Temperature
1153	Exhaust Gas Port 17 Temperature
1154	Exhaust Gas Port 18 Temperature
1155	Exhaust Gas Port 19 Temperature
1156	Exhaust Gas Port 20 Temperature
173	Exhaust Gas Temperature
2434	Left Manifold Exhaust Gas Temperature
2433	Right Manifold Exhaust Gas Temperature
174	Fuel Temperature
105	Intake Manifold 1 Temperature

(continued)

(Table 10, contd)

1131	Intake Manifold 2 Temperature
1132	Intake Manifold 3 Temperature
1133	Intake Manifold 4 Temperature
1802	Intake Manifold 5 Temperature
1803	Intake Manifold 6 Temperature
1157	Main Bearing 1 Temperature (engine)
1158	Main Bearing 2 Temperature (engine)
1159	Main Bearing 3 Temperature (engine)
1160	Main Bearing 4 Temperature (engine)
1161	Main Bearing 5 Temperature (engine)
1162	Main Bearing 6 Temperature (engine)
1163	Main Bearing 7 Temperature (engine)
1164	Main Bearing 8 Temperature (engine)
1165	Main Bearing 9 Temperature (engine)
1166	Main Bearing 10 Temperature (engine)
1167	Main Bearing 11 Temperature (engine)
176	Turbo Oil Temperature
1172	Turbocharger 1 Compressor Inlet Temperature
1180	Turbocharger 1 Turbine Inlet Temperature
1184	Turbocharger 1 Turbine Outlet Temperature
1173	Turbocharger 2 Compressor Inlet Temperature
1181	Turbocharger 2 Turbine Inlet Temperature
1185	Turbocharger 2 Turbine Outlet Temperature
1174	Turbocharger 3 Compressor Inlet Temperature
1182	Turbocharger 3 Turbine Inlet Temperature
1186	Turbocharger 3 Turbine Outlet Temperature
1175	Turbocharger 4 Compressor Inlet Temperature
1183	Turbocharger 4 Turbine Inlet Temperature
1187	Turbocharger 4 Turbine Outlet Temperature

Configurability

The RTD Module will remain fully functional during single setpoint configuration and while communicating through the communication link. The RTD Module will also operate normally if the communication link is terminated.

All configured values and error codes are stored in non-volatile memory. When the RTD Module is de-energized, all parameter values and error codes are retained.

The RTD Module is configured by using the Caterpillar service Tool on the accessory data link. The accessory data link can also be accessed by plugging into the "CAN2" connector inside the control enclosure. This service tool has the capability to configure any settable parameter. Each RTD's input has the configuration parameters that are shown in Table 11.

Table 11

Configuration Parameters for Each Input		
Description	Default Value	Range
Input #n – Suspect Parameter Number (SPN)	0	Any SPN that is listed in Table 10
Input #n - RTD Temperature Coefficient Configuration	IEC	IEC Platinum (0.00385) JIS Platinum (0.003916) US Platinum (0.003902) Legacy US Platinum (0.003920) SAMA Platinum (0.003923)
Input #n – RTD Sensor Type	Disabled	Not Installed 2-wire RTD 3-wire RTD 4-wire RTD
Input #n – High Temperature Shutdown Threshold	95	Range = 0 to 1735 °C
Input #n – High Temperature Warning Threshold	85	Range = 0 to 1735 °C
Input #n – Low Temperature Warning Threshold	-200	Range = -200 to 800 °C
Input #n – High Temperature Shutdown Delay Time	1	Range = 0 to 120 seconds
Input #n – High Temperature Warning Delay Time	1	Range = 0 to 120 seconds
Input #n - Low Temperature Warning Delay Time	1	Range = 0 to 120 seconds

Specifications

i02014506

- The operating voltage range is 9 VDC to 32 VDC. The nominal voltage is 12 - 24 VDC. The overvoltage capability is 32 VDC for one hour at 85 °C (185 °F).
- The ambient operating temperature range is –40 °C (–40 °F) to 120 °C (248 °F). If the ambient temperatures exceed 85 °C (185 °F), the RTD Module may deviate in accuracy +/- 1°C. If the ambient temperature exceeds 120 °C (248 °F), the RTD Module may not return to proper operation.
- The ambient storage temperature is –50 °C (–58 °F) to 125 °C (257 °F).

Annunciator Module

SMCS Code:

General Information

The EMCP3 Annunciator Module is used to indicate various system events and status conditions. The Annunciator Module uses indicator lights and an audible horn to give the operator information about the current status of the system. The Annunciator Module can be used to announce faults and/or status signals to the operator. The Annunciator Module also allows the operator to silence the horn or acknowledge faults to the system.

There are seventeen pair of LEDs on the annunciator's front panel. Sixteen pair of LEDs are used to announce events, diagnostics, and ready signals. The seventeenth pair of LEDs is used as a combined network/module status LED. The seventeenth pair of LEDs can tell the operator if there is a problem with the J1939 data link connection.

Basic Operation

Each pair of LEDs on the annunciator consists of two of the following three colors: green, yellow, and red. For example, a pair of red and yellow LEDs may be configured for Engine Oil Pressure. If a low engine oil pressure Warning is read over the data link, the Annunciator will flash the Yellow LED and the siren will sound. If the low engine oil pressure Shutdown is read over the data link, the Annunciator will flash the Red LED and the siren will sound.

To acknowledge the Shutdown and Alarm conditions, press the “Alarm Acknowledge” button that is located near the middle of the Annunciator.

To test the LEDs, test the horn, or silence the horn when the data link is connected or disconnected, hold in the “Lamp Test” button that is located near the top of the Annunciator.

Configuration

The Annunciator Module can be customized to signal many different conditions related to the system. The data link parameters that are supported are shown in Table 12. The parameters that are shown in Table 12 are in the form of J1939 Suspect Parameter Numbers (SPN).

Each LED pair must be configured by using the appropriate service tool. Once the service tool has been connected to the Annunciator, the user must enter the “Configuration” screen. Each LED pair has four settings: SPN, Trigger Type, Trigger Severity Level, and Failure Mode Identifier (FMI).

SPN

Choose the SPN from Table 12.

Trigger Type

The Trigger Type may be set as Disabled, General Event, or Specific Event.

Disabled – Disabling the Trigger Type disables the LED pair. When disabled, the LED pair will not respond to any data link message.

General Event – If General Event is chosen, the SPN does not matter. General Event is used when it is desired that the LED pair illuminate for any Warning, Shutdown, High, or Low.

Specific Event – Specific Event is used when the LED pair is to be associated with a specific system parameter such as oil pressure or coolant temperature.

Trigger Severity Level

The Trigger Severity Level defines how the LED pair will behave when a message associated with the programmed SPN is received (or not received).

Table 12

Supported SPNs	
SPN Description	SPN
Aftercooler Temperature	52
Starting Air Pressure	82
Fuel Filter Differential Pressure	95
Fuel Level (Local Tank)	96
Engine Oil Level	98
Oil Filter Differential Pressure	99
Engine Oil Pressure	100
Crankcase Pressure	101
Air Filter Differential Pressure	107
Altitude	108
Engine Coolant Temperature	110
Engine Coolant Level	111
Battery Voltage (switched)	158
Battery Voltage	168
Ambient Air Temperature	171
Inlet Air Temperature	172
Exhaust Temperature	173
Engine Oil Temperature	175
Engine Speed	190
Primary Data Link (J1939 #1)	639
Auxiliary I/O #1	701
Auxiliary I/O #2	702
Auxiliary I/O #3	703
Auxiliary I/O #4	704
Auxiliary I/O #5	705
Auxiliary I/O #6	706
Auxiliary I/O #7	707
Auxiliary I/O #8	708
Auxiliary I/O #9	709
Auxiliary I/O #10	710
Auxiliary I/O #11	711

(continued)

(Table 12, contd)

Supported SPNs	
SPN Description	SPN
Auxiliary I/O #12	712
Auxiliary I/O #13	713
Auxiliary I/O #14	714
Auxiliary I/O #15	715
Auxiliary I/O #16	716
Emergency Stop Shutdown	970
Generator Bearing Temperature #1	1122
Generator Bearing Temperature #2	1123
Generator Winding Temperature #1	1124
Generator Winding Temperature #2	1125
Generator Winding Temperature #3	1126
Exhaust Gas Port 1 Temperature	1137
Exhaust Gas Port 2 Temperature	1138
Exhaust Gas Port 3 Temperature	1139
Exhaust Gas Port 4 Temperature	1140
Exhaust Gas Port 5 Temperature	1141
Exhaust Gas Port 6 Temperature	1142
Exhaust Gas Port 7 Temperature	1143
Exhaust Gas Port 8 Temperature	1144
Exhaust Gas Port 9 Temperature	1145
Exhaust Gas Port 10 Temperature	1146
Exhaust Gas Port 11 Temperature	1147
Exhaust Gas Port 12 Temperature	1148
Exhaust Gas Port 13 Temperature	1149
Exhaust Gas Port 14 Temperature	1150

(continued)

(Table 12, contd)

Supported SPNs	
SPN Description	SPN
Exhaust Gas Port 15 Temperature	1151
Exhaust Gas Port 16 Temperature	1152
Exhaust Gas Port 17 Temperature	1153
Exhaust Gas Port 18 Temperature	1154
Exhaust Gas Port 19 Temperature	1155
Exhaust Gas Port 20 Temperature	1156
Accessory Data Link Fault (J1939 #2)	1231
Emergency Shutdown Override Mode Active Warning	1237
Engine Failure to Start Shutdown	1664
Right Exhaust Temperature	2433
Left Exhaust Temperature	2434
Generator Frequency	2436
Generator AC Voltage	2440
Generator AC Current	2448
Generator Real Power (kW)	2452
Generator Reactive Power (kVAr)	2456
Service Interval Warning	2648
Unexpected Engine Shutdown	
Generator Control Not in Automatic Warning	
Battery Charger Failure	
Air Damper Closed	
Fuel Tank Leak	
Loss of Utility	
ATS in Normal Position	
ATS in Emergency Position	
SCADA Data Link Fault	

(continued)

(Table 12, contd)

Supported SPNs	
SPN Description	SPN
Generator Breaker Failure to Open	
Generator Breaker Failure to Close	
Fuel Level (Remote Tank)	
Fire Extinguisher Pressure	
Failure to Transfer Warning	
Failure to Transfer Shutdown	
Utility Breaker Failure to Open	
Utility Breaker Failure to Close	
Spare Fault #1	
Spare Fault #2	
Spare Fault #3	
Spare Fault #4	
Spare Fault #5	
Spare Fault #6	
Spare Fault #7	
Spare Fault #8	
Spare Fault #9	
Spare Fault #10	
Spare Fault #11	
Spare Fault #12	

Table 13

Failure Mode Identifier (FMI) Codes	
FMI Number	Description
0	Data Valid but Above Normal Operational Range - Most Severe Level
1	Data Valid but Below Normal Operational Range - Most Severe Level
2	Data Erratic, Intermittent or Incorrect
3	Voltage Above Normal or Shorted to High Source
4	Voltage Below Normal or Shorted to Low Source
5	Current Below Normal or Grounded Circuit
6	Current Above Normal or Grounded Circuit
7	Mechanical System Not Responding or Out of Adjustment
8	Abnormal Frequency, Pulse Width or Period
9	Abnormal Update Rate
10	Abnormal Rate of Change
11	Root Cause Not Known
12	Bad Intelligent Device or Component
13	Out of Calibration
14	Special Instructions
15	Data Valid But Above Normal Operating Range - Least Severe Level
16	Data Valid But Above Normal Operating Range - Moderately Severe Level
17	Data Valid But Below Normal Operating Range - Least Severe Level
18	Data Valid But Below Normal Operating Range - Moderately Severe Level
19	Received Network Data In Error
31	Not Available or Condition Exists

i01996622

Data Link

SMCS Code: 4490

Data Links

The EMCP3 has up to three different data links:

- Two (2) CAN 2.0
- An isolated RE-485

All the data links are protected up to 5 kV direct ESD. The "EMCP3.1" will have only a single CAN 2.0 data link. The "EMCP3.2" and "EMCP3.3" will have two (2) non-isolated CAN 2.0 data links and a single, isolated, full duplex, RS-485 data link.

CAN Data link (J1939)

The EMCP3 CAN data link supports the SAE J1939 standard. CAN shield termination is supplied through a pin on the 70-pin connector.

MODBUS

The EMCP3 "EMCP3.2" and "EMCP3.3" will have a MODBUS data link that supports an isolated half-duplex.

i02003335

Electronic Control Module (Engine) (EUI Engines Only)

SMCS Code: 1901

The ECM controls engine speed on EUI engines in electric power generation applications. The desired engine speed is based on the following information:

- Input from the Speed Potentiometer (SP)
- Feedback from the sensors that are mounted on the engine

The “EMCP3” receives the following information from the ECM:

- Engine oil pressure
- Engine coolant temperature
- Operating hours for the engine
- Voltage of the battery system

The above information is shown on the display screen of the “EMCP3”. The information is used by the “EMCP3” in order to monitor the system for events. Events include low engine oil pressure or high engine coolant temperature.

The “EMCP3” also displays diagnostic codes from the ECM as a convenience to the operator. See Systems Operation, “Fault Description” for more information on the management of diagnostic codes by the “EMCP3” and ECM.

i02011357

Event Viewing

SMCS Code: 4490

Information from the EMCP3 is displayed on the display screen (1). The arrow keys on the keypad are used in order to navigate through the main menu. Press the UP key (11) or the DOWN key (15) in order to highlight the main menu options.

Press the “Enter” key (14) in order to select one of the main menu options. The arrow keys are used in order to view or to select one of the setpoints.

Note: The EMCP3 panel will power up to the main menu screen. If the EMCP3 panel is already powered up, press the “Escape” key in order to return to the main menu.

1. From the main menu, highlight “Event Log”.

2. Press the “ENTER” key (14).

3. Select an ECM and press the “ENTER” key (14) in order to scroll through the Active and Logged Events.

i02011347

Event Clearing

SMCS Code: 4490

Procedure For Clearing Events

Note: Active Warnings do not need to be cleared.

A flashing red shutdown light indicates there is an unacknowledged shutdown event. The red shutdown light will change from flashing red to solid red when the Alarm Acknowledged key is pressed. Use the following procedure in order to clear the event.

1. Press the STOP key (10) in order to shut down the engine. Enter the “EVENT LOG” option from the main menu.
2. Select an ECM from the list.
3. Scroll through the event conditions in order to highlight the active events.
4. Repair the condition that caused the shutdown event.
5. Press the “ENTER” key.
6. “RESET” will be highlighted if the condition is no longer present and the control is in “STOP”.
7. Press “ENTER” again.

The fault will clear and the red shutdown light will be turned OFF.

8. Press the “ESCAPE” key 2 times in order to get back to the main menu.

i01990612

Setpoint Programming

SMCS Code: 4490

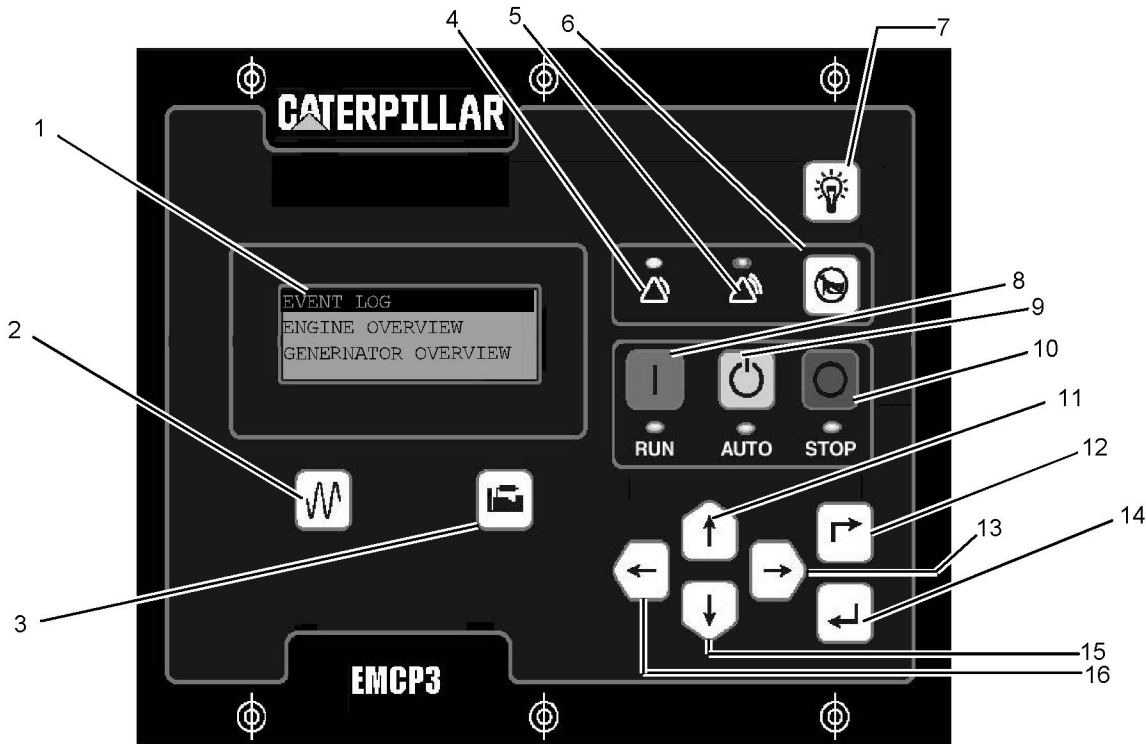


Illustration 5

g01045431

- | | |
|----------------------------------|-----------------|
| (1) Display Screen | (9) Auto Key |
| (2) AC Overview Key | (10) Stop Key |
| (3) Engine Overview Key | (11) Up Key |
| (4) Lamp Test Key | (12) Escape Key |
| (5) Amber Warning Lamp | (13) Right Key |
| (6) Red Shutdown Lamp | (14) Enter Key |
| (7) Acknowledge/Horn Silence Key | (15) Down Key |
| (8) Run Key | (16) Left Key |

Main Menu

Information from the “EMCP3” is displayed on the display screen (1). The arrow keys on the keypad are used in order to navigate through the main menu. Press the UP key (11) or the DOWN key (15) in order to highlight one of the main menu options.

Press the “Enter” key (14) in order to select one of the main menu options. The arrow keys are used in order view or to select one of the setpoints listed on the main menu.

The engine/generator setpoints affect the proper operation and serviceability of the engine, and the accuracy of information shown on the display screen. The setpoints are programmed in the “EMCP3” at the factory.

The setpoints may require changing when the “EMCP3” is moved from one engine to another engine. The setpoints may also require changing in order to satisfy the customer’s requirements. The setpoints that are stored in the “EMCP3” must match the specified setpoints of the particular generator set. The setpoints are programmable. Refer to the following tables.

i01988040

Real Time Clock Programming

SMCS Code: 4490

The real time clock provides accurate information for the time and the date of an automatic time based start/stop control. The real time clock provides a mechanism for time stamps in the event log.

The GSC will keep track of the time and the date with an internal real time clock with a battery backed up memory. The time and the date will be maintained by the internal battery even when the control battery power is disconnected.

After the internal battery dies, the real time clock will continue to keep time only when the control battery power is connected. If the control power is disconnected, the real time clock must be reprogrammed when the control is repowered.

Troubleshooting Section

Diagnostic Code Procedures

i02015216

Diagnostic Code List

SMCS Code: 4490

Table 14

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Primary Data Link Fault	639	11	PRIMARY DATA LINK FAULT	1
Starting Air Pressure Sensor Short High	82	3	STARTING AIR PRES SENSOR SHORT HIGH	1
Starting Air Pressure Sensor Short Low	82	4	STARTING AIR PRES SENSOR SHORT LOW	1
High Starting Air Pressure Warning	82	15	HIGH STARTING AIR PRES WARNING	1
High Starting Air Pressure Shutdown	82	0	HIGH STARTING AIR PRES SHUTDOWN	1
Low Starting Air Pressure Warning	82	17	LOW STARTING AIR PRES WARNING	1
Low Starting Air Pressure Shutdown	82	1	LOW STARTING AIR PRES SHUTDOWN	1
Fuel Filter Differential Pressure Sensor Short High	95	3	FUEL FILTER DIFF PRES SENSOR SHORT HIGH	1
Fuel Filter Differential Pressure Sensor Short Low	95	4	FUEL FILTER DIFF PRES SENSOR SHORT LOW	1
High Fuel Filter Differential Pressure Warning	95	15	HIGH FUEL FILTER DIFF PRES WARNING	1
High Fuel Filter Differential Pressure Shutdown	95	0	HIGH FUEL FILTER DIFF PRES SHUTDOWN	1
Low Fuel Filter Differential Pressure Warning	95	17	LOW FUEL FILTER DIFF PRES WARNING	1
Low Fuel Filter Differential Pressure Shutdown	95	1	LOW FUEL FILTER DIFF PRES SHUTDOWN	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Fuel Level Sensor Short High	96	3	FUEL LEVEL SENSOR SHORT HIGH	1
Fuel Level Sensor Short Low	96	4	FUEL LEVEL SENSOR SHORT LOW	1
High Fuel Level Warning	96	15	HIGH FUEL LEVEL WARNING	1
High Fuel Level Shutdown	96	0	HIGH FUEL LEVEL SHUTDOWN	1
Low Fuel Level Warning	96	17	LOW FUEL LEVEL WARNING	1
Low Fuel Level Shutdown	96	1	LOW FUEL LEVEL SHUTDOWN	1
Engine Oil Level Sensor Short High	98	3	ENGINE OIL LEVEL SENSOR SHORT HIGH	1
Engine Oil Level Sensor Short Low	98	4	ENGINE OIL LEVEL SENSOR SHORT LOW	1
High Engine Oil Level Warning	98	15	HIGH ENGINE OIL LVL WARNING	1
High Engine Oil Level Shutdown	98	0	HIGH ENGINE OIL LVL SHUTDOWN	1
Low Engine Oil Level Warning	98	17	LOW ENGINE OIL LVL WARNING	1
Low Engine Oil Level Shutdown	98	1	LOW ENGINE OIL LVL SHUTDOWN	1
Oil Filter Differential Pressure Sensor Short High	99	3	OIL FILTER DIFF PRES SENSOR SHORT HIGH	1
Oil Filter Differential Pressure Sensor Short Low	99	4	OIL FILTER DIFF PRES SENSOR SHORT LOW	1
High Oil Filter Differential Pressure Warning	99	15	HIGH OIL FILTER DIFF PRES WARNING	1
High Oil Filter Differential Pressure Shutdown	99	0	HIGH OIL FILTER DIFF PRES SHUTDOWN	1
Low Oil Filter Differential Pressure Warning	99	17	LOW OIL FILTER DIFF PRES WARNING	1
Low Oil Filter Differential Pressure Shutdown	99	1	LOW OIL FILTER DIFF PRES SHUTDOWN	1
Engine Oil Pressure Sensor Short High	100	3	ENGINE OIL PRES SNSR SHORT HIGH	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Engine Oil Pressure Sensor Short Low	100	4	ENGINE OIL PRES SNR SHORT LOW	1
Low Engine Oil Pressure Warning	100	17	LOW ENGINE OIL PRESS WARNING	1
Low Engine Oil Pressure Shutdown	100	1	LOW ENGINE OIL PRESS SHUTDOWN	1
Air Filter Differential Pressure Sensor Short High	107	3	AIR FILTER DIFF PRES SENSOR SHORT HIGH	1
Air Filter Differential Pressure Sensor Short Low	107	4	AIR FILTER DIFF PRES SENSOR SHORT LOW	1
High Air Filter Differential Pressure Warning	107	15	HIGH AIR FILTER DIFF PRES WARNING	1
High Air Filter Differential Pressure Shutdown	107	0	HIGH AIR FILTER DIFF PRES SHUTDOWN	1
Low Air Filter Differential Pressure Warning	107	17	LOW AIR FILTER DIFF PRES WARNING	1
Low Air Filter Differential Pressure Shutdown	107	1	LOW AIR FILTER DIFF PRES SHUTDOWN	1
Engine Coolant Temperature Sensor Short High	110	3	ENG COOL TEMP SENSOR SHORT HIGH	1
Engine Coolant Temperature Sensor Short Low	110	4	ENG COOL TEMP SENSOR SHORT LOW	1
High Engine Coolant Temperature Warning	110	15	HIGH ENGINE COOLANT TEMP WARNING	1
High Engine Coolant Temperature Shutdown	110	0	HIGH ENGINE COOLANT TEMP SHUTDOWN	1
Low Engine Coolant Temperature Warning	110	17	LOW COOLANT TEMP WARNING	1
Engine Coolant Level Sensor Short High	111	3	ENGINE COOLANT LEVEL SENSOR SHORT HIGH	1
Engine Coolant Level Sensor Short Low	111	4	ENGINE COOLANT LEVEL SENSOR SHORT LOW	1
High Engine Coolant Level Warning	111	15	HIGH ENG COOL LEVEL WARNING	1
High Engine Coolant Level Shutdown	111	0	HIGH ENG COOL LEVEL SHUTDOWN	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Low Engine Coolant Level Warning	111	17	LOW ENG COOL LEVEL WARNING	1
Low Engine Coolant Level Shutdown	111	1	LOW ENG COOL LEVEL SHUTDOWN	1
High Battery Voltage Warning	168	15	HIGH BATTERY VOLTAGE WARNING	1
High Battery Voltage Shutdown	168	0	HIGH BATTERY VOLTAGE SHUTDOWN	1
Low Battery Voltage Warning	168	17	LOW BATTERY VOLTAGE WARNING	1
Ambient Air Temperature Sensor Short High	171	3	AMBIENT AIR TEMP SENSOR SHORT HIGH	1
Ambient Air Temperature Sensor Short Low	171	4	AMBIENT AIR TEMP SENSOR SHORT LOW	1
High Ambient Air Temperature Warning	171	15	HIGH AMBIENT AIR TEMP WARNING	1
High Ambient Air Temperature Shutdown	171	0	HIGH AMBIENT AIR TEMP SHUTDOWN	1
Low Ambient Air Temperature Warning	171	17	LOW AMBIENT AIR TEMP WARNING	1
Low Ambient Air Temperature Shutdown	171	1	LOW AMBIENT AIR TEMP SHUTDOWN	1
Exhaust Temperature Sensor Short High	173	3	EXHAUST TEMPERATURE SENSOR SHORT HIGH	1
Exhaust Temperature Sensor Short Low	173	4	EXHAUST TEMPERATURE SENSOR SHORT LOW	1
High Exhaust Temperature Warning	173	15	HIGH EXHAUST TEMP WARNING	1
High Exhaust Temperature Shutdown	173	0	HIGH EXHAUST TEMP SHUTDOWN	1
Low Exhaust Temperature Warning	173	17	LOW EXHAUST TEMP WARNING	1
Low Exhaust Temperature Shutdown	173	1	LOW EXHAUST TEMP SHUTDOWN	1
Engine Oil Temperature Sensor Short High	175	3	ENGINE OIL TEMP SENSOR SHORT HIGH	1
Engine Oil Temperature Sensor Short Low	175	4	ENGINE OIL TEMP SENSOR SHORT LOW	1
High Engine Oil Temperature Warning	175	15	HIGH ENGINE OIL TEMP WARNING	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
High Engine Oil Temperature Shutdown	175	0	HIGH ENGINE OIL TEMP SHUTDOWN	1
Low Engine Oil Temperature Warning	175	17	LOW ENGINE OIL TEMP WARNING	1
Low Engine Oil Temperature Shutdown	175	1	LOW ENGINE OIL TEMP SHUTDOWN	1
Engine Speed Sensor Open	190	5	ENGINE SPEED SENSOR OPEN	1
Engine Speed Sensor Erratic or Not Present	190	2	ENGINE SPEED SENSOR ERRATIC/ LOST	1
Engine Over Speed Shutdown	190	0	ENGINE OVER SPEED SHUTDOWN	1
Engine Under Speed Warning	190	17	ENGINE UNDER SPEED WARNING	1
Engine Under Speed Shutdown	190	1	ENGINE UNDER SPEED SHUTDOWN	1
Digital Output #1 Short High	924	3	DIGITAL OUTPUT 1 SHORT HIGH	1
Digital Output #2 Short High	925	4	DIGITAL OUTPUT 2 SHORT HIGH	1
Emergency Stop Shutdown	970	31	EMERGENCY STOP SHUTDOWN	1
Generator Bearing #1 Temperature Sensor Short High	1122	3	GEN BEARING #1 TEMP SENSOR SHORT HIGH	1
Generator Bearing #1 Temperature Sensor Short Low	1122	4	GEN BEARING #1 TEMP SENSOR SHORT LOW	1
High Generator Bearing #1 Temperature Warning	1122	15	HIGH GEN BEARING #1 TEMP WARNING	1
High Generator Bearing #1 Temperature Shutdown	1122	0	HIGH GEN BEARING #1 TEMP SHUTDOWN	1
Low Generator Bearing #1 Temperature Warning	1122	17	LOW GEN BEARING #1 TEMP WARNING	1
Low Generator Bearing #1 Temperature Shutdown	1122	1	LOW GEN BEARING #1 TEMP SHUTDOWN	1
Accessory Data Link Fault	1231	11	ACCESSORY DATA LINK FAULT	1
Emergency Shutdown Override Mode Active Warning	1237	31	SHUTDOWN OVERRIDE ACTIVE WARNING	3

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Engine Failure to Start Shutdown	1664	31	ENGINE FAILURE TO START SHUTDOWN	1
Right Exhaust Temperature Sensor Short High	2433	3	RIGHT EXHAUST TEMP SENSOR SHORT HIGH	1
Right Exhaust Temperature Sensor Short Low	2433	4	RIGHT EXHAUST TEMP SENSOR SHORT LOW	1
High Right Exhaust Temperature Warning	2433	15	HIGH RIGHT EXHAUST TEMP WARNING	1
High Right Exhaust Temperature Shutdown	2433	0	HIGH RIGHT EXHAUST TEMP SHUTDOWN	1
Low Right Exhaust Temperature Warning	2433	17	LOW RIGHT EXHAUST TEMP WARNING	1
Low Right Exhaust Temperature Shutdown	2433	1	LOW RIGHT EXHAUST TEMP SHUTDOWN	1
Left Exhaust Temperature Sensor Short High	2434	3	LEFT EXHAUST TEMP SENSOR SHORT HIGH	1
Left Exhaust Temperature Sensor Short Low	2434	4	LEFT EXHAUST TEMP SENSOR SHORT LOW	1
High Left Exhaust Temperature Warning	2434	15	HIGH LEFT EXHAUST TEMP WARNING	1
High Left Exhaust Temperature Shutdown	2434	0	HIGH LEFT EXHAUST TEMP SHUTDOWN	1
Low Left Exhaust Temperature Warning	2434	17	LOW LEFT EXHAUST TEMP WARNING	1
Low Left Exhaust Temperature Shutdown	2434	1	LOW LEFT EXHAUST TEMP SHUTDOWN	1
Engine Speed-Generator Output Frequency Mismatch Warning	2436	2	ENG SPEED-GEN FREQ MISMATCH WARN	1
Generator Output Sensing System Failure	2436	12	GEN AC METERING SYS FAILURE	1
Generator Over Frequency Warning	2436	15	GEN OVER FREQUENCY WARNING	1
Generator Over Frequency Shutdown	2436	0	GEN OVER FREQUENCY SHUTDOWN	1
Generator Under Frequency Warning	2436	17	GEN UNDER FREQUENCY WARNING	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Generator Under Frequency Shutdown	2436	1	GEN UNDER FREQUENCY SHUTDOWN	1
Generator Over Voltage Warning	2440	15	GEN OVER VOLTAGE WARNING	1
Generator Over Voltage Shutdown	2440	0	GEN OVER VOLTAGE SHUTDOWN	1
Generator Under Voltage Warning	2440	17	GEN UNDER VOLTAGE WARNING	1
Generator Under Voltage Shutdown	2440	1	GEN UNDER VOLTAGE SHUTDOWN	1
Generator Reverse Power Warning	2452	17	GEN REVERSE POWER WARNING	1
Generator Reverse Power Shutdown	2452	1	GEN REVERSE POWER SHUTDOWN	1
Generator Over Current Warning	2448	15	GEN OVER CURRENT WARNING	1
Generator Over Current Shutdown	2448	0	GEN OVER CURRENT SHUTDOWN	1
Service Maintenance Interval Warning	2648	31	SERV MAINT INTERVAL WARNING	1
Unexpected Engine Shutdown	4008	31	UNEXPECTED ENGINE SHUTDOWN	1
Generator Control Not in Automatic Warning	4007	31	GEN CONTROL NOT IN AUTO WARNING	1
Engine in Cooldown	4006	31	ENGINE IN COOLDOWN	1
Low Battery Charging System Voltage Warning	167	17	LOW BATTERY CHARGING SYS VOLT WARN	1
SCADA Data Link Fault	625	11	SCADA DATA LINK FAULT	1
Event Input Function #1 High Warning	701	15	EVENT I/P FUNC #1 HIGH WARNING	1
Event Input Function #1 High Shutdown	701	0	EVENT I/P FUNC #1 HIGH SHUTDOWN	1
Event Input Function #1 Low Warning	701	17	EVENT I/P FUNC #1 LOW WARNING	1
Event Input Function #1 Low Shutdown	701	1	EVENT I/P FUNC #1 LOW SHUTDOWN	1
Event Input Function #1 Status	701	31	EVENT I/P FUNC #1 STATUS ACTIVE	1
Event Input Function #2 High Warning	702	15	EVENT I/P FUNC #2 HIGH WARNING	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Event Input Function #2 High Shutdown	702	0	EVENT I/P FUNC #2 HIGH SHUTDOWN	1
Event Input Function #2 Low Warning	702	17	EVENT I/P FUNC #2 LOW WARNING	1
Event Input Function #2 Low Shutdown	702	1	EVENT I/P FUNC #2 LOW SHUTDOWN	1
Event Input Function #2 Status	702	31	EVENT I/P FUNC #2 STATUS ACTIVE	1
Event Input Function #3 High Warning	703	15	EVENT I/P FUNC #3 HIGH WARNING	1
Event Input Function #3 High Shutdown	703	0	EVENT I/P FUNC #3 HIGH SHUTDOWN	1
Event Input Function #3 Low Warning	703	17	EVENT I/P FUNC #3 LOW WARNING	1
Event Input Function #3 Low Shutdown	703	1	EVENT I/P FUNC #3 LOW SHUTDOWN	1
Event Input Function #3 Status	703	31	EVENT I/P FUNC #3 STATUS ACTIVE	1
Event Input Function #4 High Warning	704	15	EVENT I/P FUNC #4 HIGH WARNING	1
Event Input Function #4 High Shutdown	704	0	EVENT I/P FUNC #4 HIGH SHUTDOWN	1
Event Input Function #4 Low Warning	704	17	EVENT I/P FUNC #4 LOW WARNING	1
Event Input Function #4 Low Shutdown	704	1	EVENT I/P FUNC #4 LOW SHUTDOWN	1
Event Input Function #4 Status	704	31	EVENT I/P FUNC #4 STATUS ACTIVE	1
Event Input Function #5 High Warning	705	15	EVENT I/P FUNC #5 HIGH WARNING	1
Event Input Function #5 High Shutdown	705	0	EVENT I/P FUNC #5 HIGH SHUTDOWN	1
Event Input Function #5 Low Warning	705	17	EVENT I/P FUNC #5 LOW WARNING	1
Event Input Function #5 Low Shutdown	705	1	EVENT I/P FUNC #5 LOW SHUTDOWN	1
Event Input Function #5 Status	705	31	EVENT I/P FUNC #5 STATUS ACTIVE	1
Air Damper Closed	4000	31	AIR DAMPER CLOSED	1
Battery Charger Failure	4003	31	BATTERY CHARGER FAILURE	1
Fuel Tank Leak (Fuel Rupture Basin)	1239	31	FUEL TANK LEAK	1
External Tank Fuel Level Sensor Short High	38	3	EXT TANK FUEL LEVEL SENSOR SHORT HIGH	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
External Tank Fuel Level Sensor Short Low	38	4	EXT TANK FUEL LEVEL SENSOR SHORT LOW	1
External Tank High Fuel Level Warning	38	15	EXT TANK HIGH FUEL LVL WARNING	1
External Tank High Fuel Level Shutdown	38	0	EXT TANK HIGH FUEL LEVEL S/D	1
External Tank Low Fuel Level Warning	38	17	EXT TANK LOW FUEL LVL WARNING	1
External Tank Low Fuel Level Shutdown	38	1	EXT TANK LOW FUEL LEVEL S/D	1
Fire Extinguisher Pressure Sensor Short High	137	3	FIRE EXTING PRES SENSOR SHORT HIGH	1
Fire Extinguisher Pressure Sensor Short Low	137	4	FIRE EXTING PRES SENSOR SHORT LOW	1
High Fire Extinguisher Pressure Warning	137	15	HIGH FIRE EXTNG PRES WARNING	1
High Fire Extinguisher Pressure Shutdown	137	0	HIGH FIRE EXTNG PRES SHUTDOWN	1
Low Fire Extinguisher Pressure Warning	137	17	LOW FIRE EXTNG PRES WARNING	1
Low Fire Extinguisher Pressure Shutdown	137	1	LOW FIRE EXTNG PRES SHUTDOWN	1
Generator Breaker Failure to Open	4009	31	GEN BREAKER FAILURE TO OPEN	1
Generator Breaker Failure to Close	4011	31	GEN BREAKER FAILURE TO CLOSE	1
Generator Circuit Breaker Open	4013	31	GENERATOR BREAKER OPEN	1
Generator Circuit Breaker Closed	4004	31	GENERATOR BREAKER CLOSED	1
Utility Breaker Failure to Open	4010	31	UTIL BREAKER FAILURE TO OPEN	1
Utility Breaker Failure to Close	4012	31	UTIL BREAKER FAILURE TO CLOSE	1
Utility Breaker Open	4014	31	UTILITY BREAKER OPEN	1
Utility Circuit Breaker Closed	4005	31	UTILITY BREAKER CLOSED	1
Loss of Utility	4017	31	LOSS OF UTILITY	1
Utility to Generator Transfer Failure Warning	4015	15	UTIL TO GEN TRANSFER FAILURE WARNING	1

(continued)

(Table 14, contd)

Diagnostic Codes				
Event Name	SPN	FMI	Display Text String	Password Level to Clear
Utility to Generator Transfer Failure Shutdown	4015	0	UTIL TO GEN TRANSFER FAILURE SHUTDOWN	1
Generator to Utility Transfer Failure Warning	4016	15	GEN TO UTIL TRANSFER FAILURE WARNING	1
ATS in Normal Position	4001	31	ATS IN NORMAL POSITION	1
ATS in Emergency Position	4002	31	ATS IN EMERGENCY POSITION	1

Testing and Adjusting Section

Testing and Adjusting

i01988161

Electrical Connector - Inspect

SMCS Code: 7553-040

Inspect the ECM connectors.

i01988211

External Potential Transformer Connections

SMCS Code: 1409-077

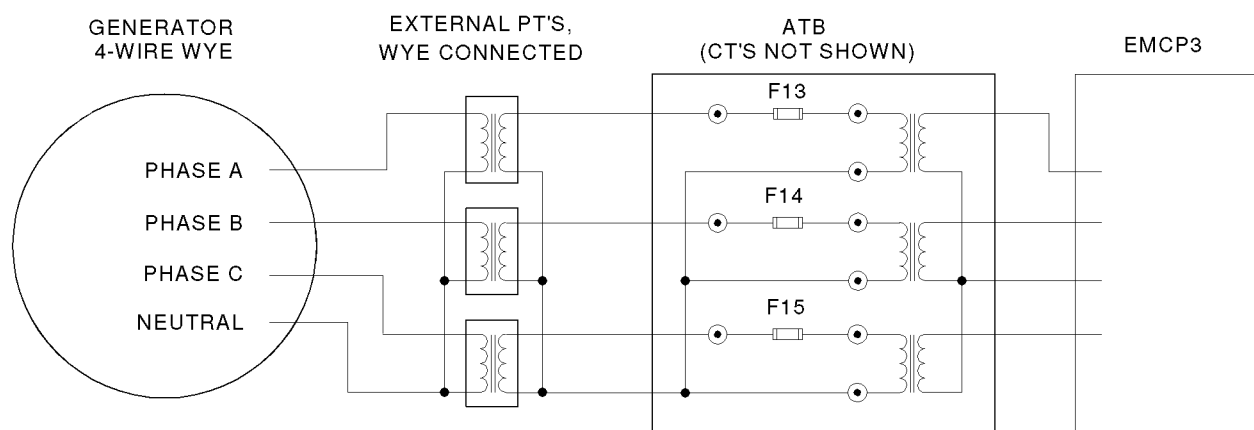


Illustration 6

g01047743

Wye Configuration Of External Potential Transformers (PT) On 4-Wire Wye Generator

This configuration allows the accurate measurement of all power parameters by the EMCP3 including when the loads are unbalanced and neutral current is present. All power parameters are shown on the display of the EMCP3.

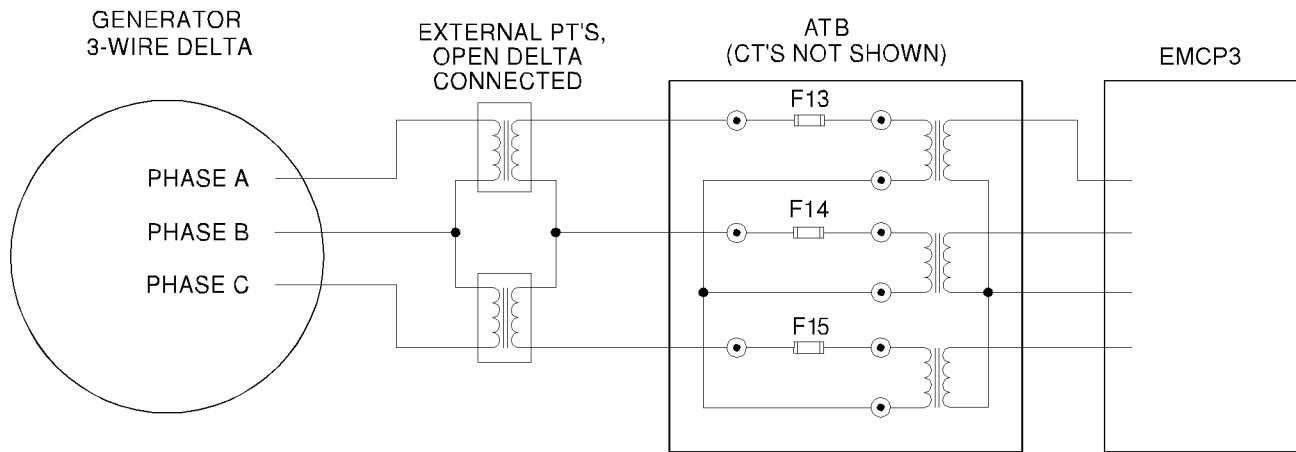


Illustration 7

g01047744

Open Delta Configuration Of External Potential Transformers (PT) On The 3-Wire Delta Generator

This configuration allows the accurate measurement of power parameters by the EMCP3 including when the loads are unbalanced and circulating current is present. The real power phase A, B and C can not be determined. The power factor phase A, B and C can not be determined. The phases are not shown on the EMCP3 display.

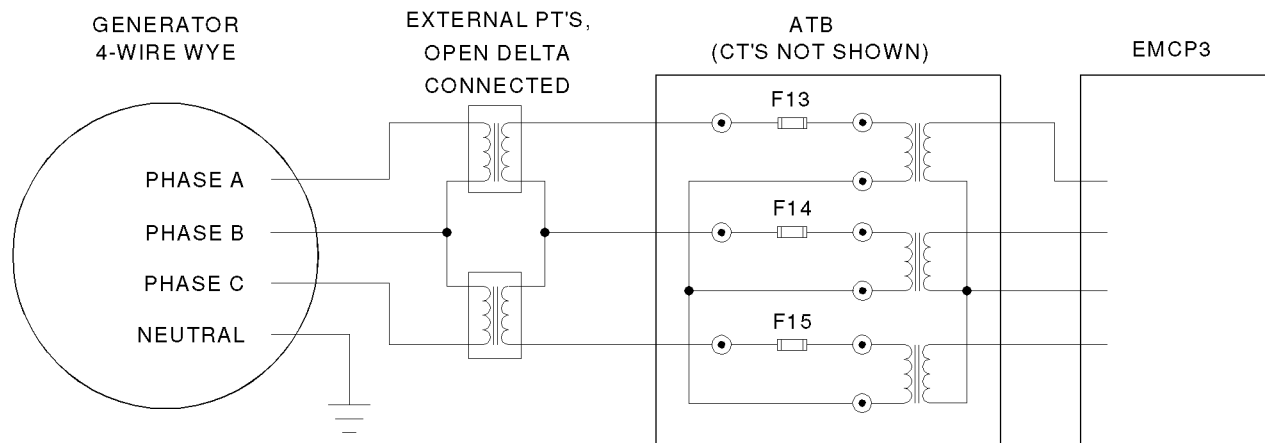


Illustration 8

g01047747

Open Delta Configuration Of External Potential Transformers (PT) On The 4-Wire Wye Generator

This configuration results in less accurate measurement of all power parameters by the "EMCP3" when the loads are unbalanced and neutral current is present. Real power phase A, B, C and power factor phase A, B, C can not be determined and are not shown on the "EMCP3" display.

Note: The wye configuration of external potential transformers (PT's) is preferred for 4-wire wye generators because of the greater accuracy when loads are unbalanced. With the open delta configuration, some power parameters can not be determined. These parameters are real power phase A, B, C and power factor phase A, B, C. For maximum accuracy, the open delta configuration of external PT's should be used only for 3-wire delta generators.

On 4-wire wye generators, three separate potential transformers (PT's) are required for accurate power metering unless the loads are completely and continually balanced. Even if the loads are balanced, some power parameters can not be determined. These parameters are not shown on the "EMCP3" display: real power phase A, B, C and power factor phase A, B, C. The ATB contains three potential transformers in order to accommodate 4-wire wye generators. The full capabilities of the ATB are not utilized when an open delta PT configuration is used for 4-wire wye generators.

On 3-wire delta generators, two potential transformers allow maximum accuracy for all load conditions. However, again real power phase A, B, C and power factor phase A, B, C can not be determined and are not shown on the "EMCP3" display.

The "EMCP3" must be programmed when connecting external PT's to the ATB.

i01988213

Speed Sensor (Engine) - Adjust

SMCS Code: 1907-025

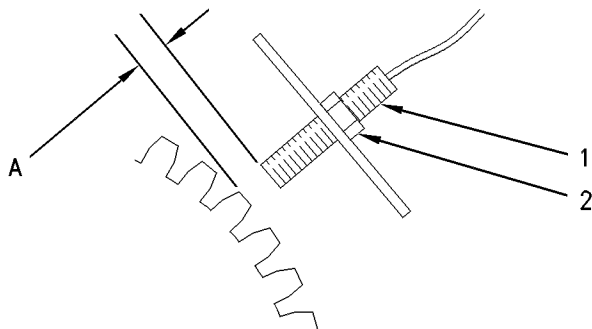


Illustration 9
Speed Sensor

(1) Speed sensor
(2) Locknut
(A) Air gap

g00289497

Note: The engine speed sensor is commonly referred to as a magnetic pickup sensor.

This adjustment procedure is for the engine speed sensor.

1. Remove the speed sensor (1) from the flywheel housing. Remove all debris from the tip of the speed sensor. Align a ring gear tooth directly in the center of the threaded sensor opening.

2. By hand, screw the speed sensor (1) into the hole until the end of the sensor contacts the gear tooth.
3. Turn the sensor (1) in the counterclockwise direction through 270 degrees (three-fourths turn).
4. Tighten locknut (2) to $25 \pm 5 \text{ N}\cdot\text{m}$ ($18 \pm 4 \text{ lb ft}$).

Note: Do not allow speed sensor (1) to turn as locknut (2) is tightened.

i01988326

Electronic Control Module (Generator Set) - Replace

SMCS Code: 4490-510

Replacement Procedure

Note: The configuration from the old ECM can be saved in the ET Service Tool. The configuration can then be uploaded to the new ECM.

1. The new ECM must be reprogrammed after the new ECM is installed. If the ECM that is being replaced is functional, then make a note of the following items: hour meter value, all engine setpoints, and any spare inputs or outputs that are programmed. See System Operation, "Setpoint Viewing" and System Operation, "Setpoint Programming".
2. Shut down the engine. Remove the positive lead wire from the battery.
3. Remove the harness connector from the ECM. A 4 mm hex wrench is required to turn the fastening screw.
4. Remove the six nuts that fasten the ECM to the front panel. Remove the ECM.
5. Place the new ECM in the front panel. Install the six nuts. Tighten the nuts.
6. Reconnect the harness connector to the ECM. Reconnect the positive lead wire to the battery. If necessary, see the Generator Set Wiring Diagram Testing And Adjusting, "Schematics And Wiring Diagrams".
7. Reprogram the setpoints, the spare inputs/outputs, the hour meter, the voltmeter/ammeter programming and the AC offset adjustment. Use the values from the original ECM. Refer to Step 1.

i02010071

Electronic Control Module (Generator Set) - Configure

SMCS Code: 4490-025

Initial Setup

Information from the EMCP3 is displayed on the display screen (1). Press the “UP” key (11) or the “DOWN” key (15) in order to highlight the main menu options.

Press the “Enter” key (14) in order to select one of the main menu options.

The keypad is also used in order to change the setpoints. Press the “Enter” key (14) in order to change a setpoint. Press the “UP” key (11) or the “DOWN” key (15) in order to increase or decrease the value. Press the “Left” key (16) or the “Right” key (13) in order to change the digit that is to be adjusted.

Note: The EMCP3 panel will power up to the main menu screen. If the EMCP3 panel is already powered up, press the “Escape” key (12) in order to return to the main menu.

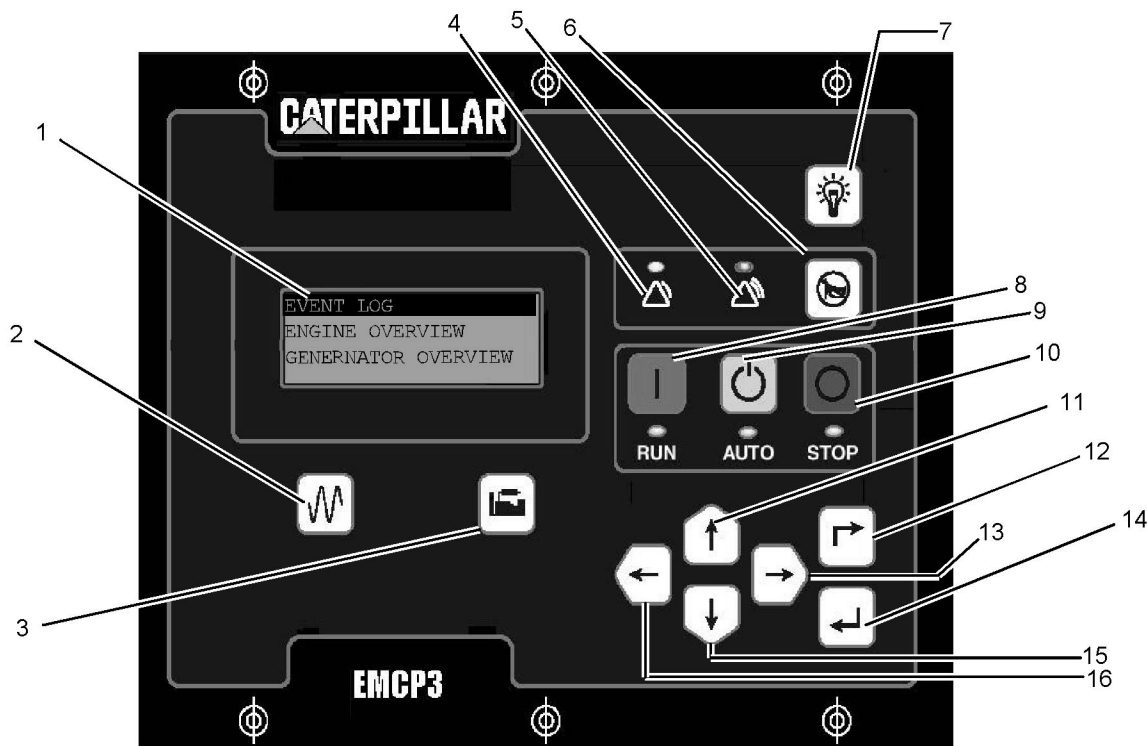


Illustration 10

g01045431

- (1) Display Screen
- (2) AC Overview Key
- (3) Engine Overview Key
- (4) Lamp Test Key
- (5) Amber Warning Lamp
- (6) Red Shutdown Lamp
- (7) Acknowledge/Horn Silence Key
- (8) Run Key

- (9) Auto Key
- (10) Stop Key
- (11) Up Key
- (12) Escape Key
- (13) Right Key
- (14) Enter Key
- (15) Down Key
- (16) Left Key

Programming The Setpoints

The engine/generator setpoints affect the proper operation and serviceability of the engine, and the accuracy of information shown on the display screen. The setpoints are programmed in the EMCP3 at the factory.

The setpoints may require changing when the EMCP3 is moved from one engine to another engine. The setpoints may also require changing in order to satisfy the customer's requirements. The setpoints that are stored in the EMCP3 must match the specified setpoints of the particular generator set.

1. From the main menu, press the "UP" key (11) or the "DOWN" key (15) in order to highlight the "PREFERENCES" option.
 - a. Press the "Enter" key (14) in order to select "PREFERENCES". "CONTRAST" will be highlighted.

- b. Press the "ENTER" key (14) in order to select "CONTRAST". Adjust the contrast as needed.
- c. Press the "DOWN" key (15) in order to highlight "BACKLIGHT".
- d. Press the "Enter" key (14) in order to select "BACKLIGHT". Adjust the backlight as needed.
- e. Press the "DOWN" key (15) in order to highlight "PRESSURE".
- f. Press the "Enter" key (14) in order to select "PRESSURE". Use the "Left" key (16) or the "Right" key (13) in order to highlight "kPa", "PSI", or "Bar".
- g. Press the "Enter" key (14) in order to save the selection.
- h. Press the "DOWN" key (15) in order to highlight "TEMPERATURE".

- i. Press the "Enter" key (14) in order to select "TEMPERATURE". Use the "Left" key (16) or the "Right" key (13) in order to highlight "°C", or "°F".
 - j. Press the "Enter" key (14) in order to save the selection.
 - k. Press the "DOWN" key (15) in order to highlight "VOLUME".
 - l. Press the "Enter" key (14) in order to select "VOLUME". Use the "Left" key (16) or the "Right" key (13) in order to highlight "Liters", "US Gal", or "Imp Gal".
 - m. Press the "Enter" key (14) in order to save the selection.
 - n. Press the "DOWN" key (15) in order to highlight "LANGUAGE".
 - o. Press the "Enter" key (14) in order to select "LANGUAGE". Use the "Left" key (16) or the "Right" key (13) in order to highlight "English", or "All Lang".
 - p. Press the "Enter" key (14) in order to save the selection.
2. Press the "ESCAPE" key (12) until "CONFIGURE" in order to go back to the main menu.
 - a. Press the "UP" key (11) until "CONFIGURE" is highlighted.
 - b. Press the "ENTER" key (14) in order to select "CONFIGURE".
 3. Press the "DOWN" key (15) until "SETPOINTS" is highlighted.
 4. Press the "DOWN" key (15) in order to scroll through the setpoint options until "AUTOMATIC START/STOP" is highlighted.
 - a. Press the "ENTER" key (14) in order to select "AUTOMATIC START/STOP".
 - b. Adjust the setpoints to the desired values.
 5. After the setpoints listed in Step 4 are adjusted, press the "DOWN" key (15) in order to highlight "ENG COOL TEMP".
 - a. Press the "ENTER" key (14) in order to select "ENG COOL TEMP".
 - b. Select "Data Link" for gensets that are equipped with an "ADEM3" or an "ADEM4". Select "I/O PIN" for all other gensets.
 - c. Adjust the setpoints that are listed to the desired values.
 6. After the setpoints listed in Step 5 are adjusted, press the "DOWN" key (15) in order to highlight "ENG OIL PRES MONITOR".
 - a. Press the "ENTER" key (14) in order to select "ENG OIL PRES MONITOR".
 - b. Select "I/O PIN" or "Data Link".
 - c. Adjust the setpoints that are listed to the desired values.
 7. After the setpoints listed in Step 6 are adjusted, press the "DOWN" key (15) in order to highlight "ENG SPEED MONITOR".
 - a. Press the "ENTER" key (14) in order to select "ENG SPEED MONITOR".
 - b. Input the flywheel teeth number.
 - c. Adjust the setpoints that are listed to the desired values.
 8. After the setpoints listed in Step 7 are adjusted, press the "DOWN" key (15) in order to highlight "GEN AC MONITOR".
 - a. Press the "ENTER" key (14) in order to select "GEN AC MONITOR".
 - b. Adjust the setpoints and input values that are listed to the desired values.
 9. After the setpoints listed in Step 8 are adjusted, press the "DOWN" key (15) in order to highlight "GEN OVER/UNDER FREQ".
 - a. Press the "ENTER" key (14) in order to select "GEN OVER/UNDER FREQ".
 - b. Adjust the setpoints and input values that are listed to the desired values.
 10. After the setpoints listed in Step 9 are adjusted, press the "DOWN" key (15) in order to highlight "GEN OVER/UNDER VOLT".
 - a. Press the "ENTER" key (14) in order to select "GEN OVER/UNDER VOLT".
 - b. Adjust the setpoints and input values that are listed to the desired values.
 11. After the setpoints listed in Step 6 are adjusted, press the "DOWN" key (15) in order to highlight "SPARE ANALOG INPUT".
 - a. Determine if the input is used or not used.

Note: The input must be “ENABLED” in order to use. The input must be used if the input is “ENABLED”.

- b.** Use the “UP” (11) key or the “DOWN” key (15) in order highlight a spare input selection.
 - c.** Press the “ENTER” key (14) in order to select the spare input name.
 - d.** Adjust the setpoints and input values that are listed to the desired values.
- 12.** After the setpoints listed in Step 11 are adjusted, press the “DOWN” key (15) in order to highlight “EVENT RESPONSE CONFIG”.
 - a.** Press the “ENTER” key (14) in order to select “EVENT RESPONSE CONFIG”.
 - b.** Use the “UP” (11) or the “DOWN” key (15) in order to highlight and scroll through the event responses. Select “DIAGNOSTICS”, “ENGINE EVENTS”, “GEN EVENTS”, or “OTHER EVENTS”.
 - c.** When a desired event response is highlighted, press the “ENTER” key (14) in order to view the “EVENT RESPONSE CONFIG”.
 - d.** Press the “RIGHT” key (13) in order to highlight “EDIT”.
 - e.** Press the “ENTER” key (14) in order to edit the “EVENT RESPONSE CONFIG”.
 - f.** Press the “RIGHT” key (13) or the “LEFT” key (16) in order to select or deselect the appropriate checkboxes.

Note: Ensure that the fault protection timer is “ENABLED” for the events related to conditions that will cause a “SHUTDOWN EVENT” during Start-Up. The related events include “LOW OIL PRESS”, “UNDER VOLTAGE”, “UNDER FREQ”, and “UNDER SPEED”

Automatic Start/Stop

Automatic Start/Stop receives starting and stopping requests from various sources (local, remote, internal), arbitrates between them and then cranks or shuts down the engine in an orderly fashion.

Table 15

Setpoints - Engine/Generator Programming ⁽¹⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Engine start fault protection activation delay time	0	300	sec	30	Fault protection time delay prevents shut down during start up from low oil pressure etc.
2	Crank Duration	5	300	sec	7	
3	Crank Cycle Rest Interval	5	300	sec	7	
4	Engine Purge Cycle Time	0	20	sec	0	
5	Maximum Number of Crank Cycles	1	20	n/a	3	
6	Cooldown Duration	0	30	min	0	
7	Start Aid Activation Time	0	240	sec	0	
8	Crank Alert Activation Time	0	60	sec	0	
9	Crank Terminate RPM	100	1000	rpm	400	Engine speed setting used in order to disengage the starting motor during engine cranking.
10	Engine Fuel Type Configuration	n/a	n/a	n/a	Diesel	Setpoint allows for selection of "Diesel" or "Natural Gas".
11	Fuel Shutoff Solenoid Type Configuration				0	
12	Engine Type Configuration			n/a	Mechanical	Select mechanical or electrical
13	Engine Controller J1939 Data Link Support Configuration			n/a	No Data Link	Setpoint allows for selection of "No Data Link", "Basic Data Link", or "Enhanced Data" Link.

⁽¹⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

AVR Desired Voltage Request

The AVR Desired Voltage Request block generates a data link request over the J1939 data link in order to request a desired output voltage from a digital voltage regulator. The AVR is used in synchronization load control and reactive import/export control.

Table 16

Setpoints - Engine/Generator Programming ⁽²⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Maximum Generator Voltage Output Bias Percentage	0	100	%	5	
2	Generator Nominal Output Voltage	100	50000	V	100	

⁽²⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Battery Voltage Monitor

The Battery Voltage Monitor block is used to measure the battery supply voltage to the “EMCP3”. The “EMCP3” will have the ability to monitor the battery supply voltage based on the “+BATT” and “-BATT”.

Table 17

Setpoints - Engine/Generator Programming ⁽³⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	High Battery Voltage Warning Event Threshold	12	50	VDC	29.4	
2	High Battery Voltage Warning Event Notification Delay Time	0	240	sec	30	
3	High Battery Voltage Shutdown Event Threshold	12	50	VDC	30.0	
4	High Battery Voltage Shutdown Event Notification Delay Time	0	240	sec	30	
5	Low Battery Voltage Warning Event Threshold	0.0	25.0	VDC	23.4	
6	Low Battery Voltage Warning Event Notification Delay Time	0	3	sec	30	
7	Low Battery Charging System Voltage Warning Event Threshold	30	240	VDC	26	
8	Low Battery Charging System Voltage Warning Event Notification Delay Time	0	240	sec	30	

⁽³⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Data Link - SCADA

SCADA Data Link is used for communication with a System Control and Data Acquisition (SCADA) and for support of a service tool connection. SCADA Data Link will use the Modbus protocol with an RS-485 half duplex hardware layer operation at a minimum 2400 bps.

Table 18

Setpoints - Engine/Generator Programming ⁽⁴⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	SCADA Data Link Baud Rate	N/A	N/A	N/A	2	
2	SCADA Data Link Parity	N/A	N/A	N/A	0	
3	SCADA Data Link Slave Address	1	247	N/A	1	
4	SCADA Data Link Access Password	0	0xffff	N/A	0	
5	SCADA Data Link Connection Time-out Interval	0.1	3600.0	sec	30	
6	RS485 Bias Resistor Enable Status	N/A	N/A	N/A	0	

⁽⁴⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Digital Inputs

Digital Inputs are used to bring on/off information such as switch closures to the GSC.

Note: There are 8 digital inputs on “EMCP 3.2” and “EMCP3.3”. There are 6 digital inputs on “EMCP 3.1.”

Table 19

Setpoints - Engine/Generator Programming ⁽⁵⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	E-STOP	Active Low	Active High	N/A	Active Low	Activating the E-STOP input will cause the generator set to stop immediately.
2	REMOTE INITIATE	Active Low	Active High	N/A	Active Low	Setpoint allows for starting and stopping the genset from a remote location. If input is active and the engine mode switch is in "AUTO", the engine will attempt to start and run. Once the input becomes in-active, the engine will enter into cooldown (if programmed) and then STOP.
3	Digital #3 ⁽⁶⁾	Active Low	Active High	N/A		The inputs can be set to PRESSURES Air Filter Differential Pressure Engine Oil Pressure Fire Extinguisher Pressure Fuel Filter Differential Pressure Oil Filter Differential Pressure Starting Air Pressure TEMPERATURES Ambient Air Temp Engine Coolant Temp Engine Oil Temp Exhaust Temp Right Exhaust Temp Left Exhaust Temp LEVELS Engine Coolant Level Engine Oil Level Fuel Level Remote Fuel Level OTHER Air Damper Closed ATS in Normal Position ATS in Emergency Position Battery Charger Failure Generator Breaker Closed Utility Breaker Closed Fuel Leak Generator Bearing #1 Temp Other #1 Other #2 Other #3 Other #4 Other #5
4	Digital #4	Active Low	Active High	N/A		
5	Digital #5	Active Low	Active High	N/A		
6	Digital #6	Active Low	Active High	N/A		
7	Digital #7	Active Low	Active High	N/A		
8	Digital #8	Active Low	Active High	N/A		

⁽⁵⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

⁽⁶⁾ The "Digital Inputs" parameter can only be set to "Active High" or "Active Low" in order to initiate a High Warning, Low Warning, High Shutdown, Low Shutdown or Status.

Digital Outputs

Digital Outputs are used in order to convey on/off information from the GSC to the outside world for purposes such as operating relays, solenoids and indicator lamps.

Table 20

Setpoints - Engine/Generator Programming ⁽⁷⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Digital Output #N Active State Configuration	N/A	N/A	N/A	0	
2						

⁽⁷⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Digital Selectors

Digital Selectors are used in order to determine what “EVENTS” or “STATUS” will cause each of the relays to activate.

Table 21

Setpoints - Engine/Generator Programming ⁽⁸⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Digital Selector #1 Source Configuration	N/A	N/A	N/A	Use Input #1	Digital Selector #1 controls Relay Output #3 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input
2	Digital Selector #2 Source Configuration				Use Input #4	Digital Selector #2 controls Relay Output #4 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input
3	Digital Selector #3 Source Configuration				Use Input #4	Digital Selector #3 controls Relay Output #5 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input

(continued)

(Table 21, contd)

Setpoints - Engine/Generator Programming ⁽⁸⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
4	Digital Selector #4 Source Configuration				Disabled	Digital Selector #4 controls Relay Output #6 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input
5	Digital Selector #5 Source Configuration				Use Input #5	Digital Selector #5 controls Relay Output #7 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input
6	Digital Selector #6 Source Configuration				Use Input #5	Digital Selector #6 controls Relay Output #8 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input
7	Digital Selector #7 Source Configuration				Use Input #1	Digital Selector #7 controls Digital Output #1 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input
8	Digital Selector #8 Source Configuration				Disabled	Digital Selector #8 controls Digital Output #2 Config Options are: Disabled Use Input #1 Use Input #2 Use Input #3 Use Input #4 Use Input #5 Use Data Link Input
9	Digital Selector #9 Source Configuration					
10	Digital Selector #10 Source Configuration					

⁽⁸⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Electronic Control Module Reduced Power Mode

Table 22

Setpoints - Engine/Generator Programming ⁽⁹⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Electronic Control Module Reduced Power Mode Enable Status	N/A	N/A	N/A	Enabled	
2	Electronic Control Module Reduced Power Mode Delay Time	0	120	min	30	

⁽⁹⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Engine Coolant Temperature Monitor

The Engine Coolant Temperature Monitor feature is used to convert a raw sensor value into coolant temperature (in degrees C) and to detect sensor diagnostics.

Table 23

Setpoints - Engine/Generator Programming ⁽¹⁰⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Engine Coolant Temp Sensor Configuration	N/A	N/A	N/A	0	Select I/O Pin or Data Link
2	High Engine Coolant Temp Warning Event Threshold	85 °C (185 °F)	120 °C (248 °F)		100 °C (212 °F)	
3	High Engine Coolant Temp Warning Event Notification Delay Time	0	30	sec	15	
4	High Engine Coolant Temp Shutdown Event Threshold	85 °C (185 °F)	120 °C (248 °F)		120 °C (248 °F)	
5	High Engine Coolant Temp Shutdown Event Notification Delay Time	0	30	sec	15	
6	Low Engine Coolant Temp Warning Event Threshold	0 °C (32°F)	36 °C (99 °F)		21 °C (0 °F)	
7	Low Engine Coolant Temp Warning Event Notification Delay Time	0	30	sec	10	

⁽¹⁰⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Engine Oil Pressure Monitor

The Engine Coolant Temperature Monitor feature is used to convert a raw sensor value into coolant temperature (in degrees C) and to detect sensor diagnostics.

Table 24

Setpoints - Engine/Generator Programming ⁽¹¹⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Engine Oil Pressure Sensor Configuration	N/A	N/A	N/A	0	
2	Low Engine Oil Pressure Warning Event Threshold	34 kPa (5 psi)0.34 Bar	420 kPa (61 psi)		160 kPa (23 psi)4.20 Bar	
3	Low Idle Low Engine Oil Pressure Warning Event Threshold	34 kPa (5 psi)0.34 Bar	420 kPa (61 psi)		160 kPa (23 psi)4.20 Bar	
4	Low Engine Oil Pressure Warning Event Notification Delay Time	0	30	sec	10	
5	Low Engine Oil Pressure Shutdown Event Threshold	34 kPa (5 psi)0.34 Bar	420 kPa (61 psi)		34 kPa (5 psi)4.20 Bar	
6	Low Idle Low Engine Oil Pressure Shutdown Event Threshold	34 kPa (5 psi)0.34 Bar	420 kPa (61 psi)		160 kPa (23 psi)4.20 Bar	
7	Low Engine Oil Pressure Shutdown Event Notification Delay Time	0	30	sec	10	
8	Low Engine Oil Pressure Step Speed	400	1800	rpm	1350	The engine speed that determines Low Idle. When the engine speed is below this setpoint, the Low Idle setpoint is used.

⁽¹¹⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Engine Speed Monitor

The purpose of the Engine Speed Monitor feature is to determine the engine speed, in rpm, from the Magnetic Pickup (MPU) input pins and to detect diagnostics on the MPU. The MPU used for these determinations will be an independent MPU to be used by the "EMCP3" only.

Table 25

Setpoints - Engine/Generator Programming ⁽¹²⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Flywheel Teeth	95	350	N/A	95	
2	Engine Over Speed Shutdown Threshold	400	4330	rpm	400	
3	Engine Under Speed Warning Event Threshold	400	4330	rpm	4330	
4	Engine Under Speed Warning Event Notification Delay Time	0.0	20.0	sec	2.0	
5	Engine Under Speed Shutdown Event Threshold	400	4330	rpm	4330	
6	Engine Under Speed Shutdown Event Notification Delay Time	0.0	20.0	sec	2.0	

⁽¹²⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Event Input Functions

Table 26

Setpoints - Engine/Generator Programming ⁽¹³⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Event Input Function #NN Active State Configuration	N/A	N/A	N/A	N/A	Settings for event input functions #1- #8
2	Event Input Function #NN Event Notification Delay Time	0	250	sec	0	Settings for event input functions #1- #8
3	Event Input Function #NN Suspect Parameter Number	N/A	N/A	N/A	107	Settings for event input functions #1- #8
4	Event Input Function #NN Failure Mode Identifier	0.0	20.0	sec	2.0	Settings for event input functions #1- #8

⁽¹³⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Event Output Functions

Table 27

Setpoints - Engine/Generator Programming ⁽¹⁴⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Event Output Function #NN Trigger Condition	N/A	N/A	N/A	0	Settings for event output functions #1- #30
2	Event Output Function #NN Suspect Parameter Number	N/A	N/A	N/A	100	Settings for event output functions #1- #30

⁽¹⁴⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Event Response Configuration

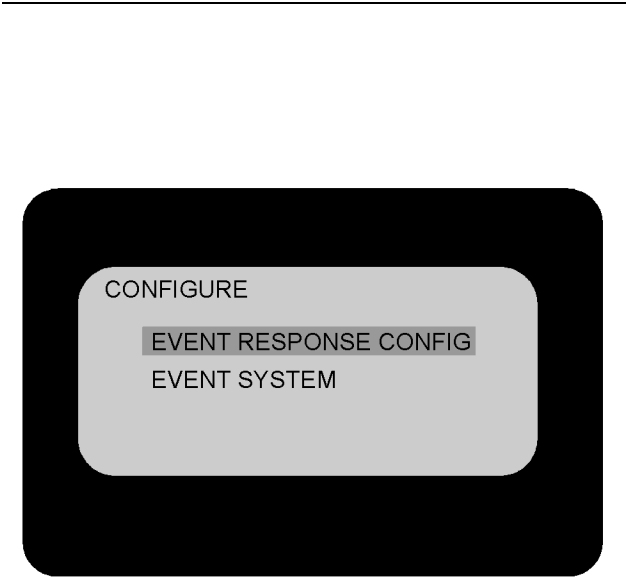


Illustration 11

g01039593

Diagnostics Configuration

The “Diagnostics Configuration” block is used to configure the desired response for any diagnostic generated by the genset control.

Note: Table 28 lists the available options for each setpoint number. The options that are available for each setpoint are designated by an “X” in the option column.

Table 28

Setpoints - Diagnostics Configuration ⁽¹⁵⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Brker Trip #1	Brker Trip #1	FPT	Active Only
1	Accessory Data Link Diagnostic Response Config	X	X	X	X		X	X		
2	Air Filter Differential Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
3	Ambient Air Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
4	Digital Output #1 Diagnostic Response Config	X	X	X	X		X	X		
5	Digital Output #2 Diagnostic Response Config	X	X	X	X		X	X		
6	Engine Coolant Level Sensor Diagnostic Response Config	X	X	X	X		X	X		
7	Engine Coolant Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
8	Engine Oil Level Sensor Diagnostic Response Config	X	X	X	X		X	X		
9	Engine Oil Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		

(continued)

(Table 28, contd)

Setpoints - Diagnostics Configuration ⁽¹⁵⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Brker Trip #1	Brker Trip #1	FPT	Active Only
1	Accessory Data Link Diagnostic Response Config	X	X	X	X		X	X		
10	Engine Oil Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
11	Engine Speed Sensor Diagnostic Response Config		X		X ⁽¹⁶⁾		X	X		
12	Exhaust Temp Sensor Diagnostic Response Config	X	X	X	X	X	X	X		
13	Right Exhaust Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
14	Left Exhaust Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
15	Fire Extinguisher Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
16	Fuel Filter Differential Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		

(continued)

(Table 28, contd)

Setpoints - Diagnostics Configuration ⁽¹⁵⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Brker Trip #1	Brker Trip #1	FPT	Active Only
1	Accessory Data Link Diagnostic Response Config	X	X	X	X		X	X		
17	Fuel Level Sensor Diagnostic Response Config	X	X	X	X		X	X		
18	External Tank Fuel Level Sensor Diagnostic Response Config	X	X	X	X		X	X		
19	Generator Bearing #1 Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
20	Generator Output Sensing System Diagnostic Response Config	X	X	X	X		X	X		
21	Engine Oil Filter Differential Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
22	Primary Data Link Diagnostic Response Config	X	X	X	X		X	X		

(continued)

(Table 28, contd)

Setpoints - Diagnostics Configuration ⁽¹⁵⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Brker Trip #1	Brker Trip #1	FPT	Active Only
1	Accessory Data Link Diagnostic Response Config	X	X	X	X		X	X		
23	SCADA Data Link Diagnostic Response Config	X	X	X	X		X	X		
24	Starting Air Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		

⁽¹⁵⁾ Each setpoint in the Diagnostics Configuration block is used in order to program a system response to the associated Suspect Parameter Number/Failure Mode Identifier (SPN/FMI) for any internal source.

⁽¹⁶⁾ Setpoint Is Not Adjustable

Engine Protection Events Configuration

The “Engine Protection Events Configuration” block is used to configure the desired response for any engine protection event generated by the genset control.

Note: Table 29 lists the available options for each setpoint number. The options that are available for each setpoint are designated by an “X” in the option column.

Table 29

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
1	Air Damper Closed Event Response Config		X		X					X
2	High Air Filter Differential Pressure Warning Event Response Config	X	X				X	X		

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
3	High Air Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X		
4	Low Air Filter Differential Pressure Warning Event Response Config	X	X				X	X	X	
5	Low Air Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X	X	
6	Emergency Stop Shutdown Event Response Config		X		X	X ⁽¹⁶⁾		X		
7	High Engine Coolant Level Warning Event Response Config	X	X	X	X		X	X		
8	High Engine Coolant Level Shutdown Event Response Config		X	X	X		X	X		
9	Low Engine Coolant Level Warning Event Response Config	X	X				X	X		
10	Low Engine Coolant Level Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
11	High Engine Coolant Temp Warning Event Response Config	X	X				X	X	X	
12	High Engine Coolant Temp Shutdown Event Response Config		X	X	X		X	X	X	
13	Low Engine Coolant Temp Warning Event Response Config	X	X				X	X	X	
14	Engine Failure to Start Shutdown Event Response Config		X		X ⁽¹⁶⁾		X	X		
15	High Engine Oil Level Warning Event Response Config	X	X				X	X		
16	High Engine Oil Level Shutdown Event Response Config		X	X	X		X	X		
17	Low Engine Oil Level Warning Event Response Config	X	X				X	X		
18	Low Engine Oil Level Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
19	Low Engine Oil Pressure Warning Event Response Config	X	X				X	X	X	
20	Low Engine Oil Pressure Shutdown Event Response Config		X	X	X		X	X	X	
21	High Engine Oil Temp Warning Event Response Config	X	X				X	X		
22	High Engine Oil Temp Shutdown Event Response Config		X	X	X		X	X		
23	Low Engine Oil Temp Warning Event Response Config	X	X				X	X	X	
24	Low Engine Oil Temp Shutdown Event Response Config		X	X	X		X	X	X	
25	Unexpected Engine Shutdown Event Response Config		X		X ⁽¹⁶⁾		X	X		
26	Engine Over Speed Shutdown Event Response Config		X		X ⁽¹⁶⁾		X	X		
27	Engine Under Speed Warning Event Response Config	X	X				X	X	X	

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
28	Engine Under Speed Shutdown Event Response Config		X	X	X		X	X	X	
29	High Exhaust Temp Warning Event Response Config	X	X				X	X		
30	High Exhaust Temp Shutdown Event Response Config	X	X	X	X		X	X		
31	Low Exhaust Temp Warning Event Response Config	X	X				X	X	X	
32	Low Exhaust Temp Shutdown Event Response Config		X	X	X		X	X	X	
33	High Right Exhaust Temp Warning Event Response Config	X	X				X	X		
34	High Right Exhaust Temp Shutdown Event Response Config		X	X	X		X	X		
35	Low Right Exhaust Temp Warning Event Response Config	X	X				X	X	X	

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
36	Low Right Exhaust Temp Shutdown Event Response Config		X	X	X		X	X	X	
37	High Left Exhaust Temp Warning Event Response Config	X	X				X	X		
38	High Left Exhaust Temp Shutdown Event Response Config	X	X	X	X		X	X		
39	Low Left Exhaust Temp Warning Event Response Config	X	X				X	X	X	
40	Low Left Exhaust Temp Shutdown Event Response Config		X	X	X		X	X	X	
41	High Fuel Filter Differential Pressure Warning Event Response Config				X	X		X		
42	High Fuel Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
43	Low Fuel Filter Differential Pressure Warning Event Response Config	X	X				X	X	X	
44	Low Fuel Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X	X	
45	High Fuel Level Warning Event Response Config	X	X				X	X		
46	High Fuel Level Shutdown Event Response Config		X	X	X		X	X		
47	Low Fuel Level Warning Event Response Config	X	X				X	X		
48	Low Fuel Level Shutdown Event Response Config		X	X	X		X	X		
49	External Tank High Fuel Level Warning Event Response Config	X	X				X	X		
50	External Tank High Fuel Level Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
51	External Tank Low Fuel Level Warning Event Response Config	X	X				X	X		
52	External Tank Low Fuel Level Shutdown Event Response Config		X	X	X		X	X		
53	Fuel Tank Leak Event Response Config	X	X	X	X		X	X		
54	High Engine Oil Filter Differential Pressure Warning Event Response Config	X	X				X	X		
55	High Engine Oil Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X		
56	Low Engine Oil Filter Differential Pressure Warning Event Response Config	X	X				X	X	X	
57	Low Engine Oil Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X	X	

(continued)

(Table 29, contd)

Setpoints - Engine Protection Events Configuration ⁽¹⁷⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
58	Service Maintenance Interval Warning Event Response Config	X	X							
59	High Starting Air Pressure Warning Event Response Config	X	X				X	X		
60	High Starting Air Pressure Shutdown Event Response Config		X	X	X		X	X		
61	Low Starting Air Pressure Warning Event Response Config	X	X				X	X	X	
62	Low Starting Air Pressure Shutdown Event Response Config		X	X	X		X	X	X	

⁽¹⁷⁾ Each setpoint in the Engine Protection Events Configuration block is used in order to program a system response to the associated Suspect Parameter Number/Failure Mode Identifier (SPN/FMI) for any internal source.

⁽¹⁶⁾ Setpoint Is Not Adjustable

Generator Protection Events Configuration

The “Generator Protection Events Configuration” block is used to configure the desired response for any engine protection event generated by the genset control.

Note: Table 30 lists the available options for each setpoint number. The options that are available for each setpoint are designated by an “X” in the option column.

Table 30

Setpoints - Generator Protection Events Configuration ⁽¹⁸⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
1	High Generator Bearing #1 Temp Warning Event Response Config	X	X				X	X		
2	High Generator Bearing #1 Temp Shutdown Event Response Config		X	X	X		X	X		
3	Low Generator Bearing #1 Temp Warning Event Response Config	X	X				X	X	X	
4	Low Generator Bearing #1 Temp Shutdown Event Response Config		X	X	X		X	X	X	
5	Generator Over Current (Amp) Warning Event Response Config	X	X				X	X		
6	Generator Over Current (Amp) Shutdown Event Response Config		X		X	X ⁽¹⁶⁾		X		
7	Generator Over Frequency Warning Event Response Config	X	X	X	X		X	X		

(continued)

(Table 30, contd)

Setpoints - Generator Protection Events Configuration ⁽¹⁸⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
8	Generator Over Frequency Shutdown Event Response Config		X	X	X		X	X		
9	Generator Under Frequency Warning Event Response Config	X	X				X	X	X	
10	Generator Under Frequency Shutdown Event Response Config		X	X	X		X	X	X	
11	Generator Reverse Power Warning Event Response Config	X	X				X	X		
12	Generator Reverse Power Shutdown Event Response Config		X	X	X		X	X		
13	Generator Over Voltage Warning Event Response Config	X	X				X	X		
14	Generator Over Voltage Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 30, contd)

Setpoints - Generator Protection Events Configuration ⁽¹⁸⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
15	Generator Under Voltage Warning Event Response Config	X	X				X	X	X	
16	Generator Under Voltage Shutdown Event Response Config		X	X	X		X	X	X	

⁽¹⁸⁾ Each setpoint in the “Generator Protection Events Configuration” block is used in order to program a system response to the associated Suspect Parameter Number/Failure Mode Identifier (SPN/FMI) for any internal source.

⁽¹⁶⁾ Setpoint Is Not Adjustable

Other System Events Config

The “Other System Events Configuration” block is used to configure the desired response for any engine protection event generated by the genset control.

Note: Table 31 lists the available options for each setpoint number. The options that are available for each setpoint are designated by an “X” in the option column.

Table 31

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
1	High Ambient Air Temp Warning Event Response Config	X	X				X	X		
2	High Ambient Air Temp Shutdown Event Response Config		X	X	X		X	X		
3	Low Ambient Air Temp Warning Event Response Config	X	X				X	X		

(continued)

(Table 31, contd)

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
4	Low Ambient Air Temp Shutdown Event Response Config		X	X	X		X	X		
5	Automatic Transfer Switch in Normal Position Event Response Config	X	X							X
6	Automatic Transfer Switch in Emergency Position Event Response Config	X	X							X
7	Battery Charger Failure Diagnostic Response Config	X	X							X
8	High Battery Voltage Warning Event Response Config	X	X				X	X		
9	High Battery Voltage Shutdown Event Response Config		X	X	X		X	X		
10	Low Battery Voltage Warning Event Response Config	X	X				X	X	X	

(continued)

(Table 31, contd)

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
11	Low Battery Charging System Voltage Warning Event Response Config	X	X				X	X	X	
12	Generator Breaker Failure to Open Event Response Config	X	X		X		X	X		
13	Generator Breaker Failure to Close Event Response Config	X	X				X	X		
14	Generator Breaker Open Event Response Config	X	X							X
15	Generator Breaker Closed Event Response Config	X	X							X
16	Utility Breaker Failure to Open Event Response Config	X	X		X		X	X		
17	Utility Breaker Failure to Close Event Response Config	X	X		X		X	X		
18	Utility Breaker Open Event Response Config	X	X							X
19	Utility Breaker Closed Event Response Config	X	X							X

(continued)

(Table 31, contd)

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
20	Emergency Shutdown Override Mode Active Warning Event Response Config	X ⁽¹⁶⁾	X							
21	Engine in Cooldown Event Response Config	X	X							X
22	Engine Speed-Generator Output Frequency Mismatch Warning Event Response Config	X	X				X	X		
23	Event Input Function #1 High Warning Event Response Config	X	X				X	X	X	
24	Event Input Function #1 High Shutdown Event Response Config		X	X	X		X	X	X	
25	Event Input Function #1 Low Warning Event Response Config	X	X				X	X	X	
26	Event Input Function #1 Low Shutdown Event Response Config		X	X	X		X	X	X	

(continued)

(Table 31, contd)

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
27	Event Input Function #1 Event Response Config	X	X						X	X
28	Event Input Function #2 High Warning Event Response Config	X	X	X	X		X	X		
29	Event Input Function #2 High Shutdown Event Response Config		X	X	X		X	X	X	
30	Event Input Function #2 Low Warning Event Response Config	X	X				X	X	X	
31	Event Input Function #2 Low Shutdown Event Response Config		X	X	X		X	X	X	
32	Event Input Function #2 Event Response Config	X	X						X	X
33	Event Input Function #3 High Warning Event Response Config	X	X				X	X	X	
34	Event Input Function #3 High Shutdown Event Response Config		X	X	X		X	X	X	

(continued)

(Table 31, contd)

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
35	Event Input Function #3 Low Warning Event Response Config	X	X				X	X	X	
36	Event Input Function #3 Low Shutdown Event Response Config		X	X	X		X	X	X	
37	Event Input Function #3 Event Response Config	X	X						X	X ⁽¹⁶⁾
38	Event Input Function #4 High Warning Event Response Config	X	X				X	X	X	
39	Event Input Function #4 High Shutdown Event Response Config		X	X	X		X	X	X	
40	Event Input Function #4 Low Warning Event Response Config	X	X				X	X	X	
41	Event Input Function #4 Low Shutdown Event Response Config		X	X	X		X	X	X	
42	Event Input Function #4 Event Response Config	X	X						X	X

(continued)

(Table 31, contd)

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
43	Event Input Function #5 High Warning Event Response Config	X	X				X	X	X	
44	Event Input Function #5 High Shutdown Event Response Config		X	X	X		X	X	X	
45	Event Input Function #5 Low Warning Event Response Config	X	X				X	X	X	
46	Event Input Function #5 Low Shutdown Event Response Config		X	X	X		X	X	X	
47	Event Input Function #5 Event Response Config	X	X						X	X
48	High Fire Extinguisher Pressure Warning Event Response Config	X	X				X	X		
49	High Fire Extinguisher Pressure Shutdown Event Response Config		X	X	X		X	X		
50	Low Fire Extinguisher Pressure Warning Event Response Config	X	X				X	X	X	

(continued)

(Table 31, contd)

Setpoints - Other System Events Configuration ⁽¹⁹⁾										
Setpt #	Name	Warning	Audible Alert	Soft Shutdown	Hard Shutdown	Loss of Utility	Breaker Trip #1	Breaker Trip #2	FPT	Active Only
51	Low Fire Extinguisher Pressure Shutdown Event Response Config		X	X	X		X	X	X	
52	Generator Control Not in Automatic Warning Event Response Config	X	X							X
53	Loss of Utility Event Response Config	X	X							X
54	Utility to Generator Transfer Failure Warning Event Response Config	X	X				X	X		
55	Utility to Generator Transfer Failure Shutdown Event Response Config		X	X			X	X		
56	Generator to Utility Transfer Failure Warning Event Response Config	X	X				X	X		

⁽¹⁹⁾ Each setpoint in the “Other System Events Configuration” block is used in order to program a system response to the associated Suspect Parameter Number/Failure Mode Identifier (SPN/FMI) for any internal source.

⁽¹⁶⁾ Setpoint Is Not Adjustable

Event System

Event System logs system events to non-volatile memory. Event System also manages the status of the events in order to provide overall status outputs to the system.

Table 32

Setpoints - Engine/Generator Programming ⁽²⁰⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Event Warning Condition Response Auto Reset Enable Status		N/A	N/A	1	
2	Event Audible Alert Response Auto Reset Enable Status	N/A	N/A	N/A	1	
3	Event Loss of Utility Response Auto Reset Enable Status	N/A	N/A	N/A	1	
4	Event Breaker #1 Trip Response Auto Reset Enable Status	N/A	N/A	N/A	1	
5	Event Breaker #2 Trip Response Auto Reset Enable Status	N/A	N/A	N/A	1	

⁽²⁰⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Generator AC Monitor

The Generator AC Monitor block measures the AC voltage and current output by the generator. The following generator values will be monitored:

- True RMS line - line voltages
- Average line - voltage
- True RMS line - neutral voltages (for star/wye configurations)
- Average line-neutral voltage (for star/wye configurations)
- True RMS line currents
- Average line current
- Generator output frequency

Table 33

Setpoints - Engine/Generator Programming ⁽²¹⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Generator Connection Configuration	N/A	N/A	N/A	Star/Wye	Generator Configurations can be "Star/Wye", "Delta/3 Wire", "Delta/4 Wire", "Single Phase 2 Wire", "Single Phase 3 Wire"
2	Generator Potential Transformer Primary Winding Rating	1	50000	V	1	
3	Generator Potential Transformer Secondary Winding Rating	1	150	V	1	
4	Generator Current Transformer Primary Winding Rating	1	7000	A	75	
5	Generator Current Transformer Secondary Winding Rating	1	5	A	5	Can only be set to 1 or 5
6	Number of Generator Poles	0	200	N/A	4	
7	Generator Rated Frequency	N/A	N/A	Hz	60	Frequency can be set to 50Hz, 60Hz or 400Hz
8	Generator Rated Voltage	100	50000	V	100	
9	Generator Rated Power	1	50000	kW	1	
10	Generator Rated Apparent Power	1	50000	kVA	1	

⁽²¹⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Generator Breaker Control

The purpose of Generator Breaker Control is to open and close the generator breaker and to generate alarms on failure of the generator breaker to open or close.

Table 34

Setpoints - Engine/Generator Programming ⁽²²⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Generator Breaker Closing Pulse Active Time	0.1	10	sec	1.0	
2	Generator Breaker Closing Pulse Rest Interval	0	60	sec	1.0	
3	Generator Breaker Maximum Closing Time	1	120	sec	60	
4	Generator Breaker Maximum Opening Time	1	20	sec	3	
5	Generator Breaker Lockout Status	N/A	N/A	N/A	0	

⁽²²⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Generator Over Current

Table 35

Setpoints - Engine/Generator Programming ⁽²³⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Generator Definite Time Over Current (Amp) Warning Event Percentage Threshold	80	130	%	100	Setpoint for the starting current
2	Generator Inverse Time Over Current (Amp) Shutdown Event Time Multiplier	0.05	10.00	sec	.27	Time multiplier setpoint
3	Generator Definite Time Over Current (Amp) Shutdown Event Percentage Threshold	100	300	%	125	Highest Priority If current is above this setpoint value for the specified time (setpoint #4) there will be an overcurrent shutdown.
4	Generator Definite Time Over Current (Amp) Shutdown Event Notification Delay Time	0.1	20.0	sec	10	Highest Priority Time limit for setpoint #3

⁽²³⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Generator Over/Under Frequency

The Generator Over/Under Frequency Alarm detects bus frequency above or below programmable thresholds for a programmable duration and activates an alarm.

Table 36

Setpoints - Engine/Generator Programming ⁽²⁴⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Generator Over Frequency Warning Event Percentage Threshold	80	120	%	105	
2	Generator Over Frequency Warning Event Notification Delay Time	0	120	sec	10	
3	Generator Over Frequency Shutdown Event Percentage Threshold	80.0	120	%	110	
4	Generator Over Frequency Shutdown Event Notification Delay Time	0	120	sec	2	
5	Generator Under Frequency Warning Event Percentage Threshold	80.0	120.0	%	95.0	
6	Generator Under Frequency Warning Event Notification Delay Time	0	120	sec	10	
7	Generator Under Frequency Shutdown Event Percentage Threshold	80.0	120.0	%	90.0	
8	Generator Under Frequency Shutdown Event Notification Delay Time	0	120	sec	4	

⁽²⁴⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Generator Over/Under Voltage

The Generator Over/Under Voltage Alarm detects bus output voltage above or below programmable thresholds for a programmable duration and activates an alarm.

Table 37

Setpoints - Engine/Generator Programming ⁽²⁵⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Generator Over Voltage Warning Event Percentage Threshold	100	125	%	105	
2	Generator Over Voltage Warning Event Notification Delay Time	0	120	sec	10	
3	Generator Over Voltage Shutdown Event Percentage Threshold	100	125	%	110	
4	Generator Over Voltage Shutdown Event Notification Delay Time	0	120	sec	2	
5	Generator Under Voltage Warning Event Percentage Threshold	60	100	%	95.0	
6	Generator Under Voltage Warning Event Notification Delay Time	0	120	sec	10	
7	Generator Under Voltage Shutdown Event Threshold	60	100	%	90.0	
8	Generator Under Voltage Shutdown Event Notification Delay Time	0	120	sec	4	

⁽²⁵⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Generator Reverse Power

The Generator Reverse Power Alarm detects a reverse power condition that persists for a duration above a programmed level.

Table 38

Setpoints - Engine/Generator Programming ⁽²⁶⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Generator Reverse Power Warning Event Percentage Threshold	1	20	%	5	
2	Generator Reverse Power Warning Event Notification Delay Time	0	30	sec	10	
3	Generator Reverse Power Shutdown Event Percentage Threshold	1	20	%	10	
4	Generator Reverse Power Shutdown Event Notification Delay Time	0	30	sec	10	

⁽²⁶⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Governor Desired Engine Speed Request

The Governor Desired Engine Speed Request block generates a data link request over the J1939 data link in order to request a desired engine speed in RPM from an electronic governor. It is used in synchronization, kW load control, import/export control and process control.

Table 39

Setpoints - Engine/Generator Programming ⁽²⁷⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Maximum Engine Speed Range	0	2000	rpm	100	
2	Generator Nominal Output Frequency	40	500	Hz	50	

⁽²⁷⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Programmable Cycle Timer

- Duration of cycle

Programmable Cycle Timer allows block outputs to be triggered on a user-defined schedule. The GSC will provide 14 user-programmable sequences that are automatically repeated in a 7-day cycle. Each sequence will have the following programmable setpoints, programmable in each group leader control (supervisory or master control):

- Days of week (Disabled, SUN - SAT)
- Time of day to start cycle

Table 40

Setpoints - Engine/Generator Programming ⁽²⁸⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Programmable Cycle Timer #1 Activation Day of the Week	0	127	N/A	0	
2	Programmable Cycle Timer #1 Activation Start Time	00.00	23.59	hours	00.00	
3	Programmable Cycle Timer #1 Active Time	00.01	24.00	hours	00.01	
4	Programmable Cycle Timer #1 Output #1 Activation Configuration	N/A	N/A	N/A	0	
5	Programmable Cycle Timer #1 Output #2 Activation Configuration	N/A	N/A	N/A	0	
6	Programmable Cycle Timer #2 Activation Day of the Week	0	127	N/A	0	
7	Programmable Cycle Timer #2 Activation Start Time	00.00	23.59	hours	00.00	
8	Programmable Cycle Timer #2 Active Time	00.01	24.00	hours	00.01	
9	Programmable Cycle Timer #2 Output #1 Activation Configuration	N/A	N/A	N/A	0	
10	Programmable Cycle Timer #2 Output #2 Activation Configuration	N/A	N/A	N/A	0	
11	Programmable Cycle Timer #3 Activation Day of the Week	0	127	N/A	0	
12	Programmable Cycle Timer #3 Activation Start Time	00.00	23.59	hours	00.00	
13	Programmable Cycle Timer #3 Active Time	00.01	24.00	hours	00.01	
14	Programmable Cycle Timer #3 Output #1 Activation Configuration	N/A	N/A	N/A	0	
15	Programmable Cycle Timer #3 Output #2 Activation Configuration	N/A	N/A	N/A	0	
16	Programmable Cycle Timer #4 Activation Day of the Week	0	127	N/A	0	
17	Programmable Cycle Timer #4 Activation Start Time	00.00	23.59	hours	00.00	
18	Programmable Cycle Timer #4 Active Time	00.01	24.00	hours	00.01	

(continued)

(Table 40, contd)

Setpoints - Engine/Generator Programming⁽²⁸⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
19	Programmable Cycle Timer #4 Output #1 Activation Configuration	N/A	N/A	N/A	0	
20	Programmable Cycle Timer #4 Output #2 Activation Configuration	N/A	N/A	N/A	0	
21	Programmable Cycle Timer #5 Activation Day of the Week	0	127	N/A	0	
22	Programmable Cycle Timer #5 Activation Start Time	00.00	23.59	hours	00.00	
23	Programmable Cycle Timer #5 Active Time	00.01	24.00	hours	00.01	
24	Programmable Cycle Timer #5 Output #1 Activation Configuration	N/A	N/A	N/A	0	
25	Programmable Cycle Timer #5 Output #2 Activation Configuration	N/A	N/A	N/A	0	
26	Programmable Cycle Timer #6 Activation Day of the Week	0	127	N/A	0	
27	Programmable Cycle Timer #6 Activation Start Time	00.00	23.59	hours	00.00	
28	Programmable Cycle Timer #6 Active Time	00.01	24.00	hours	00.01	
29	Programmable Cycle Timer #6 Output #1 Activation Configuration	N/A	N/A	N/A	0	
30	Programmable Cycle Timer #6 Output #2 Activation Configuration	N/A	N/A	N/A	0	
31	Programmable Cycle Timer #7 Activation Day of the Week	0	127	N/A	0	
32	Programmable Cycle Timer #7 Activation Start Time	00.00	23.59	hours	00.00	
33	Programmable Cycle Timer #7 Active Time	00.01	24.00	hours	00.01	
34	Programmable Cycle Timer #7 Output #1 Activation Configuration	N/A	N/A	N/A	0	
35	Programmable Cycle Timer #7 Output #2 Activation Configuration	N/A	N/A	N/A	0	

(continued)

(Table 40, contd)

Setpoints - Engine/Generator Programming ⁽²⁸⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
36	Programmable Cycle Timer #8 Activation Day of the Week	0	127	N/A	0	
37	Programmable Cycle Timer #8 Activation Start Time	00.00	23.59	hours	00.00	
38	Programmable Cycle Timer #8 Active Time	00.01	24.00	hours	00.01	
39	Programmable Cycle Timer #8 Output #1 Activation Configuration	N/A	N/A	N/A	0	
40	Programmable Cycle Timer #8 Output #2 Activation Configuration	N/A	N/A	N/A	0	
41	Programmable Cycle Timer #9 Activation Day of the Week	0	127	N/A	0	
42	Programmable Cycle Timer #9 Activation Start Time	00.00	23.59	hours	00.00	
43	Programmable Cycle Timer #9 Active Time	00.01	24.00	hours	00.01	
44	Programmable Cycle Timer #9 Output #1 Activation Configuration	N/A	N/A	N/A	0	
45	Programmable Cycle Timer #9 Output #2 Activation Configuration	N/A	N/A	N/A	0	
46	Programmable Cycle Timer #1 Activation Day of the Week	0	127	N/A	0	
47	Programmable Cycle Timer #10 Activation Start Time	00.00	23.59	hours	00.00	
48	Programmable Cycle Timer #10 Active Time	00.01	24.00	hours	00.01	
49	Programmable Cycle Timer #10 Output #1 Activation Configuration	N/A	N/A	N/A	0	
50	Programmable Cycle Timer #10 Output #2 Activation Configuration	N/A	N/A	N/A	0	
51	Programmable Cycle Timer #11 Activation Day of the Week	0	127	N/A	0	
52	Programmable Cycle Timer #11 Activation Start Time	00.00	23.59	hours	00.00	
53	Programmable Cycle Timer #11 Active Time	00.01	24.00	hours	00.01	

(continued)

(Table 40, contd)

Setpoints - Engine/Generator Programming⁽²⁸⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
54	Programmable Cycle Timer #11 Output #1 Activation Configuration	N/A	N/A	N/A	0	
55	Programmable Cycle Timer #11 Output #2 Activation Configuration	N/A	N/A	N/A	0	
56	Programmable Cycle Timer #12 Activation Day of the Week	0	127	N/A	0	
57	Programmable Cycle Timer #12 Activation Start Time	00.00	23.59	hours	00.00	
58	Programmable Cycle Timer #12 Active Time	00.01	24.00	hours	00.01	
59	Programmable Cycle Timer #12 Output #1 Activation Configuration	N/A	N/A	N/A	0	
60	Programmable Cycle Timer #12 Output #2 Activation Configuration	N/A	N/A	N/A	0	
61	Programmable Cycle Timer #13 Activation Day of the Week	0	127	N/A	0	
62	Programmable Cycle Timer #13 Activation Start Time	00.00	23.59	hours	00.00	
63	Programmable Cycle Timer #13 Active Time	00.01	24.00	hours	00.01	
64	Programmable Cycle Timer #13 Output #1 Activation Configuration	N/A	N/A	N/A	0	
65	Programmable Cycle Timer #13 Output #2 Activation Configuration	N/A	N/A	N/A	0	
66	Programmable Cycle Timer #14 Activation Day of the Week	0	127	N/A	0	
67	Programmable Cycle Timer #14 Activation Start Time	00.00	23.59	hours	00.00	
68	Programmable Cycle Timer #14 Active Time	00.01	24.00	hours	00.01	

(continued)

(Table 40, contd)

Setpoints - Engine/Generator Programming ⁽²⁸⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
69	Programmable Cycle Timer #14 Output #1 Activation Configuration	N/A	N/A	N/A	0	
70	Programmable Cycle Timer #14 Output #2 Activation Configuration	N/A	N/A	N/A	0	

⁽²⁸⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Relay Outputs

Table 41

Setpoints - Engine/Generator Programming ⁽²⁹⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Relay Output #1 Active State Configuration	N/A	N/A	N/A	1	Relay Output #1 is always configured as the "Starter Motor Relay"
2	Relay Output #2 Active State Configuration	N/A	N/A	N/A	1	Relay #2 is always configured as the "Fuel Control Relay"
3	Relay Output #3 Active State Configuration	N/A	N/A	N/A	1	Relay Output #3 is controlled by Digital Selector #1 The output can be set to "Active High" or "Active Low"
4	Relay Output #4 Active State Configuration	N/A	N/A	N/A	1	Relay Output #4 is controlled by Digital Selector #2 The output can be set to "Active High" or "Active Low"
5	Relay Output #5 Active State Configuration	N/A	N/A	N/A	1	Relay Output #5 is controlled by Digital Selector #3 The output can be set to "Active High" or "Active Low"
6	Relay Output #6 Active State Configuration	N/A	N/A	N/A	1	Relay Output #6 is controlled by Digital Selector #4 The output can be set to "Active High" or "Active Low"
7	Relay Output #7 Active State Configuration	N/A	N/A	N/A	1	Relay Output #7 is controlled by Digital Selector #5
8	Relay Output #8 Active State Configuration	N/A	N/A	N/A	1	Relay Output #8 is controlled by Digital Selector #6 The output can be set to "Active High" or "Active Low"

⁽²⁹⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Remote Callback

Remote Callback is used in gensets with a modem connection in order to allow the genset control to dial a programmed telephone number in response to a fault condition. A receiving PC can then query the nature of the fault.

Table 42

Setpoints - Engine/Generator Programming ⁽³⁰⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Remote Dial Enable Status	N/A	N/A	N/A	1	Setpoints for relay Outputs #1 - #8
2	Remote Dial Command Configuration	N/A	N/A	N/A	1	Setpoints for relay Outputs #1 - #8

⁽³⁰⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Service Maintenance Interval

Table 43

Setpoints - Engine/Generator Programming ⁽³¹⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Service Maintenance Interval Hours	0	2000	hours	1800000 sec	
2	Service Maintenance Interval Days	0	365	days	180	

⁽³¹⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Spare Analog Input

Table 44

Setpoints - Engine/Generator Programming ⁽³²⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Spare Analog Input Enable Status	N/A	N/A	N/A	Disabled	Setpoint allows for selection of Enabled or Disabled
2	Spare Analog Input Type Configuration	N/A	N/A	N/A	0	Select Levels, Temps, or Pressures
3	Spare Analog Input Suspect Parameter Number	N/A	N/A	N/A	107	
4	Spare Analog Input High Percentage Warning Event Threshold	0	100	%	0	
5	Spare Analog Input High Temp Warning Event Threshold	-273	1735	deg C	-273	

(continued)

(Table 44, contd)

Setpoints - Engine/Generator Programming ⁽³²⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
6	Spare Analog Input High Pressure Warning Event Threshold	-250	10000	kPa	-250	
7	Spare Analog Input High Warning Event Notification Delay Time	0	60	sec	0	
8	Spare Analog Input High Percentage Shutdown Event Threshold	0	100	%	0	
9	Spare Analog Input High Temp Shutdown Event Threshold	-273	1735	deg C	-273	
10	Spare Analog Input High Pressure Shutdown Event Threshold	-250	10000	kPa	-250	
11	Spare Analog Input High Shutdown Event Notification Delay Time	0	60	sec	0	
12	Spare Analog Input Low Percentage Warning Event Threshold	0	100	%	0	
13	Spare Analog Input Low Temp Warning Event Threshold	-273	1735	deg C	-273	
14	Spare Analog Input Low Pressure Warning Event Threshold	-250	10000	kPa	-250	
15	Spare Analog Input Low Warning Event Notification Delay Time	0	60	sec	0	
16	Spare Analog Input Low Percentage Shutdown Event Threshold	0	100	%	0	
17	Spare Analog Input Low Temp Shutdown Event Threshold	-273	1735	deg C	-273	

(continued)

(Table 44, contd)

Setpoints - Engine/Generator Programming ⁽³²⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
18	Spare Analog Input Low Pressure Shutdown Event Threshold	-250	10000	kPa	-250	
19	Spare Analog Input Low Shutdown Event Notification Delay Time	0	60	sec	0	

⁽³²⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Transfer Switch

The purpose of the Transfer Switch function is to automatically transition from utility power to standby genset power in the case of a Loss of Utility event or an internal request and then to automatically transition back to utility power after the utility returns or the external request is removed.

Table 45

Setpoints - Engine/Generator Programming ⁽³³⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Generator/Utility Automatic Transfer Enable Status	N/A	N/A	N/A	1	
2	Loss of Utility Event Notification Delay Time	0	30	sec	10	
3	Utility to Generator Transfer Delay Time	1	60	sec	3	
4	Generator to Utility Transfer Delay Time	1	60	min	180	
5	Generator to Utility Fast Transfer Delay Time	1	60	sec	10	
6	Utility to Generator Transfer Failure Warning Event Threshold	1	240	sec	60	
7	Utility to Generator Transfer Failure Shutdown Event Threshold	1	240	sec	90	
8	Generator to Utility Transfer Failure Warning Event Threshold	1	240	sec	60	

⁽³³⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

Utility Breaker Control

The purpose of Utility Breaker Control is to open and close the utility breaker and to generate alarms on failure of the utility breaker to open or close.

Table 46

Setpoints - Engine/Generator Programming ⁽³⁴⁾						
Setpoint Number	Setpoint Name	Min Value	Max Value	Units	Factory Default	Description
1	Utility Breaker Closing Pulse Active Time	0.1	10.0	sec	1.0	
2	Utility Breaker Closing Pulse Rest Interval	0	60	sec	15	
3	Utility Breaker Maximum Closing Time	1	20	sec	60	
4	Utility Breaker Maximum Opening Time	1	20	sec	3	
5	Utility Breaker Lockout Status	N/A	N/A	N/A	0	

⁽³⁴⁾ The setpoints that are stored or the setpoints that are being programmed must match the specified setpoints of the particular generator set.

i01988180

Typical Generator Abbreviations

SMCS Code: 4490

A – Ammeter

ACT – Actuator

ADS – Engine Combustion Air Damper Position Switch

AFCR – Auxiliary Fuel Control Valve

ALM – Alarm Module

ALS – Alarm Silence Push Button

ALT – Alternator

AR – Arming Relay

ASOS – Air Shutoff Solenoid

ASR – Air Shutoff Relay

ASSV – Air Start Solenoid Valve

ATB – AC Transformer Box

AUX – Auxiliary Terminal Strip

AUXREL – Auxiliary Relay (Crank Termination)

AWG – American Wire Gauge

BATT – Battery

BCF – Battery Charger Failure Switch

BTB – Bus Transformer Box

C – Common

CAM – Custom Alarm Module

CAR – Custom Alarm Relay

CB – Circuit Breaker

CCM – Customer Communication Module

CDM – Engine Cooldown Timer Module

CIM – Customer Interface Module

CT – Current Transformer

CTR – Crank Termination Relay

D – Diode

DCV – DC Voltmeter

DS – Disconnect Switch

ECLC – Engine Coolant Loss Sensor Connector

ECLS – Engine Coolant Loss Sensor

ECS – Engine Control Switch

ECTS – Engine Coolant Temperature Sensor

EFCR – Emergency Fuel Control Relay
EFL – Emergency Fuel Light
EG – Electronic Governor (Speed Sensing)
EGA – Electronic Governor Actuator
EGR – Electronic Governor Relay
EHC – Ether Hold-In Coil
EHS – Ether Hold-In Switch
ENFR – Engine Failure Relay
EOTC – Engine Oil Temperature Sensor Connector
EOTS – Engine Oil Temperature Sensor
EOPS – Engine Oil Pressure Sensor
EPC – Ether Pull-In Coil
EPS – Ether Pull-In Switch
ES – Ether Solenoid
ESPB – Emergency Stop Push Button
ESL – Emergency Stop Light
F – Fuse
FCR – Fuel Control Relay
FCTM – Fuel Control Timer Module
FRB – Fuel Rupture Basin
FS – Fuel Solenoid
FSOS – Fuel Shutoff Solenoid
GFR – Generator Fault Relay
GOL – Generator On Load
GOV – Governor
GPHI – Ground Post (High Voltage)
GPLO – Ground Post (Low Voltage)
GS – Governor Switch
GSC – Generator Set Control
GSM – Governor Synchronizing Motor
GSOV – Gas Shutoff Valve
HZ – Frequency Meter

KWR – Kilowatt Level Relay
IC – Remote Start/Stop Initiate Contact
L – Load Leads
LFL – Low Fuel Level Light
LFLAS – Low Fuel Level Alarm Switch
LFS – Latching Fuel Control Solenoid
LOLAS – Low Oil Level Alarm Switch
LWLAS – Low Water Level Alarm Switch
LWTL – Low Water Temperature Light
MAN – Manual
MPU – Magnetic Speed Pickup
NC – Normally Closed
NO – Normally Open
OCL – Overcrank Light
OCR – Overcurrent Relay
OCT – Overcrank Timer
OP – Oil Pressure
OPG – Oil Pressure Gauge
OPL – Oil Pressure Light
OSL – Overspeed Light
OSR – Oil Step Relay
OVR – Overvoltage Relay
PEEC – Programmable Electronic Engine Control
PL – Panel Illumination Light
PLS – Panel Light Switch
POS – Positive
POT – Potentiometer
PP – Prelube Pump
PPMS – Prelube Pump Magnetic Switch
PPPS – Prelube Pump Oil Pressure Switch
PR – Preregulator
PS – Pinion Solenoid

PWM – Electrical Converter (Pulse Width Modulated)

RAN – Remote Annunciator

RDM – Relay Driver Module

RPL – Reverse Power Light

RPR – Reverse Power Relay

RPSR – Reverse Power Slave Relay

RR – Run Relay

SASV – Start Aid Solenoid Valve

SATS – Start Aid Temperature Switch

SAS – Starting Aid Switch

SEC – Second

SHTC – Circuit Breaker Shunt Trip Coil

SIG – Signal

SL – Synchronizing Light

SLM – Synchronizing Light Module

SLR – Synchronizing Light Resistor

SM – Starting Motor

SMMS – Starting Motor Magnetic Switch

SMR – Starting Motor Relay

SP – Speed Adjust Potentiometer

SPM – Synchronizing Parallel Module

SR – Slave Relay

SS – Synchronizing Switch

T – Generator Line Leads

TD – Time Delay Relay

TSC – Transfer Switch Position Indicating Contact

V – AC Voltmeter

VAR – Voltage Adjust Rheostat

VR – Voltage Regulator

WT – Water Temperature

WTG – Water Temperature Gauge

WTL – Water Temperature Light

XDUCER – Transducer

Z – Zener Diode

i01988206

Symbols

SMCS Code: 4490

	OUTGOING/INCOMING PANEL TERMINAL
	INTERNAL PANEL TERMINAL
	POWER TERMINAL
	ATB TERMINAL
	MARSHALLING BOX DC TERMINAL
	MARSHALLING BOX AC TERMINAL
	GSC 40 WAY HARNESS CONNECTOR
	GSC RELAY MODULE TERMINAL
	PANEL 70 WAY CONNECTOR
	DC CONNECTOR No.1 (BLACK)
	DC CONNECTOR No.2 (GREY)
	AC CONNECTOR FROM ALT. (GREEN)
	OIL PRESSURE ENGINE CONNECTOR
	ENGINE TEMP. ENGINE CONNECTOR
	MAGNETIC PICKUP ENGINE CONNECTOR
	COOLANT LOSS ENGINE CONNECTOR
	OIL TEMPERATURE ENGINE CONNECTOR
	40 WAY ENGINE CONNECTOR
	MARSHALLING BOX 40 WAY DC CONNECTOR
	MARSHALLING BOX 40 WAY AC CONNECTOR
	PRELUBE CONTROL 2 WAY CONNECTOR

Illustration 12

g00442132

i01988402

ECM Connections

SMCS Code: 4490; 7566

Illustration 13

g01029815

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