CATERPILLAR®

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Systems Operation Troubleshooting Testing and Adjusting

EMCP 3

CNB1-Up (Generator Set)
CMC1-Up (Generator Set)
BRK1-Up (Generator Set)
CAL1-Up (Generator Set)
FDN1-Up (Generator Set)

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.

⚠ WARNING

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.

⚠ WARNING

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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Systems Operation Section

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General Information

SMCS Code: 4490

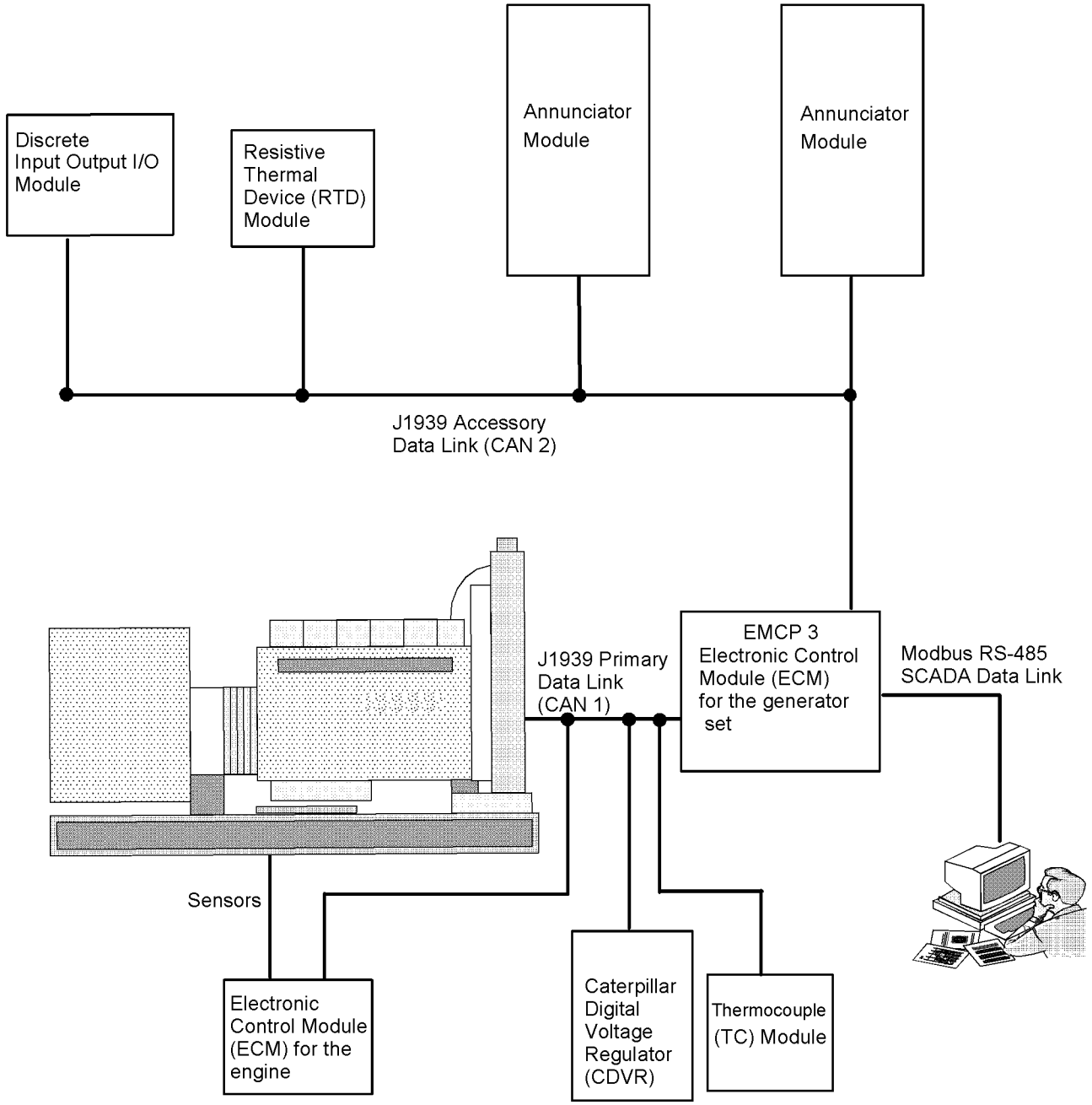

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Illustration 1

Block diagram of a generator set with EMCP 3 and EUI Engine

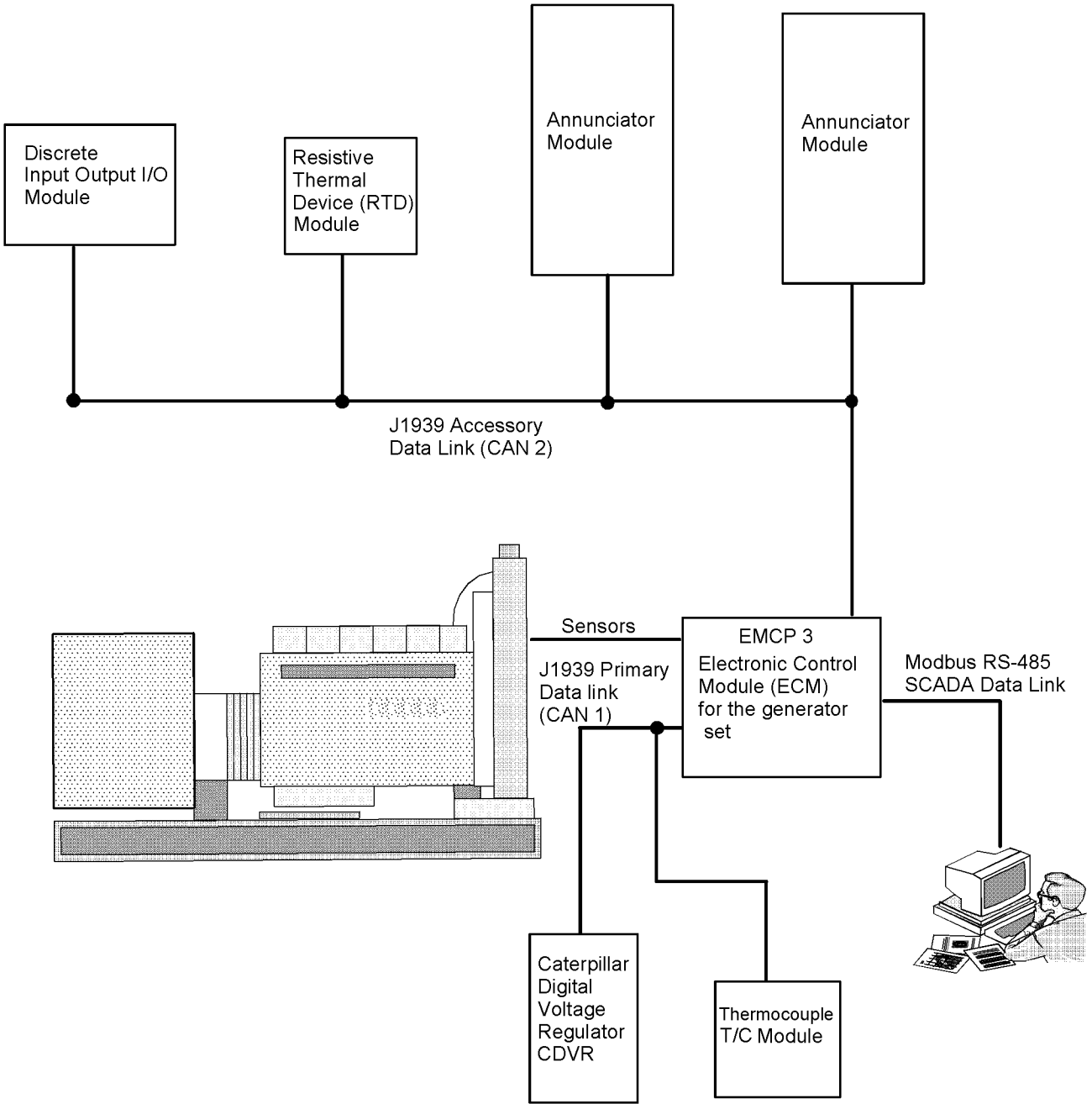

Illustration 2 g01035964

Block diagram of a generator set with EMCP 3 and MUI Engine

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Component Location

SMCS Code: 4490

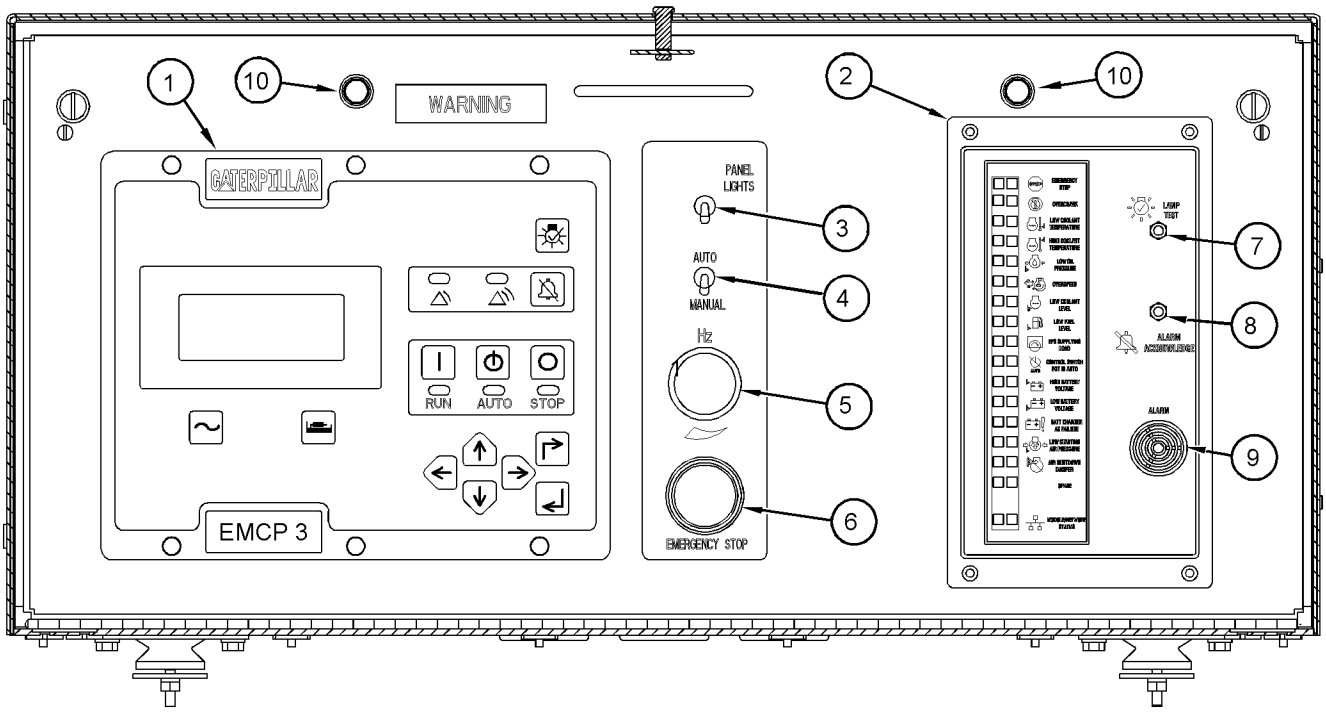

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Illustration 3

EMCP 3 Control Panel - Face Of Front Panel

(1) Electronic Control Module (ECM) for the Generator Set
(2) Annunciator Module (ALM)
(3) Panel Light Switch (PLS)
(4) Either Start Aid Switch (SAS) (optional)
(5) Speed Potentiometer (SP) (optional)
(6) Emergency Stop Push Button (ESPB)
(7) Lamp Test Switch
(8) Alarm Acknowledge/Silence Switch
(9) Alarm Horn
(10) Panel Lights

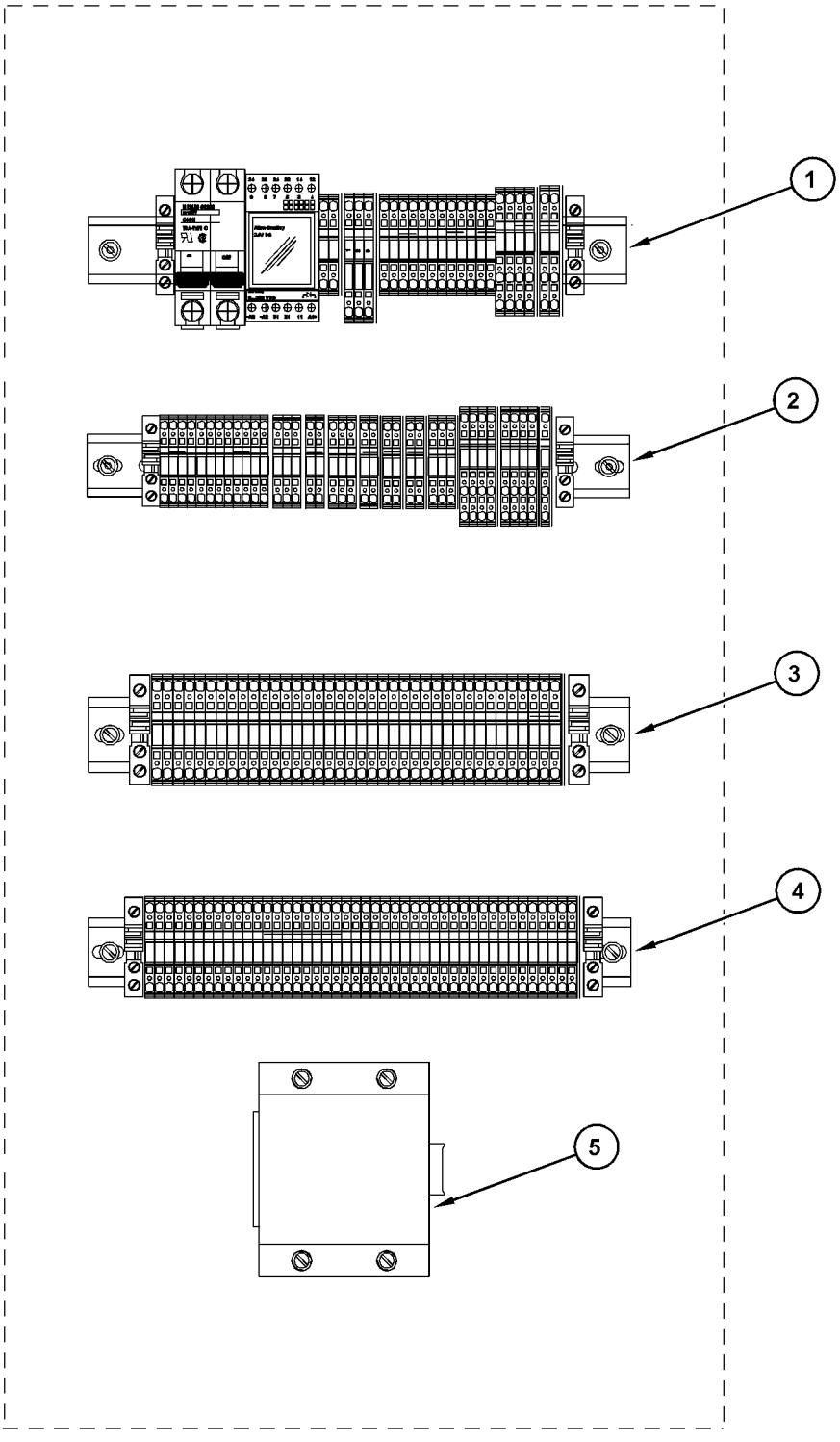

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Illustration 4

EMCP 3 Control Panel -Subpanel

(1) AC Terminal Strip
(2) DC Terminal Strip
(3) Switchgear Option Terminal Strip
(4) Discrete Input Output (I/O) Terminal Strip
(5) Discrete Input Output (I/O) Module or Resistive Temperature Device (RTD) Module

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Electronic Control Module (Generator Set)

SMCS Code: 4490

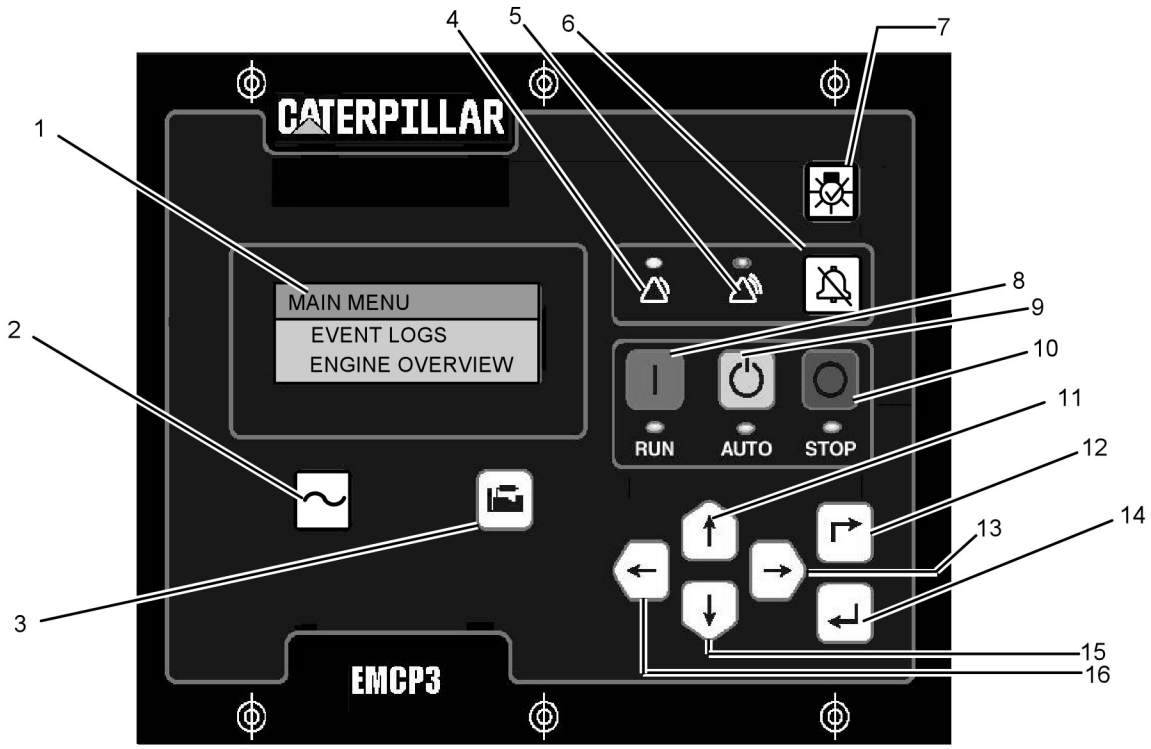

Illustration 5 g01045431

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

Navigation Keys

AC Overview – The AC Overview Key (2) will navigate the display the first screen of AC information. The AC Overview Key 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.

Alarm Acknowledge/Silence – Pressing the Alarm Acknowledge/Silence 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 Alarm Acknowledge/Silence Key may also be configured to send out a global alarm silence on the J1939 Data Link which will silence horns on annunciators.

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.

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 (10) will cause the engine to enter the “STOP” mode.

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

Escape – The Escape Key (12) is used during menu navigation in order to navigate up through the menu/sub-menu structure. Each key press causes the user to move backwards/upwards through the navigation menus. The Escape Key is also used to cancel out of data entry screens during setpoint programming. If the Escape Key is pressed during setpoint programming, none of the changes made on screen will be saved to memory.

Scroll Right – The Scroll Right Key (13) is used during setpoint adjustment. During numeric data entry, the Scroll Right Key is used to choose which digit is being edited. The Scroll 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 Scroll 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 Scroll Right Key will cause a check mark to appear, Enabling the function.

Enter – The Enter Key (14) is used during menu navigation to select menu items in order to navigate forward/downward in the menu/sub-menu structure. The Enter Key is also used during setpoint programming in order to save setpoints changes. Pressing the Enter Key during setpoint programming causes setpoint changes to be saved to memory

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.

Scroll Left – The Scroll Left Key (16) is used during setpoint adjustment. During numeric data entry, the Scroll Left Key is used to choose which digit is being edited. The Scroll 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 Scroll 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 Scroll Left 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 Alarm Acknowledge/Silence Key (6)is pressed. If there are no longer any active warnings, the yellow light will turn off after the Alarm Acknowledge/Silence Key (6) 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/Silence Key (6) 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 “EMCP 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). If the operator wants to operate the genset in the Reduced Power Mode, The Emergency Stop must be configured for Active Low Refer to: Testing and Adjusting , “Electronic Control Module generator Set) Configure”Activating the emergency stop input will cause the generator set to stop immediately or prevent the generator set from starting. Once Digital Input #1 goes active, the engine will not start until the event is reset. Refer to: System Operation , “Event Resetting”

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 I/P 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 programmed to monitor the following parameters or components. Refer to:System Operation Troubleshooting Testing and Adjusting, “Digital Input Programming”

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 Temperature
- Engine Coolant Temperature
- Engine Oil Temperature
- Exhaust Temperature
- Rear Bearing Temperature
- Right Exhaust Temperature
- Left Exhaust Temperature

Levels

- Engine Coolant Level
- Engine Oil Level
- Fuel Level
- External Tank 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 Detected
- Custom Event

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Thermocouple Module

SMCS Code: 7490

General Information

The Thermocouple Module (TC) 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 Termocouple Module will read the inputs and then calculates the temperature in “Celsius”. The Thermocouple Module will then broadcast the information onto the “J1939” data link. The EMCP 3 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 EMCP 3.

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 EMCP 3 controller reads these messages and annunciates and/or performs engine shutdown appropriately. Any of the inputs can be disabled to prevent unnecessary diagnostic faults.

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

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

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 “EMCP 3” 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**
52	Engine Intercooler Temperature
105	Intake Manifold 1 Temperature
110	Engine Coolant Temperature

(continued)

(Table 3, contd)

171	Ambient Air Temperature
172	Air Inlet Temperature
173	Exhaust Gas Temperature
174	Fuel Temperature
175	Engine Oil Temperature 1
176	Turbo Oil Temperature
441	Auxiliary Temperature 1
442	Auxiliary Temperature 2
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
1131	Intake Manifold 2 Temperature
1132	Intake Manifold 3 Temperature
1133	Intake Manifold 4 Temperature
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
1157	Main Bearing 1 Temperature (engine)
1158	Main Bearing 2 Temperature (engine)

(continued)

(Table 3, contd)

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)
1172	Turbocharger 1 Compressor Inlet Temperature
1173	Turbocharger 2 Compressor Inlet Temperature
1174	Turbocharger 3 Compressor Inlet Temperature
1175	Turbocharger 4 Compressor Inlet Temperature
1180	Turbocharger 1 Turbine Inlet Temperature
1181	Turbocharger 2 Turbine Inlet Temperature
1182	Turbocharger 3 Turbine Inlet Temperature
1183	Turbocharger 4 Turbine Inlet Temperature
1184	Turbocharger 1 Turbine Outlet Temperature
1185	Turbocharger 2 Turbine Outlet Temperature
1186	Turbocharger 3 Turbine Outlet Temperature
1187	Turbocharger 4 Turbine Outlet Temperature
1212	Engine Auxiliary Coolant Temperature
1800	Battery 1 Temperature
1801	Battery 2 Temperature
1802	Intake Manifold 5 Temperature
1803	Intake Manifold 6 Temperature
2433	Right Manifold Exhaust Gas Temperature
2434	Left Manifold Exhaust Gas 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 service tool has the capability to configure any programmable/configurable parameter. The input to each thermocouple 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	0 to 1735 C
Input #n – High Temperature Warning Threshold	85	0 to 1735 C
Input #n – Low Temperature Warning Threshold	-200	-200 to 800 C
Input #n – High Temperature Shutdown Delay Time	1	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).

i02015971

Discrete Input/Output Module

SMCS Code: 7490

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 operating eight relay outputs. The Discrete I/O Module can be mounted on the genset package or can be remote mounted away from the genset package.

Inputs

The Discrete I/O Module has twelve inputs with four return channels.The inputs can be activated by either switching to a return or to battery negative. 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.

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	0 to 120 sec.	0 sec.
Input #nn Suspect parameter Number (SPN)	Any SPN Supported by EMCP 3	N/A
Input #nn Failure Mode Identifier (FMI)	Any FMI supported by EMCP 3	N/A

Table 6

Configuration Examples			
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
111	Engine Coolant Level	X	X
137	Extinguisher 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

(continued)

(Table 6, contd)

Configuration Examples			
SPN	**SPN Description**	**Input**	**Output**
175	Engine Oil Temperature		X
190	Engine Overspeed		X
628	Voltage Regulator Failure		X
970	Emergency Stop Shutdown		X
1122	Generator Bearing Temperature #1		X
1124	Generator Winding Temperature #1		X
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
1383	Unexpected Engine Shutdown		x
1664	Engine Failure to Start Shutdown		X
2436	Generator Frequency		X
2440	Generator Voltage		X

(continued)

(Table 6, contd)

Configuration Examples			
SPN	**SPN Description**	**Input**	**Output**
2448	Generator AC Current		X
2452	Generator Reverse Power (kW)		X
2456	Generator Reactive Power (VAR)		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
4007	Generator Control Not in Auto		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	

(continued)

(Table 6, contd)

Configuration Examples			
SPN	**SPN Description**	**Input**	**Output**
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 " Form C" 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. Each output has the configuration parameters that are shown in table 7

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.

Table 7

Configuration Parameters for Each Output	
Setpoint Parameter	Range
Output #nn Suspect Parameter Number (SPN)	Any SPN supported by EMCP 3
Output #nn Triggger Condition	Disabled Condition Exists - Specific Diagnostic - General Diagnostic - Specific High Shutdown - Specific High Warning - Specific Low Shutdown - Specific Low Warning - Specific Shutdown - General Warning - General Warning or Shutdown - Specific Warning, Shutdown or Diagnostic - General Warning, Shutdown or Diagnostic - Specific

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.This service tool has the capability to configure any configurable/programmable 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 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: 7490

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 “Celsius”. The RTD Module will then broadcast the information onto the “J1939” data link. The Engine Control Module (ECM) for the generator set 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 ECM.

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 ECM 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	
FMI	**Description**
0	RTD Input #n High Temperature Shutdown
4	RTD Input Sensor #n Short Circuit
5	RTD Input Sensor #n Open Circuit
15	RTD Input #n High Temperature Warning
17	RTD Input #n Low Temperature Warning

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 “EMCP 3” controller as either Fahrenheit or Celsius.

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

Table 10

SPNs Available for Configuration of Temperature Inputs	
SPN	**Description**
52	Engine Intercooler Temperature

(continued)

(Table 10, contd)

SPNs Available for Configuration of Temperature Inputs	
SPN	**Description**
105	Intake Manifold 1 Temperature
110	Engine Coolant Temperature
171	Ambient Air Temperature
172	Air Inlet Temperature
173	Exhaust Gas Temperature
174	Fuel Temperature
175	Engine Oil Temperature 1
176	Turbo Oil Temperature
441	Auxiliary Temperature 1
442	Auxiliary Temperature 2
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
1131	Intake Manifold 2 Temperature
1132	Intake Manifold 3 Temperature
1133	Intake Manifold 4 Temperature
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

(continued)

(Table 10, contd)

SPNs Available for Configuration of Temperature Inputs	
SPN	**Description**
1156	Exhaust Gas Port 20 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)
1172	Turbocharger 1 Compressor Inlet Temperature
1173	Turbocharger 2 Compressor Inlet Temperature
1174	Turbocharger 3 Compressor Inlet Temperature
1175	Turbocharger 4 Compressor Inlet Temperature
1180	Turbocharger 1 Turbine Inlet Temperature
1181	Turbocharger 2 Turbine Inlet Temperature
1182	Turbocharger 3 Turbine Inlet Temperature
1183	Turbocharger 4 Turbine Inlet Temperature
1184	Turbocharger 1 Turbine Outlet Temperature
1185	Turbocharger 2 Turbine Outlet Temperature
1186	Turbocharger 3 Turbine Outlet Temperature
1187	Turbocharger 4 Turbine Outlet Temperature
1212	Engine Auxiliary Coolant Temperature
1800	Battery 1 Temperature
1801	Battery 2 Temperature
1802	Intake Manifold 5 Temperature
1803	Intake Manifold 6 Temperature
2433	Right Manifold Exhaust Gas Temperature
2434	Left Manifold Exhaust Gas 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. This service tool has the capability to configure any configurable/programmable 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	Not Installed	Not Installed 2-wire RTD 3-wire RTD 4-wire RTD
Input #n – High Temperature Shutdown Threshold	95	0 to 1735 °C
Input #n – High Temperature Warning Threshold	85	0 to 1735 °C
Input #n – Low Temperature Warning Threshold	-200	-200 to 800 °C
Input #n – High Temperature Shutdown Delay Time	1	0 to 120 seconds
Input #n – High Temperature Warning Delay Time	1	0 to 120 seconds
Input #n - Low Temperature Warning Delay Time	1	0 to 120 seconds

Specifications

- 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).

i02014506

Annunciator Module

SMCS Code: 4490

General Information

The EMCP 3 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 LED indicators on the annunciator's front panel. Sixteen pair of LED indicators are used to announce events, diagnostics, and ready signals. The seventeenth pair of LED indicators is used as a combined network/module status LED. The seventeenth pair of LED indicators can tell the operator if there is a problem with the J1939 data link connection.

Basic Operation

Each pair of LED indicators on the annunciator consists of two of the following three colors: green, yellow, and red. For example, a pair of red and yellow LED indicators 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 audible horn will sound. If the low engine oil pressure Shutdown is read over the data link, the Annunciator will flash the Red LED and the audible horn will sound.

To acknowledge the Shutdown and Alarm conditions or silence the horn, press the "Alarm Acknowledge" button that is located near the middle of the Annunciator.

To test the LED indicators or test 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).

Custom Event Annunciation

The annunciator can be configured for any event (SPN and FMI combination) listed in tables 12 and 13. For custom events (that are not listed on the standard film) the user has two options. A descriptive label may be placed next to the appropriate LED pair after the LED's have been configured or the standard film may be replaced with a label from the 260-6898 Custom Label Kit.

Custom events that originate from sensing devices that do not communicate on the J1939 Data Link need to have their dry contacts wired to EMCP3 spare digital inputs or wired to an unused input on the optional Discrete I/O Module. For information on programming EMCP3 spare digital inputs see System Operation, "Digital Input Programming". For information on programming the Discrete I/O Module see System Operation, "Discrete Input/Output Module".

Suspect Parameter Number (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**
Fuel Level (External Tank)	38
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

(continued)

(Table 12, contd)

Supported SPNs	
SPN Description	**SPN**
Altitude	108
Engine Coolant Temperature	110
Engine Coolant Level	111
Fire Extinguisher Pressure	137
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
SCADA Data Link Fault	625
Primary Data Link (J1939 #1)	639
Event Input Function #1	701
Event Input Function #2	702
Event Input Function #3	703
Event Input Function #4	704
Event Input Function #5	705
Event Input Function #6	706
Event Input Function #7	707
Event Input Function #8	708
Event Input Function #9	709
Event Input Function #10	710
Event Input Function #11	711
Event Input Function #12	712
Event Input Function #13	713
Event Input Function #14	714
Event Input Function #15	715
Event Input Function #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

(continued)

(Table 12, contd)

Supported SPNs	
SPN Description	**SPN**
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
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
Ruptured Fuel Basin - Primary Tank	1239
Unexpected Engine Shutdown	1383
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 Reverse Power (kW)	2452
Generator Reverse Power (kVAr)	2456
Service Interval Warning	2648
Air Damper Closed	4000
ATS in Normal Position	4001
ATS in Emergency Position	4002
Battery Charger Failure	4003
Generator Control Not in Automatic Warning	4007
Generator Breaker Failure to Open	4009
Utility Breaker Failure to Open	4010

(continued)

(Table 12, contd)

Supported SPNs	
SPN Description	**SPN**
Generator Breaker Failure to Close	4011
Utility to Generator Transfer Failure Warning	4015
Utility to Generator Transfer Failure Shutdown	4015
Utility Breaker Failure to Close	4015
Generator to Utility Transfer Failure Warning	4016
Loss of Utility	4017

Failure Mode Identifier (FMI)

Choose the FMI from Table 13

Table 13

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

Adding Optional Remote Annunciator

An additional annunciator may be added if desired. In order to operate properly, the annunciator must be located within 243.8 m (800 ft.) of the EMCP 3 control panel and the end of line terminating resistor must be relocated. Refer to Illustration 6.

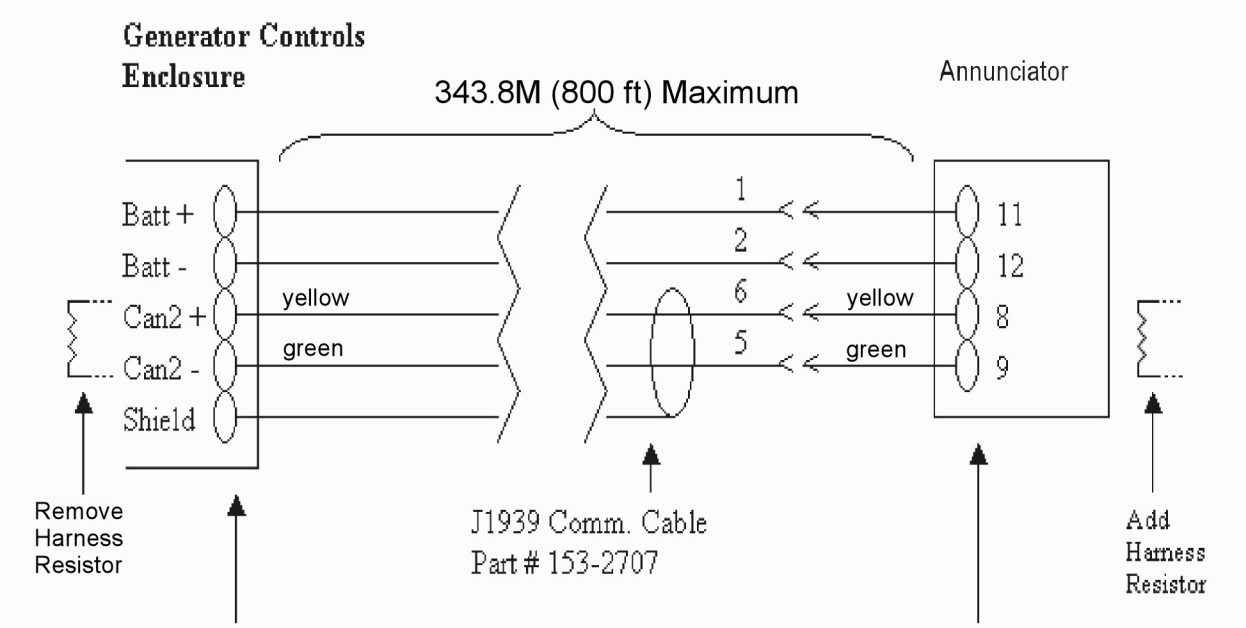

Illustration 6 g01093231

Adding Optional Remote Annunciator.

An additional Discrete I/O Module may be added in parallel to remote annunciators. In order to operate properly, the device to be added in parallel to the annunciator must be within 2.7 m (9 ft.) of the annunciator. Refer to Illustration 7.

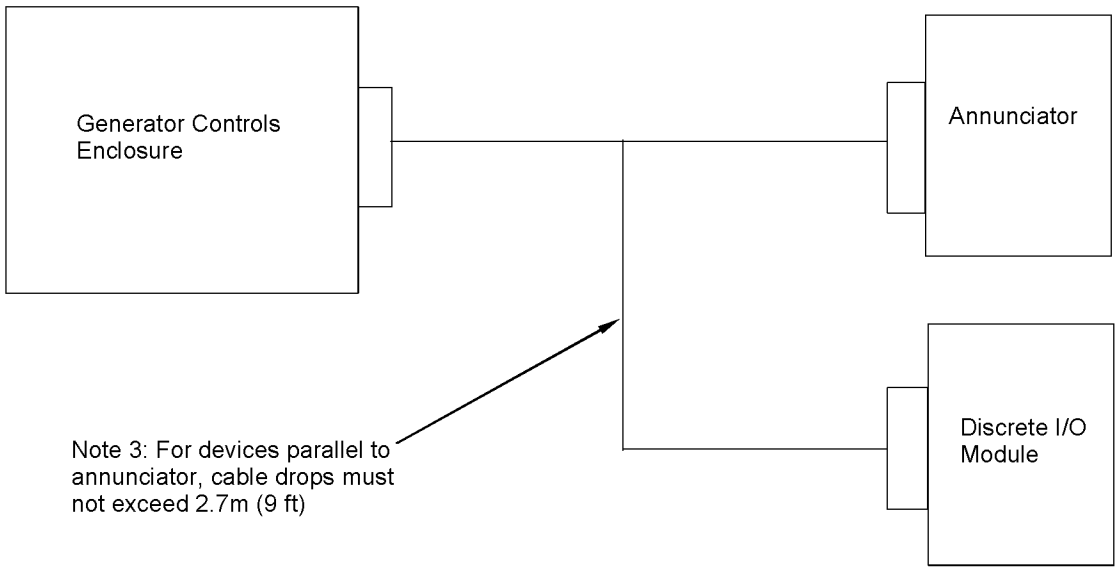

Illustration 7
g01093228

Connection details for devices in parallel with remote annunciator.

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Data Link

SMCS Code: 4490

Data Links

The EMCP 3 has up to three different data links:

- One Primary Data Link
- One Accessory Data Link
- One System Control And Data Acquisition (SCADA) Data Link

Note: The “EMCP 3.1” has one Primary Data Link. The “EMCP 3.2” and “EMCP 3.3” have two Primary Data Links and a single SCADA data link.

Primary Data Link - J1939 (CAN 1)

The Primary Data Link is used for local communication among modules associated with a single genset such as the Electronic Control Module (ECM) for the engine (EUI engines only), Caterpillar Digital Voltage Regulator (CDVR), Thermocouple Module and EUI Engine Sensor information. On MUI engines, the engine sensors are wired directly to the EMCP 3. The Primary Data Link utilizes the Society Of Automotive Engineers (SAE) J1939 protocol and requires Control Area Network (CAN) hardware running at 250k bits per second.

The Primary Data Link supports appropriate SAE J1939 Broadcast Parameter Group Numbers (PGN) and Suspect Parameter Numbers (SPN) for engine and genset data.

Accessory Data Link - J1939 (CAN 2)

The Accessory Data Link is used for local communication among modules associated with a single genset such as Annunciators, RTD Modules and Discrete Input Output Modules. It utilizes the Society Of Automotive Engineers (SAE) J1939 protocol and requires CAN hardware running at 250k bits per second.

The Accessory Data Link supports appropriate SAE J1939 Broadcast Parameter Group Numbers (PGN) and Suspect Parameter Numbers (SPN) for engine and genset data.

System Control and Data Acquisition (SCADA) Data Link - Modbus RS-485

The SCADA Data Link is used for communication with a System Control And Data Acquisition (SCADA) system, and for support of a service tool connection.

The SCADA Data Link uses the Modbus Protocol with an RS-485 half duplex hardware layer operating at a minimum of 2.4k bits per second. All data items are accessed as Modbus registers. Data that is less than 16 bits occupies a single register. Larger data occupies consecutive registers to allow access using single request.

The SCADA Data Link is a Master/Slave Data Link. The SCADA controller Service Tool or customer software will be the master and the genset controls will be slaves on the Data Link.

The SCADA controller can connect directly to the genset control or it may be connected remotely through a modem using a RS485 to RS232 converter. Passwords levels are used to restrict access to the genset control.

Each genset control on the SCADA Data Link has a unique Modbus Address. A setpoint is available to select the address for the genset control.

In order to use a modem connection to the SCADA Data Link, the modem must be pre-configured with all necessary communication parameters and set to automatically answer. No modem handshaking or control is performed by the genset controls.

i02003335

Electronic Control Module (Engine) (EUI Engines Only)

SMCS Code: 1901

The Electronic Control Module (ECM) for the engine controls engine speed on EUI engines in electric power generation applications. The desired engine speed is based on the following information:

- Input from a converter that converts the analog speed signal of a speed potentiometer into a pulse width modulated signal or directly from EMCP 3 over the Primary J1939 Data Link
- Feedback from the sensors that are mounted on the engine

Note: There are primary and secondary speed inputs for the EMCP 3 The speed inputs can be a pulse width modulated signal or the speed inputs can be transmitted over the Data Link. The speed inputs are configurable as primary or secondary with the Electronic Technician. If the primary speed input fails the EMCP 3 will acknowledge and respond to the secondary input. If the primary speed input fails and the secondary input is disabled, the engine will go to the idle speed setting.

The EMCP 3 receives the following information from the engine ECM:

- Engine Oil Pressure
- Engine Coolant Temperature
- Left Exhaust Manifold Temperature
- Right Exhaust Manifold Temperature
- Intake Manafold Temperature
- Oil Temperature
- Fuel Pressure
- Boost Pressure
- Oil Filter Differential Pressure
- Fuel Filter Differential Pressur
- Air Filter Differential Pressure
- Fuel Consumption

The above information is shown on the display screen of the EMCP 3. The information is used by the EMCP 3 in order to monitor the system for events.

The EMCP 3 also displays diagnostic codes from the ECM as a convenience to the operator. See Troubleshooting, “Diagnostic code Trouble Code List” for more information on the management of diagnostic codes by the EMCP 3 and ECM.

i02195508

System Operation

SMCS Code: 4490

Engine Starting Sequence

1. The EMCP 3 receives an engine start signal. The signal will be one of three.
   - The operator presses the “RUN” Key.
   - The control is in “AUTO” and the remote initiate input (IC) becomes active.
   - The operator presses the “AUTO” Key and a start command is sent via the RS-485 SCADA Data Link.
2. The EMCP 3 checks the system before beginning the cranking sequence. The EMCP 3 checks that no system faults are present. The EMCP 3 checks that all previous shutdown faults have been reset. The EMCP 3 also checks that the engine is not already running. If the engine is equipped with prelube, the EMCP 3 checks the status of the prelube. If the prelube is not complete, the EMCP 3 will not crank the engine.
3. The EMCP 3 begins the crank sequence.
   a. On MUI engines, the EMCP 3 activates the starting motor relay (SMR) and the fuel control relay (FCR).
   b. On EUI engines, the EMCP 3 activates the starting motor relay (SMR) and sends a start signal to the Engine ECM via the J1939 Primary Data Link. The Engine ECM activates the fuel control relay (FCR).
4. The EMCP 3 cycle cranks the engine until the cycle crank time reaches the setpoint for total crank time or until the engine starts.
5. The EMCP 3 deactivates the starting motor relay (SMR) a when the engine speed reaches the setpoint for crank terminate speed.

Engine Stopping Procedure

1. The EMCP 3 will receive an engine stop signal. The signal will be one of three.
   - The operator presses the “STOP” Key.
   - The control is in “AUTO” and the remote initiate input (IC) becomes inactive.
   - The operator presses the “AUTO” Key and a stop command is sent via the RS-485 SCADA Data Link.
2. After receiving the stop signal, the EMCP 3 checks that there are no present system faults.
3. The EMCP 3 begins the cooldown period. In order to bypass the cooldown hold down the “STOP” Key. “PRESS ENTER TO BYPASS”, “PRESS ESCAPE TO CONTINUE” will be shown on the display. Press the Enter Key to bypass the cooldown sequence or press the Escape Key to continue the cooldown sequence.
4. After the cooldown cycle, the EMCP 3 initiates a engine shutdown by turning off the fuel supply.
   a. On the MUI engines, the EMCP 3 deactivates the fuel control relay (FCR) which shuts the engine down.
   b. On EUI engines, the EMCP 3 sends a shutdown signal to the Engine ECM. The Engine ECM deactivates the Fuel Control Relay (FCR) which shuts down the engine.

i02051829

Password Entry

SMCS Code: 4490

There are 3 levels of password protection on the EMCP 3 control panel. All of the adjustable parameters are associated with a specific level of security required to make an adjustment to the parameter.

The passwords only affect changing parameters from the EMCP 3 control panel. Changing parameters with the Caterpillar Service Tool does not require passwords

The level of password protection that is required for each setpoint is identified on the parameter setpoint entry screen. A security level identification number “1”, “2”, or “3” next to a padlock symbol is displayed on the parameter setpoint entry screen. A Level 3 security is used for the most secure setpoints and Level 1 security is used for the least secure setpoints.

If the EMCP 3 is currently at the required level of protection when viewing a parameter, the padlock will not appear.

If a parameter is displayed with a padlock but no security level identification number next to it, the parameter cannot be changed from the EMCP 3 display.

Level 1 and Level 2 passwords are disabled when shipped from the factory. On initial start up of the EMCP 3, Level 1 and Level 2 passwords can be user defined if desired.

Drop to Minimum Security Level

The first option on the security screen is “DROP TO MIN LEVEL”. “DROP TO MIN LEVEL” refers to a process of placing the “EMCP 3” into the lowest level of security authorized. This would be used when leaving the control. If “DROP TO MIN LEVEL” is not initiated manually, the control will automatically revert to minimum level after 10 minutes.

1. From the “MAIN MENU”, press the “UP” key or the “ DOWN” key to highlight the “CONFIGURE” menu.
   a. Press the “ENTER” key in order to select “CONFIGURE”. “SECURITY” will be highlighted.
   b. Press the “ENTER” key in order to select “SECURITY”. “DROP TO MIN LEVEL” will be displayed.
   c. Press the “ENTER” key to select “DROP TO MIN LEVEL”
   d. The “EMCP 3” will now be at the minimum level of security

Note: The current level of security for the EMCP 3 is displayed at the top of the display any time the EMCP 3 is in the “SECURITY” screen.

Enter Level 1 or 2 Password

1. From the “MAIN MENU”, press the “UP” key or the “DOWN” key to highlight the “CONFIGURE” menu.
   a. Press the “ENTER” key in order to select “CONFIGURE”. “SECURITY” will be highlighted.
   b. Press the “ENTER” key in order to select “SECURITY”. “DROP TO MIN LEVEL” will be highlighted.
   c. Press the “DOWN” key in order to highlight “ENTER LEVEL 1 OR 2”
   d. Press the “ENTER” key in order to select “ENTER LEVEL 1 or 2”. “ENTER PASSWORD FOR DESIRED LEVEL” is displayed. Also shown is a 16 digit display with 0 highlighted at the far right.
   e. Press the “UP” or “DOWN” key in order to increment or decrement the highlighted digit to the desired number.
   f. Press the “RIGHT” key in order to highlight the next character to be entered. Press the “UP” or “DOWN” key in order to increment or decrement the highlighted digit to the desired number.
   g. Continue until the correct password has been entered for the corresponding level. When all digits of the password are correctly entered press the “ENTER” key. The current level of password protection is displayed and parameters can be set.

Note: The EMCP 3 will go to the highest level of security authorized by a correctly entered password.

Note: The password can be up to 16 digits, but does not have to be 16 digits. The password can be as few as 1 digit. The password is entirely determined by the user.

Note: A password is not required if changing parameters with Caterpillar Service Tool

Enter level 3 password

1. From the “MAIN MENU”, press the “UP” key or the “DOWN” key to highlight the “CONFIGURE” menu.
   a. Press the “ENTER” key to select “CONFIGURE”. “SECURITY” will be highlighted.
   b. Press the “ENTER” key in order to select “SECURITY”. “DROP TO MIN LEVEL” will be displayed.
   c. Press the “DOWN” key in order to highlight “ENTER LEVEL 3”. Press “ENTER” to select “ENTER LEVEL 3 ”.
   d. A 16 digit number is shown and “ENTER RESPONSE” is highlighted. Copy this number and call the factory to obtain a factory provided response code to enter into the EMCP 3.

e. When the factory response is received from the factory, press “ENTER” to select “ENTER RESPONSE”. “ENTER RESPONSE” is displayed. Also shown is a 16 digit entry field where the factory provided password will be entered.

f. Press the “UP” or “DOWN” key in order to increment or decrement the highlighted digit to the correct factory provided password.

g. Press the “RIGHT” key in order to highlight the next character to be entered. Press the “UP” or “DOWN” key in order to increment or decrement the highlighted digit to the correct password.

h. Continue to set all 16 digits until the factory provided password is displayed.

i. When all digits of the factory password are correctly entered, press the “ENTER” key. The current level (LEVEL 3) of security is displayed and parameters can be set.

Note: A password is not required if changing parameters with Caterpillar Service Tool

Change level 1 or level 2 password

1. From the “MAIN MENU”, press the “UP” key or the “DOWN” key to highlight the “CONFIGURE” menu.

a. Press the “ENTER” key in order to select “CONFIGURE”. “SECURITY” will be highlighted.

b. Press the “ENTER” key in order to select “SECURITY”. “DROP TO MIN LEVEL” will be highlighted

c. Make sure that the current level of security is at least as high as the level of the password to be changed.

d. Press the “DOWN ” key to highlight “CHANGE LEVEL 1 PSWD.” Press the “ENTER” key to select “CHANGE LEVEL 1 PSWD”

e. “CHANGE LEVEL 1 PSWD” is displayed. Press the “UP” or “DOWN” key in order to increment or decrement the highlighted digit to the desired new password.

f. Press the “RIGHT” key in order to highlight the next character to be entered. Press the UP or “DOWN” key in order to increment or decrement the highlighted digit to the desired number.

g. Continue until the desired password is displayed.

h. Press the “ENTER” key. The password is now set.

Note: To change level 2 password, substitute “CHANGE LEVEL 2 PSWD” for “CHANGE LEVEL 1 PSWD” in step 1.d above.

Note: To disable a security level, set the password to a single zero.

i02011357

Event Viewing

SMCS Code: 4490

Information from the EMCP 3 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 one of the setpoints.

The EMCP 3 panel will power up to the main menu screen. If the EMCP 3 panel is already powered up, press the “Escape” key (12) in order to return to the main menu.

The event system uses the following terms to describe the status of an Event:

PRESENT – The condition causing the event is present and affecting system behavior.

ACTIVE – The event was previously present but it is no longer. It has been latched by the event system and needs to be reset before the engine can be restarted.

INACTIVE – The event was active at some time but is no longer active and is not affecting system behavior

Perform the following steps in order to view one of the events.

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

2. Press the “ENTER” key (14).

3. Select an ECM and press the “ENTER” key (14).

4. In order to scroll through the Events, use the “UP” and “DOWN” keys.

5. Press “ENTER” after highlighting an event to see additional information such as SPN, FMI, time and date of first occurrence, time and date of last occurrence, engine hours at first occurrence, and engine hours at last occurrence.

i02011347

Event Resetting

SMCS Code: 4490

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 reset the event.

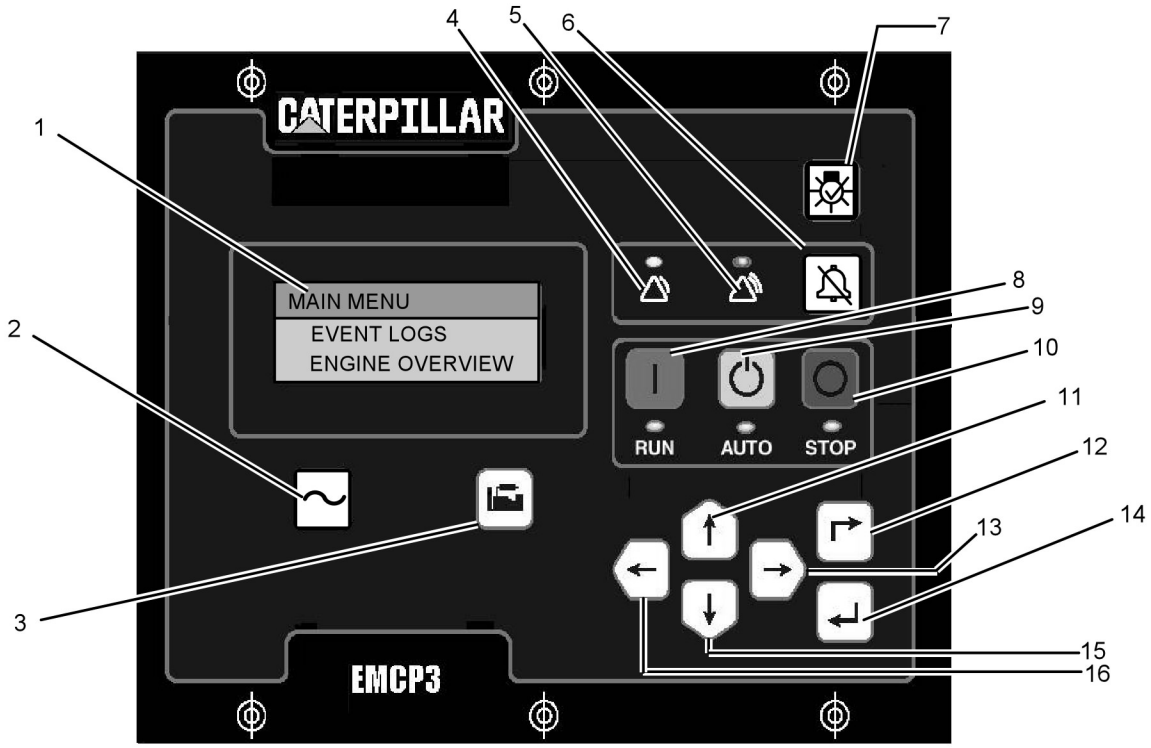
1. Press the STOP Key (10). Enter the “EVENT LOG” option from the main menu.
2. Select an ECM from the list.
3. Scroll through the event conditions in order to highlight the active events.
4. Make sure the condition that caused the event is no longer present
5. Press the Enter Key.
6. “RESET” will be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

   The fault will clear and the red shutdown light will be turned off if there are no other active shutdowns.
8. Press the Escape Key 3 times in order to get back to the main menu.

i01990612

Setpoint Programming

SMCS Code: 4490



g01045431

Illustration 8

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

Main Menu

Information from the EMCP 3 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 Scroll Up Key (11) or the Scroll 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 EMCP 3 at the factory.

The setpoints may require changing when the EMCP 3 is moved from one engine to another engine. The setpoints may also require changing in order to satisfy the requirements of the installation. The setpoints that are stored in the EMCP 3 must match the specified setpoints of the particular generator set. The setpoints are programmable. See the Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”.

i02155375

Digital Input Programming

SMCS Code: 4490

There are two parts to programming the Digital Inputs. The first part involves programming the Active State of the Digital Input (Active High or Active Low). The second part involves programming the Event Input Functions.

Digital Input #1 is dedicated to Emergency Stop. Digital Input #2 is dedicated to Remote Initiate (Remote Start). The six remaining Digital Inputs on the EMCP 3.3 and EMCP 3.2 (four remaining Digital Inputs on EMCP 3.1) can be programmed for various other applications.

Programming the Active State of the Digital Input

The digital inputs of the EMCP 3 are tied to an internal pull-up resistor. Therefore, if there is no connection to a digital input, the digital input will sit at a logical high. A ground or -batt input should be wired to each EMCP 3 Digital Input. If an Active High configuration is desired, the ground or -batt input should be wired through a normally-closed switch. If an Active Low configuration is desired, the ground or -batt input should be wired through a normally-open switch.

1. To program the Active State of the Digital Input, go through the following menu options:
   - Main Menu
   - >Configure
   - >Setpoints
   - >I/O
   - >Digital Inputs
2. Select the Digital Input that you want to program. Press the Enter Key.
3. Press the Enter Key again. The current configuration will be highlighted.
4. Use the Scroll Up Key and the Scroll Down Key in order to change the current configuration to the desired setting.
5. Press the Enter Key to save the setting.

Programming the Event Input Functions

1. To program the Active State of the Digital Input, go through the following menu options:
   - Main Menu
   - >Configure
   - >Setpoints
   - >Events
   - >Event I/P Functions
2. Once in the Input Function menu, the first setting is the Active State. The Active State should always be set to Active High. The next setting is the Time Delay. While on the Time Delay Setting, press Enter and use the arrow keys to enter the desired value.

Note: Event Input Function #1 corresponds to Digital Input #3, Event Input Function #2 corresponds to Digital Input #4, etc.

3. The next setting is the Suspect Parameter Number (SPN). Press the Enter Key in order to choose the SPN. Refer to the list of available SPN's below.

   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 Temperature
   - Engine Coolant Temperature
   - Engine Oil Temperature
   - Exhaust Temperature
   - Rear Bearing Temperature
   - Right Exhaust Temperature
   - Left Exhaust Temperature

   Levels

- Engine Coolant Level
- Engine Oil Level
- Fuel Level
- External Tank Fuel Level

Others

- Air Damper Closed
- ATS in Normal Position
- ATS in Emergency Position
- Battery Charger Failure
- Generator Breaker Closed
- Utility Breaker Closed
- Fuel Leak Detected
- Custom Event

4. After the SPN is chosen, the Failure Mode Identifier (FMI) is the next setting. The following FMI's are available:
   - High Warning (example: High Temperature Warning)
   - Low Warning (example: Low Temperature Warning)
   - High Shutdown
   - Low Shutdown
   - Status

i02184156

Digital Output Programming

SMCS Code: 4490

There are two parts to programming the Digital Outputs. The first part involves programming the Active State of the Digital Output (Active High or Active Low). The second part involves programming the Digital Selectors.

The EMCP 3.1 does not have any Digital Outputs. The EMCP 3.2 has one Digital Output. The EMCP 3.3 has two (2) Digital Outputs.

Each output is capable of sinking 300mA.

The digital outputs have diagnostics for a short to battery when the driver is on and diagnostics for a open circuit when the driver is off. If a short to battery persists for 5 seconds, the driver will be disabled until the condition goes away.

Programming the Active State of the Digital Output

The outputs are internally controlled in the EMCP 3. The active state is programmable but should always be set to active high.

1. To program the Active State of the Digital Output, go through the following menu options:
   - Main Menu
   - >Configure
   - >Setpoints
   - >I/O
   - >Digital Outputs
2. Select the Digital Output that you want to program. Press the Enter Key.
3. Press the Enter Key again. The current configuration will be highlighted.
4. Use the Scroll Up Key and the Scroll Down Key in order to change the current configuration to the desired setting.
5. Press the Enter Key to save the setting.

Programming the Digital Selectors

There are 8 digital selectors. The digital selectors determine what conditions cause the Digital Outputs to become active. Only two of the digital selectors are associated with digital outputs.

1. In order to program the Digital Selectors, go through the following menu options
   - Main Menu
   - >Configure
   - >Other
   - >Digital Selectors
2. Select the Digital Selector that you want to program. Press the Enter Key.

3. Press the Enter Key again. The current configuration will be highlighted.

4. Use the Scroll Up Key and the Scroll Down Key in order to change the current configuration to the desired setting

5. Press the Enter Key to save the setting.

Available Digital Selectors

Digital Selector # 7

Digital Selector #7 controls Digital Output #1. The available configuration options for Digital Selector #7 are shown in table 14.

Table 14

Digital Selector # 7 Configuration Options	
Display Text	**Condition**
Disabled	Disabled
Use Input #1(1)	Disable Shore Power(1)
Use Input #2	Start Aid
Use Input #3	Breaker #1
Use Input #4	Breaker #2
Use Input #5	Low Oil Pressure Warning
Use Data Link Input	Use SCADA Data Link Command

(1) Default

Digital Selector # 8

Digital Selector #8 controls Digital Output #2 The available configuration options for Digital Selector #8 are shown in table 15.

Table 15

Digital Selector # 7 Configuration Options	
Display Text	**Condition**
Disabled(1)	Disabled(1)
Use Input #1	Breaker #1
Use Input #2	Breaker #2
Use Input #3	Common Alarm
Use Input #4	Auto Mode
Use Input #5	High Coolant Temperature Warning
Use Data Link Input	Use SCADA Data Link Command

(1) Default

i02155393

Spare Analog Input Programming

SMCS Code: 4490

The Spare Analog Input is intended to be connected to a resistive sender such as the Coolant Temperature Sensor or the Oil Pressure Sensor.

Programming the Spare Analog Input

To program the Spare Analog Input, go through the following menu options:

- Main Menu
- >Configure
- >Setpoints
- >I/O
- >Spare Analog Input

The Spare Analog Input setpoints are shown below.

Enable/Disable

If you intend to use the Spare Analog Input, the Enable/Disable setpoint must first be enabled. If you do not intend to use the Spare Analog Input, the Enable/Disable setpoint MUST be disabled. If the Spare Analog Input is enabled and not being used, diagnostic codes will be logged

Suspect Parameter Number (SPN)

The following SPN's are available:

Pressures

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

Temperatures

- Ambient Air Temperature
- Engine Oil Temperature
- Exhaust Temperature

- Right Exhaust Temperature
- Left Exhaust Temperature
- Rear Bearing Temperature

Levels

- Engine Coolant Level
- Engine Oil Level
- Fuel Level
- External Tank Fuel Level

High Warning Threshold

This is a numerical value entry.

High Warning Time Delay

This is a numerical value entry.

High Shutdown Threshold

This is a numerical value entry.

High Shutdown Time Delay

This is a numerical value entry.

Low Warning Threshold

This is a numerical value entry.

Low Warning Time Delay

This is a numerical value entry.

Low Shutdown Threshold

This is a numerical value entry.

Low Shutdown Time Delay

This is a numerical value entry.

i02183827

Relay Output Programming

SMCS Code: 4490

There are two parts to programming the Relay Outputs. The first part involves programming the Active State of the Relay Output (Active High or Active Low). The second part involves programming the Digital Selectors.

Relay Output #1 is dedicated to controlling the starter motor. Relay Output #2 is dedicated to fuel enable. The six remaining Relay Outputs on the EMCP 3.3 and EMCP 3.2 (four remaining Relay Outputs on EMCP 3.1) can be programmed for various other applications.

The EMCP 3.1 will have six relays: All six will be type-A. The EMCP 3.2 and EMCP 3.3 will have eight relays: Six will be type-A and two will be type-C. Type-A is defined as one normally-open contact plus common. Type-C is defined as two contacts, normally-open and normally-closed plus common.

Each relay is capable of handling 2A @ 30 VDC. The relay contacts are not protected against shorts to battery or ground.

The relay contacts are not protected against shorts to battery or ground.

Programming the Active State of the Relay Output

The relay contacts are dry contacts. The relays are internally controlled in the EMCP 3. The active state is programmable but should always be set to active high.

1. To program the Active State of the Relay Output, go through the following menu options:
   - Main Menu
   - >Configure
   - >Setpoints
   - >I/O
   - >Relay Outputs
2. Select the Relay Output that you want to program. Press the Enter Key.
3. Press the Enter Key again. The current configuration will be highlighted.

4. Use the Scroll Up Key and the Scroll Down Key in order to change the current configuration to the desired setting.

5. Press the Enter Key to save the setting.

Programming the Digital Selectors

There are 8 digital selectors. The digital selectors determine what conditions cause the Relay Outputs to become active. Only six of the digital selectors are associated with Relay Outputs.

1. In order to program the Digital Selectors, go through the following menu options
   - Main Menu
   - >Configure
   - >Other
   - >Digital Selectors
2. Select the Digital Selector that you want to program. Press the Enter Key.
3. Press the Enter Key again. The current configuration will be highlighted.
4. Use the Scroll Up Key and the Scroll Down Key in order to change the current configuration to the desired setting
5. Press the Enter Key to save the setting.

Available Digital Selectors

Digital Selector # 1

Digital Selector #1 controls Relay Output #3. The available configuration options for Digital Selector #1 are shown in Table 16.

Table 16

Digital Selector # 1 configuration Options	
Display Text	**Condition**
Disabled	Disabled
Use Input #1(1)	Air Shutoff(1)
Use Input #2	Start Aid
Use Input #3	Common Warning
Use Input #4	Low Coolant Temperature Warning
Use Input #5	Breaker #1
Use Data Link Input	Use SCADA Data Link Command

(1) Default

Digital Selector # 2

Digital Selector #2 controls Relay Output #4 The available configuration options for Digital Selector #2 are shown in Table 17.

Table 17

Digital Selector # 2 Configuration Options	
Display Text	**Condition**
Disabled	Disabled
Use Input #1	Horn Control
Use Input #2	Common Alarm
Use Input #3	Common Warning
Use Input #4(1)	Common Shutdown(1)
Use Input #5	Control not In Automatic
Use Data Link Input	Use SCADA Data Link Command

(1) Default

Digital Selector # 3

Digital Selector #3 controls Relay Output #5. The available configuration options for Digital Selector #3 are shown in Table 18.

Table 18

Digital Selector # 3 Configuration Options	
Display Text	**Condition**
Disabled	Disabled
Use Input #1	Common Alarm
Use Input #2	Common Warning
Use Input #3	Overcrank Shutdown
Use Input #4(1)	Engine Started(1)
Use Input #5	Breaker #2
Use Data Link Input	Use SCADA Data Link Command

(1) Default

Digital Selector # 4

Digital Selector #4 controls Relay Output #6. The available configuration options for Digital Selector #4 are shown in Table 19.

Table 19

Digital Selector # 4 Configuration Options	
Display Text	**Condition**
Disabled(1)	Disabled(1)
Use Input #1	Common Warning
Use Input #2	Overspeed Shutdown
Use Input #3	Engine Started
Use Input #4	Crank Alert
Use Input #5	ECM Fault Reset
Use Data Link Input	Use SCADA Data Link Command

(1) Default

Digital Selector # 5

Digital Selector #5 controls Relay Output #7. The available configuration options for Digital Selector #5 are shown in Table 20

Table 20

Digital Selector # 5 Configuration Options	
Display Text	**Condition**
Disabled	Disabled
Use Input #1	Low Oil Pressure Warning
Use Input #2	Engine Started
Use Input #3	Low Oil Pressure Shutdown
Use Input #4	ECM Fault Reset
Use Input #5(1)	Rated Speed(1)
Use Data Link Input	Use SCADA Data Link Command

(1) Default

Digital Selector #6

Digital Selector #6 controls Relay Output #8. The available configuration options for Digital Selector #5 are shown in Table 21

Table 21

Digital Selector # 2 Configuration Options	
Display Text	**Condition**
Disabled	Disabled
Use Input #1	High Coolant Temperature Warning
Use Input #2	Crank Alert
Use Input #3	ECU Fault Reset
Use Input #4	High Coolant Temperature Shutdown
Use Input #5(1)	Start Aid(1)
Use Data Link Input	Use SCADA Data Link Command

(1) Default

i02054560

Voltage and Frequency Adjustment

SMCS Code: 4490

1. From the “MAIN MENU”, press the Scroll Up Key (11) or the Scroll Down Key (15) in order to highlight the “CONTROL” menu.

   a. Press the Enter Key (14) in order to select “CONTROL”. “ADJUST SPEED” and “ADJUST VOLTAGE” will be displayed.

   b. Press the Scroll Up Key (11) in order to increase the voltage and the Scroll Down key (15) in order to decrease the voltage.

   c. Press the Scroll Left Key (16) in order to decrease the engine speed and the Scroll Right Key (13) in order to increase the engine speed.

Note: The voltage can only be controlled from the EMCP 3 if a CDVR is installed on the generator and the EMCP is a version 3.3 Speed can only be controlled if there is an A 3 or newer ECM on the engine.

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 EMCP 3 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 fails, 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.

1. From the “MAIN MENU”, press the Scroll Up Key (11) or the Scroll Down Key (15) in order to highlight the “CONFIGURE” menu.

2. Press the Enter Key (14) in order to select “CONFIGURE”. “SECURITY” is highlighted.

3. Press the Scroll Down Key (15) in order to highlight “TIME/DATE”.

4. Press the Enter Key (14) in order to select “TIME/DATE”. “SET TIME/DATE” is displayed. Also shown is the current time and date programmed into the EMCP 3. The currently programmed time is shown highlighted inside a box

5. With the currently programmed time shown inside the box, press the Enter Key (14). “SET TIME ” and the currently programmed time is displayed.

6. Press Enter Key (14) and the 6 digit time will be displayed with seconds highlighted at the far right.

7. Use the Scroll Right Key (13) or the Scroll Left Key (16) in order to highlight the digit to be programmed.

8. Press the Scroll Up Key (11) or the Scroll Down Key (15) in order to increment or decrement the highlighted digit to the desired number.

9. Continue until the correct time has been entered. When all digits of the time are correctly entered, press the Enter Key (14). “SET TIME” is shown with the newly programmed time highlighted.

10. Press the Escape Key (12) once. “SET TIME/DATE” is shown and the newly programmed time will be displayed inside a box.

11. Press the Scroll Right Key (13) in order to highlight the currently programmed date inside a box. Press the Enter Key (14) in order to select the date. “SET DATE” and the currently programmed date is displayed.

12. Press the Enter Key (14) in order to select the date. A 8 digit display is shown with the year highlighted at the far right.

13. Use the Scroll Right Key (13) or Scroll Left Key (16) in order to highlight the digit to be programmed.

14. Press the Scroll Up Key (11) or Scroll Down Key (15) in order to increment or decrement the highlighted digit to the desired number.

15. Continue until the correct date has been entered. When all digits of the date are correctly entered, press the Enter Key (14). “SET DATE” is shown with the newly programmed date highlighted.

16. Press the Escape Key (12) three times to return to the “MAIN MENU”.

Troubleshooting Section

Introduction

i02196307

General Information

SMCS Code: 4490

⚠ WARNING

Personal injury or death can result from high voltage.

When power generation equipment must be in operation to make tests and/or adjustments, high voltage and current are present.

Improper test equipment can fail and present a high voltage shock hazard to its user.

Make sure the testing equipment is designed for and correctly operated for high voltage and current tests being made.

When servicing or repairing electric power generation equipment:

- **Make sure the unit is off-line (disconnected from utility and/or other generators power service) , and either locked out or tagged DO NOT OPERATE.**
- **Remove all fuses.**
- **Make sure the generator engine is stopped.**
- **Make sure all batteries are disconnected.**
- **Make sure all capacitors are discharged.**

Failure to do so could result in personal injury or death. Make sure residual voltage in the rotor, stator and the generator is discharged.

⚠ WARNING

When the engine-generator, or any source to which the engine-generator is synchronized to, is operating, voltages up to 600V are present in the control panel.

Do not short these terminal with line voltage to ground with any part of the body or any conductive material. Loss of life or injury could result from electrical shock or injury from molten metal.

⚠ WARNING

Do not connect generator to a utility electrical distribution system unless it is isolated from the system. Electrical feedback into the distribution system can occur and could cause personal injury or death.

Open and secure main distribution system switch, or if the connection is permanent, install a double throw transfer switch to prevent electrical feedback. Some generators are specifically approved by a utility to run in parallel with the distribution system and isolation may not be required. Always check with your utility as to the applicable circumstances.

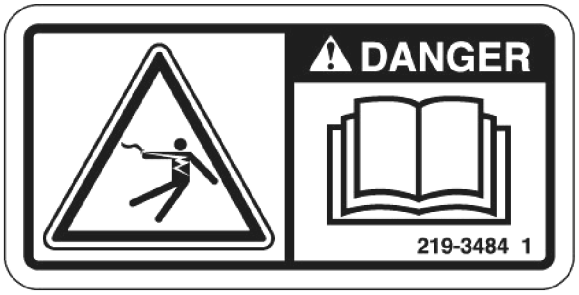


Illustration 9 g00891948

Danger Label for Electrical Shock (North America)

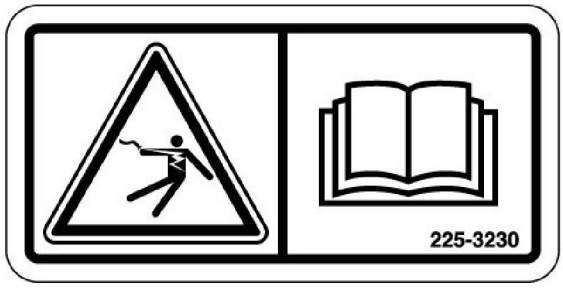


Illustration 10 g00874165

Danger Label for Electrical Shock (Outside of North America)

DANGER

The Cat VR6 presents an electrical shock/electrocution hazard. This hazard will cause serious injury or death.

Service by trained personnel only.

The terminals and heat sinks are live at hazardous voltages when power is applied and for up to 8 minutes after power is removed.

DANGER

The Cat Digital Voltage Regulator presents an electrical shock/electrocution hazard. This hazard will cause serious injury or death.

Service by trained personnel only.

The terminals and heat sinks are live at hazardous voltages when power is applied and for up to 8 minutes after power is removed.

DANGER

The secondary wires of the current transformer must be shorted together when they are disconnected from the equipment. Extremely high voltages will be generated at the lead ends if the secondary wires are not shorted together. Bodily contact with high voltage will result in serious injury or death.

i02174153

Service Tools

SMCS Code: 0785

Table 22

Genset Diagnostic Tools	
190-8900	Deutsch HD Style Connector Repair Kit. Replaces 4C-3406 Repair Kit and does not contain 1U5804 Crimp Tool that can be ordered separately if needed.
6V-3000	Sure Seal Repair Kit
175-3700	Deutsch DT Style Connector Repair Kit.
	4 mm Hex Wrench
237-5130	Digital Multimeter with infrared thermometer
257-9140	Fluke 80 Series Digital Multimeter
146-4080	Digital Multimeter with RS232 output
7X-1710	Multimeter Connector Probe Group
155-5175	1000 Amp AC Current Probe for use with digital multimeters
155-5176	1000 Amp AC / 1400 Amp DC Current Probe for use with digital multimeters
243-3134	Insulation Tester
255-8266	1200 Amp AC/DC Clamp On Ammeter
227-4324	2000 Amp AC/DC clamp On Ammeter

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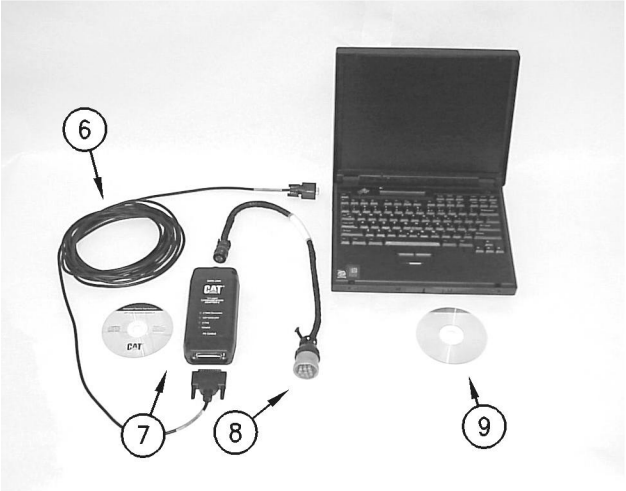
Diagnostic Capabilities

SMCS Code: 1400

The Caterpillar Electronic Technician (ET)



g00774942

Illustration 11

Connections for the Communication Adapter II and the Electronic Technician (ET)

The components that are needed in order to use the Communication Adapter II and the CAT Electronic Technician in order to determine diagnostic codes are listed:

(6) Cable
(7) 171 - 4400 Communication Adapter ii
(8) Service diagnostic cable.
(9) Current version of Caterpillar Electronic Technician software and an IBM-COMPATIBLE personal computer

The Caterpillar Electronic Technician (ET) is a software program that is used to access data. The service technician can use the ET in order to perform maintenance on the machine. Some of the options that are available with the Caterpillar Electronic Technician are listed below:

- View diagnostic codes.
- Viewing active event codes and logged event codes
- View the status of parameters.
- Clear active diagnostic codes and clear logged diagnostic codes
- Program the ECM (Flash). This is done with the “WINflash” program. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Flash Program”.
- Print reports.

The following list contains some of the diagnostic functions and programming functions that are performed by the service tools.

- The failures of the ECM system are displayed.
- The status of most of the inputs and the outputs are displayed.
- The settings for the ECM are displayed.
- Display the status of the input and output parameters in real time.
- Display the clock hour of the internal diagnostic clock.
- The number of occurrences and the clock hour of the first occurrence and the last occurrence is displayed for each logged diagnostic code.
- The definition for each logged diagnostic code and each event is displayed.
- Load new FLASH software.

See Troubleshooting, “Diagnostic Trouble Code List” for the list of diagnostic codes for the ECM.

- Active diagnostic codes
- Logged diagnostic codes

Event Codes

Logged Event Codes

An indicator for logged events is provided. The indicator allows the service technician to keep track of event codes that are intermittent. The data for the logged event will include the following information:

- An event identifier
- A text description of the problem
- The number of occurrences of the problem
- A time stamp will display the first occurrence of the problem.
- A time stamp will display the last occurrence of the problem.

Status Groups For The Electronic Technician

The Status Groups are lists of ECM parameters. The status of the parameters are shown in real time.

i02015216

Diagnostic Trouble Code List

SMCS Code: 7569

The following table lists the diagnostic trouble codes for the genset. The column titled "Display Text String" is what will be displayed on the EMCP 3 control panel. In order to view the "Suspect Parameter Number" and the "Failure Mode Identifier" press the Enter Key while viewing the "Display Text String".

If the diagnostic code was generated from the Electronic Control Module (ECM) for the Engine, refer to the Systems Operation, Testing and Adjusting manual for your particular engine and perform the diagnostic procedure indicated by the SPN/FMI.

If the diagnostic code is generated from the EMCP 3 Electronic Control Module for the generator set, refer to the last column of the following table and reference the " Troubleshooting Topic", within this section.

Note: All of the following codes require a level 1 password in order to clear the code with the exception of the Emergency Shutdown Override Mode Active Warning that requires a level 3 password in order to clear the code

Table 23

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
38	0	External Tank High Fuel Level Shutdown	EXT TANK HIGH FUEL LEVEL S/D	Digital Input Circuit Fault and Analog Input Circuit Fault
38	1	External Tank Low Fuel Level Shutdown	EXT TANK LOW FUEL LEVEL S/D	Digital Input Circuit Fault and Analog Input Circuit Fault
38	3	External Tank Fuel Level Sensor Short High	EXT TANK FUEL LEVEL SENSOR SHORT HIGH	Analog Input Circuit Fault
38	4	External Tank Fuel Level Sensor Short Low	EXT TANK FUEL LEVEL SENSOR SHORT LOW	Analog Input Circuit Fault
38	15	External Tank High Fuel Level Warning	EXT TANK HIGH FUEL LVL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
38	17	External Tank Low Fuel Level Warning	EXT TANK LOW FUEL LVL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
82	0	High Starting Air Pressure Shutdown	HIGH STARTING AIR PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
82	1	Low Starting Air Pressure Shutdown	LOW STARTING AIR PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
82	3	Starting Air Pressure Sensor Short High	STARTING AIR PRES SENSOR SHORT HIGH	Analog Input Circuit Fault
82	4	Starting Air Pressure Sensor Short Low	STARTING AIR PRES SENSOR SHORT LOW	Analog Input Circuit Fault
82	15	High Starting Air Pressure Warning	HIGH STARTING AIR PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
82	17	Low Starting Air Pressure Warning	LOW STARTING AIR PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
95	0	High Fuel Filter Differential Pressure Shutdown	HIGH FUEL FLTR DIFF PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
95	1	Low Fuel Filter Differential Pressure Shutdown	LOW FUEL FILTER DIFF PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
95	3	Fuel Filter Differential Pressure Sensor Short High	FUEL FLTER DIFF PRES SENSOR SHORT HIGH	Analog Input Circuit Fault
95	4	Fuel Filter Differential Pressure Sensor Short Low	FUEL FLTR DIFF PRES SENSOR SHORT LOW	Analog Input Circuit Fault
95	15	High Fuel Filter Differential Pressure Warning	HIGH FUEL FLTR DIFF PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
95	17	Low Fuel Filter Differential Pressure Warning	LOW FUEL FILTER DIFF PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
96	0	High Fuel Level Shutdown	HIGH FUEL LEVEL SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
96	1	Low Fuel Level Shutdown	LOW FUEL LEVEL SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
96	3	Fuel Level Sensor Short High	FUEL LEVEL SENSOR SHORT HIGH	Analog Input Circuit Fault
96	4	Fuel Level Sensor Short Low	FUEL LEVEL SENSOR SHORT LOW	Analog Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
96	15	High Fuel Level Warning	HIGH FUEL LEVEL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
96	17	Low Fuel Level Warning	LOW FUEL LEVEL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
98	0	High Engine Oil Level Shutdown	HIGH ENGINE OIL LVL SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
98	1	Low Engine Oil Level Shutdown	LOW ENGINE OIL LVL SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
98	3	Engine Oil Level Sensor Short High	ENGINE OIL LEVEL SENSOR SHORT HIGH	Analog Input Circuit Fault
98	4	Engine Oil Level Sensor Short Low	ENGINE OIL LEVEL SENSOR SHORT LOW	Analog Input Circuit Fault
98	15	High Engine Oil Level Warning	HIGH ENGINE OIL LVL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
98	17	Low Engine Oil Level Warning	LOW ENGINE OIL LVL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
99	0	High Oil Filter Differential Pressure Shutdown	HIGH OIL FILTER DIFF PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
99	1	Low Oil Filter Differential Pressure Shutdown	LOW OIL FILTER DIFF PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
99	3	Oil Filter Differential Pressure Sensor Short High	OIL FILTER DIFF PRES SENSOR SHORT HIGH	Analog Input Circuit Fault
99	4	Oil Filter Differential Pressure Sensor Short Low	OIL FILTER DIFF PRES SENSOR SHORT LOW	Analog Input Circuit Fault
99	15	High Oil Filter Differential Pressure Warning	HIGH OIL FILTER DIFF PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
99	17	Low Oil Filter Differential Pressure Warning	LOW OIL FILTER DIFF PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
100	1	Low Engine Oil Pressure Shutdown	LOW ENGINE OIL PRESS SHUTDOWN	Data Link circuit Fault and Digital Input Circuit Fault
100	17	Low Engine Oil Pressure Warning	LOW ENGINE OIL PRESS WARNING	Data Link circuit Fault and Digital Input Circuit Fault
107	0	High Air Filter Differential Pressure Shutdown	HIGH AIR FILTER DIFF PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
107	1	Low Air Filter Differential Pressure Shutdown	LOW AIR FILTER DIFF PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
107	3	Air Filter Differential Pressure Sensor Short High	AIR FILTER DIFF PRES SENSOR SHORT HIGH	Analog Input Circuit Fault
107	4	Air Filter Differential Pressure Sensor Short Low	AIR FILTER DIFF PRES SENSOR SHORT LOW	Analog Input Circuit Fault
107	15	High Air Filter Differential Pressure Warning	HIGH AIR FILTER DIFF PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
107	17	Low Air Filter Differential Pressure Warning	LOW AIR FILTER DIFF PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
110	0	High Engine Coolant Temperature Shutdown	HIGH ENGINE COOLANT TEMP SHUTDOWN	Data Link Circuit Fault and Digital Input Circuit Fault
110	15	High Engine Coolant Temperature Warning	HIGH ENGINE COOLANT TEMP WARNING	Data Link Circuit Fault and Digital Input Circuit Fault
110	17	Low Engine Coolant Temperature Warning	LOW COOLANT TEMP WARNING	Data Link Circuit Fault and Digital Input Circuit Fault
111	0	High Engine Coolant Level Shutdown	HIGH ENG COOL LEVEL SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
111	1	Low Engine Coolant Level Shutdown	LOW ENG COOL LEVEL SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
111	3	Engine Coolant Level Sensor Short High	ENGINE COOLANT LEVEL SENSOR SHORT HIGH	Analog Input Circuit Fault
111	4	Engine Coolant Level Sensor Short Low	ENGINE COOLANT LEVEL SENSOR SHORT LOW	Analog Input Circuit Fault
111	15	High Engine Coolant Level Warning	HIGH ENG COOL LEVEL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
111	17	Low Engine Coolant Level Warning	LOW ENG COOL LEVEL WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
137	0	High Fire Extinguisher Pressure Shutdown	HIGH FIRE EXTNG PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
137	1	Low Fire Extinguisher Pressure Shutdown	LOW FIRE EXTNG PRES SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
137	3	Fire Extinguisher Pressure Sensor Short High	FIRE EXTING PRES SENSOR SHORT HIGH	Analog Input Circuit Fault
137	4	Fire Extinguisher Pressure Sensor Short Low	FIRE EXTNG PRES SENSOR SHORT LOW	Analog Input Circuit Fault
137	15	High Fire Extinguisher Pressure Warning	HIGH FIRE EXTNG PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
137	17	Low Fire Extinguisher Pressure Warning	LOW FIRE EXTNG PRES WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
167	17	Low Battery Charging System Voltage Warning	LOW BATTERY CHARGING SYS VOLT WARN	Charging System
168	0	High Battery Voltage Shutdown	HIGH BATTERY VOLTAGE SHUTDOWN	Charging System
168	15	High Battery Voltage Warning	HIGH BATTERY VOLTAGE WARNING	Charging System
168	17	Low Battery Voltage Warning	LOW BATTERY VOLTAGE WARNING	Charging System
171	0	High Ambient Air Temperature Shutdown	HIGH AMBIENT AIR TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
171	1	Low Ambient Air Temperature Shutdown	LOW AMBIENT AIR TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
171	3	Ambient Air Temperature Sensor Short High	AMBIENT AIR TEMP SENSOR SHORT HIGH	Analog Input Circuit Fault
171	4	Ambient Air Temperature Sensor Short Low	AMBIENT AIR TEMP SENSOR SHORT LOW	Analog Input Circuit Fault
171	15	High Ambient Air Temperature Warning	HIGH AMBIENT AIR TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
171	17	Low Ambient Air Temperature Warning	LOW AMBIENT AIR TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
173	0	High Exhaust Temperature Shutdown	HIGH EXHAUST TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
173	1	Low Exhaust Temperature Shutdown	LOW EXHAUST TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
173	3	Exhaust Temperature Sensor Short High	EXHAUST TEMPERATURE SENSOR SHORT HIGH	Analog Input Circuit Fault
173	4	Exhaust Temperature Sensor Short Low	EXHAUST TEMPERATURE SENSOR SHORT LOW	Analog Input Circuit Fault
173	15	High Exhaust Temperature Warning	HIGH EXHAUST TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
173	17	Low Exhaust Temperature Warning	LOW EXHAUST TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
175	0	High Engine Oil Temperature Shutdown	HIGH ENGINE OIL TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
175	1	Low Engine Oil Temperature Shutdown	LOW ENGINE OIL TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
175	3	Engine Oil Temperature Sensor Short High	ENGINE OIL TEMP SENSOR SHORT HIGH	Analog Input Circuit Fault
175	4	Engine Oil Temperature Sensor Short Low	ENGINE OIL TEMP SENSOR SHORT LOW	Analog Input Circuit Fault
175	15	High Engine Oil Temperature Warning	HIGH ENGINE OIL TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
175	17	Low Engine Oil Temperature Warning	LOW ENGINE OIL TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
190	0	Engine Over Speed Shutdown	ENGINE OVER SPEED SHUTDOWN	Engine Over Speed Warning
190	1	Engine Under Speed Shutdown	ENGINE UNDER SPEED SHUTDOWN	Engine Under Speed Warning
190	2	Engine Speed Sensor Erratic or Not Present	ENGINE SPEED SENSOR ERRATIC/LOST	Engine Speed Circuit Fault
190	5	Engine Speed Sensor Open	ENGINE SPEED SENSOR OPEN	Engine Speed Circuit Fault
190	17	Engine Under Speed Warning	ENGINE UNDER SPEED WARNING	Engine Under Speed Warning
625	11	SCADA Data Link Fault	SCADA DATA LINK FAULT	Data Link Circuit Fault
639	11	Primary Data Link Fault	PRIMARY DATA LINK FAULT	Data Link Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
701	0	Custom Event #1 High Shutdown	CUSTOM EVENT #1 HIGH SHUTDOWN	Digital Input Circuit Fault
701	1	Custom Event #1 Low Shutdown	CUSTOM EVENT #1 LOW SHUTDOWN	Digital Input Circuit Fault
701	15	Custom Event #1 High Warning	CUSTOM EVENT #1 HIGH WARNING	Digital Input Circuit Fault
701	17	Custom Event #1 Low Warning	CUSTOM EVENT #1 LOW WARNING	Digital Input Circuit Fault
701	31	Custom Event #1 Status	CUSTOM EVENT #1 STATUS ACTIVE	Digital Input Circuit Fault
702	0	Custom Event #2 High Shutdown	CUSTOM EVENT #2 HIGH SHUTDOWN	Digital Input Circuit Fault
702	1	Custom Event #2 Low Shutdown	CUSTOM EVENT #2 LOW SHUTDOWN	Digital Input Circuit Fault
702	15	Custom Event #2 High Warning	CUSTOM EVENT #2 HIGH WARNING	Digital Input Circuit Fault
702	17	Custom Event #2 Low Warning	CUSTOM EVENT #2 LOW WARNING	Digital Input Circuit Fault
702	31	Custom Event #2 Status	CUSTOM EVENT #2 STATUS ACTIVE	Digital Input Circuit Fault
703	0	Custom Event #3 High Shutdown	CUSTOM EVENT #3 HIGH SHUTDOWN	Digital Input Circuit Fault
703	1	Custom Event #3 Low Shutdown	CUSTOM EVENT #3 LOW SHUTDOWN	Digital Input Circuit Fault
703	15	Custom Event #3 High Warning	CUSTOM EVENT #3 HIGH WARNING	Digital Input Circuit Fault
703	17	Custom Event #3 Low Warning	CUSTOM EVENT #3 LOW WARNING	Digital Input Circuit Fault
703	31	Custom Event #3 Status	CUSTOM EVENT #3 STATUS ACTIVE	Digital Input Circuit Fault
704	0	Custom Event #4 High Shutdown	CUSTOM EVENT #4 HIGH SHUTDOWN	Digital Input Circuit Fault
704	1	Custom Event #4 Low Shutdown	CUSTOM EVENT #4 LOW SHUTDOWN	Digital Input Circuit Fault
704	15	Custom Event #4 High Warning	CUSTOM EVENT #4 HIGH WARNING	Digital Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
704	17	Custom Event #4 Low Warning	CUSTOM EVENT #4 LOW WARNING	Digital Input Circuit Fault
704	31	Custom Event #4 Status	CUSTOM EVENT #4 STATUS ACTIVE	Digital Input Circuit Fault
705	0	Custom Event #5 High Shutdown	CUSTOM EVENT #5 HIGH SHUTDOWN	Digital Input Circuit Fault
705	1	Custom Event #5 Low Shutdown	CUSTOM EVENT #5 LOW SHUTDOWN	Digital Input Circuit Fault
705	15	Custom Event #5 High Warning	CUSTOM EVENT #5 HIGH WARNING	Digital Input Circuit Fault
705	17	Custom Event #5 Low Warning	CUSTOM EVENT #5 LOW WARNING	Digital Input Circuit Fault
705	31	Custom Event #5 Status	CUSTOM EVENT #5 STATUS ACTIVE	Digital Input Circuit Fault
706	0	Custom Event #6 High Shutdown	CUSTOM EVENT #6 HIGH SHUTDOWN	Digital Input Circuit Fault
706	1	Custom Event #6 Low Shutdown	CUSTOM EVENT #6 LOW SHUTDOWN	Digital Input Circuit Fault
706	15	Custom Event #6 High Warning	CUSTOM EVENT #6 HIGH WARNING	Digital Input Circuit Fault
706	17	Custom Event #6 Low Warning	CUSTOM EVENT #6 LOW WARNING	Digital Input Circuit Fault
706	31	Custom Event #6 Status	CUSTOM EVENT #6 STATUS ACTIVE	Digital Input Circuit Fault
924	3	Digital Output #1 Short High	DIGITAL OUTPUT 1 SHORT HIGH	Digital Output Circuit Fault
925	3	Digital Output #2 Short High	DIGITAL OUTPUT 2 SHORT HIGH	Digital Output Circuit Fault
970	31	Emergency Stop Shutdown	EMERGENCY STOP SHUTDOWN	Digital Input Circuit Fault
1122	0	High Generator Bearing #1 Temperature Shutdown	HIGH GEN BEARING #1 TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
1122	1	Low Generator Rear Bearing Temperature Shutdown	LOW GEN REAR BEARING TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
1122	3	Generator Rear Bearing Temperature Sensor Short High	GEN REAR BEARING TEMP SENSOR SHORT HIGH	Analog Input Circuit Fault
1122	4	Generator Rear Bearing Temperature Sensor Short Low	GEN REAR BEARING TEMP SENSOR SHORT LOW	Analog Input Circuit Fault
1122	15	High Rear Generator Bearing Temperature Warning	HIGH GEN REAR BEARING TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
1122	17	Low Generator Rear Bearing Temperature Warning	LOW GEN REAR BEARING TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
1231	11	Accessory Data Link Fault	ACCESSORY DATA LINK FAULT	Data Link Circuit Fault
1239	31	Fuel Tank Leak (Fuel Rupture Basin)	FUEL TANK LEAK	Digital Input Circuit Fault
1664	31	Engine Failure to Start Shutdown	ENGINE FAILURE TO START SHUTDOWN	Engine Overcrank Warning
2433	0	High Right Exhaust Temperature Shutdown	HIGH RIGHT EXHAUST TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
2433	1	Low Right Exhaust Temperature Shutdown	LOW RIGHT EXHAUST TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
2433	3	Right Exhaust Temperature Sensor Short High	RIGHT EXHAUST TEMP SENSOR SHORT HIGH	Analog Input Circuit Fault
2433	4	Right Exhaust Temperature Sensor Short Low	RIGHT EXHAUST TEMP SENSOR SHORT LOW	Analog Input Circuit Fault
2433	15	High Right Exhaust Temperature Warning	HIGH RIGHT EXHAUST TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
2433	17	Low Right Exhaust Temperature Warning	LOW RIGHT EXHAUST TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
2434	0	High Left Exhaust Temperature Shutdown	HIGH LEFT EXHAUST TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
2434	1	Low Left Exhaust Temperature Shutdown	LOW LEFT EXHAUST TEMP SHUTDOWN	Digital Input Circuit Fault and Analog Input Circuit Fault
2434	3	Left Exhaust Temperature Sensor Short High	LEFT EXHAUST TEMP SENSOR SHORT HIGH	Analog Input Circuit Fault
2434	4	Left Exhaust Temperature Sensor Short Low	LEFT EXHAUST TEMP SENSOR SHORT LOW	Analog Input Circuit Fault

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
2434	15	High Left Exhaust Temperature Warning	HIGH LEFT EXHAUST TEMP WARNING	Analog Input Circuit Fault
2434	17	Low Left Exhaust Temperature Warning	LOW LEFT EXHAUST TEMP WARNING	Digital Input Circuit Fault and Analog Input Circuit Fault
2436	0	Generator Over Frequency Shutdown	GEN OVER FREQUENCY SHUTDOWN	Generator Over Frequency Warning
2436	1	Generator Under Frequency Shutdown	GEN UNDER FREQUENCY SHUTDOWN	Generator Under Frequency Warning
2436	2	Engine Speed-Generator Output Frequency Mismatch Warning	ENG SPEED-GEN FREQ MISMATCH WARN	Engine Speed Warning
2436	12	Generator Output Sensing System Failure	GEN AC METERING SYS FAILURE	Generator Output Sensing Circuit Fault
2436	15	Generator Over Frequency Warning	GEN OVER FREQUENCY WARNING	Generator Over Frequency Warning
2436	17	Generator Under Frequency Warning	GEN UNDER FREQUENCY WARNING	Generator Under Frequency Warning
2440	0	Generator Over Voltage Shutdown	GEN OVER VOLTAGE SHUTDOWN	Generator Over Voltage Warning
2440	1	Generator Under Voltage Shutdown	GEN UNDER VOLTAGE SHUTDOWN	Generator Under Voltage Warning
2440	15	Generator Over Voltage Warning	GEN OVER VOLTAGE WARNING	Generator Over Voltage Warning
2440	17	Generator Under Voltage Warning	GEN UNDER VOLTAGE WARNING	Generator Under Voltage Warning
2448	0	Generator Over Current Shutdown	GEN OVER CURRENT SHUTDOWN	Generator Over Current Warning
2448	15	Generator Over Current Warning	GEN OVER CURRENT WARNING	Generator Over Current Warning
2452	1	Generator Reverse Power Shutdown	GEN REVERSE POWER SHUTDOWN	Generator Reverse Power Warning
2452	17	Generator Reverse Power Warning	GEN REVERSE POWER WARNING	Generator Reverse Power Warning

(continued)

(Table 23, contd)

Trouble Codes				
Suspect Parameter Number (SPN)	**Failure Mode Identifier (FMI)**	**Code Description**	**Display Text String**	**Troubleshooting topic**
2648	31	Service Maintenance Interval Warning	SERV MAINT INTERVAL WARNING	Service Information Interval Warning
4000	31	Air Damper Closed	AIR DAMPER CLOSED	Digital Input Circuit Fault
4001	31	ATS in Normal Position	ATS IN NORMAL POSITION	Digital Input Circuit Fault
4002	31	ATS in Emergency Position	ATS IN EMERGENCY POSITION	Digital Input Circuit Fault
4003	31	Battery Charger Failure	BATTERY CHARGER FAILURE	Digital Input Circuit Fault
4004	31	Generator Circuit Breaker Closed	GENERATOR BREAKER CLOSED	Digital Input Circuit Fault
4005	31	Utility Circuit Breaker Closed	UTILITY BREAKER CLOSED	Digital Input Circuit Fault
4006	31	Engine in Cooldown	ENGINE IN COOLDOWN	Engine Cooldown Warning
4007	31	Generator Control Not in Automatic Warning	GEN CONTROL NOT IN AUTO WARNING	Generator Control Not In Automatic Warning
4008	31	Unexpected Engine Shutdown	UNEXPECTED ENGINE SHUTDOWN	Unexpected Engine Shutdown

Diagnostic System Procedures

i02174519

Engine Cooldown Warning

SMCS Code: 4490

System Operation Description:

Loss of a remote initiate signal, activation of the stop signal input or a data link message calling for a engine shutdown causes the engine to enter the stop mode. If running, the engine will continue to run in cooldown. When the cooldown interval is complete, the engine will stop. An immediate shutdown due to a critical fault will cause the engine to shutdown and the Cooldown Timer to be bypassed. For more information on setting the cooldown duration setpoint, see Testing and Adjusting, "Electronic Control Module (Generator Set) - Configure"

Conditions Which Generate This Code:

The code for the engine cooldown is generated when the EMCP 3 determines that a engine cooldown is in progress. The engine will continue to run until the cooldown duration time has expired.

Talk to the Operator

Note: No repair to the engine is necessary.

A. Determine the conditions that caused the diagnostic code.

Expected Result:

A shutdown was initiated by the operator or by the software that caused the engine to enter into the cooldown mode.

Results:

- OK – STOP.

i02174686

Engine Overcrank Warning

SMCS Code: 4490

System Operation Description:

The crank cycle and the number of crank cycles are programmable. The crank cycle is the amount of time for engagement of the starting motor. This also includes the amount of time for cooling of the starting motor between crank cycles. If the engine does not start within the number of crank cycles that are programmed, “ENGINE FAILURE TO START SHUTDOWN ” will be displayed on the EMCP 3 in order to inform the operator of an overcrank condition.

Note: Refer to the engine Troubleshooting manual for more information on engine starting and engine cranking for your particular genset.

Conditions Which Generate This Code:

The code for the engine overcrank is generated when the EMCP 3 determines that a engine overcrank condition has occurred.

Test Step 1. PERFORM THE INITIAL CHECK.

A. Check for active diagnostic codes on the engine ECM and the EMCP 3. If any codes are present, correct the diagnostic codes first.

Expected Result:

No other diagnostic codes or indicators are active.

Results:

- OK – No other diagnostic codes or indicators are active. Proceed to Test Step 2
- NOT OK – Another diagnostic code is active or an indicator is active.

  Repair: Exit this procedure. Troubleshoot the active code or indicator. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 2. CHECK THE SETPOINTS.

A. View the setpoints (Crank Duration, Crank Cycle Rest Interval, and Maximum Number of Crank Cycles). Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to Test Step 3 for MUI engines. Proceed to Test step 4 for EUI engines.
- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. Inspect the 2301A Governor Power Source and Wiring. (MUI Engines Only)

Refer to the Genset Electrical System Schematic in the Service Manual for an accurate representation of the genset that is being serviced.

A. Verify the Emergency Stop Push Button is not pressed

B. Verify pin 58 on the EMCP 3 is connected through a normally open contact on the emergency stop switch to battery positive.

C. Verify the Fuel Control Relay Output on pin 38 of the EMCP 3 is connected to terminal 2 on the 2301A Governor and verify the in line fuse is not open.

D. Verify terminal 1 on the 2301A is connected to battery negative.

Expected Result:

The 2301A Governor power Source and wiring are correct.

Results:

- OK – The wiring is correct. The EMCP 3 may have failed.

  Repair: It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this procedure again. If the failure is not found, replace the EMCP 3.

  STOP.

- NOT OK – The wiring is not correct.

  Repair: Repair the wiring or replace the wiring. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 4. Check communications between EMCP 3 and Engine ECM. (EUI Engines Only)

A. Use the CAT ET to Verify the Fuel enable input on the Engine ECM is configured for "CAN Input".

B. Refer to the Genset Electrical System Schematic in the Service Manual and check the Data Link wiring between the EMCP and the Engine ECM. See Troubleshooting, “Data Link Circuit Fault”

Results:

- OK – The Data Link wiring is correct. The EMCP 3 may have failed.

  Repair: It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this procedure again. If the failure is not found, replace the EMCP 3.

  STOP.

- NOT OK – The wiring is not correct.

  Repair: Repair the wiring or replace the wiring. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

i02177056

Engine Speed Warning

SMCS Code: 4490

System Operation Description:

The EMCP 3 determines the engine speed, in rpm, from the magnetic pickup. The input from the magnetic pickup will be a frequency proportional to the engine speed and to the number of flywheel teeth. The EMCP 3 will convert the frequency of the engine speed sensor input into rpm based on the flywheel teeth setpoint value. The relationship between engine speed and generator frequency can be computed based on the number of generator poles. If the engine speed does not correspond to the generator frequency, “ENG SPEED-GEN FREQ MISMATCH WARN ” will be displayed on the EMCP 3 in order to inform the operator of a mismatch condition.

Note: Refer to the engine Troubleshooting manual for more information regarding engine speed for your particular genset.

Conditions Which Generate This Code:

This code is generated when engine speed and frequency values mismatch by more than 10% for more than 10 seconds, If the setpoint for number of generator poles is set to a value of 0 poles, then this condition is not tested

Test Step 1. PERFORM THE INITIAL CHECK.

A. Check for active diagnostic codes on the engine ECM and the EMCP 3. If any codes are present, correct the diagnostic codes first.

Expected Result:

No other diagnostic codes or indicators are active.

Results:

- OK – No other diagnostic codes or indicators are active. Proceed to Test Step 2
- NOT OK – Another diagnostic code is active or an indicator is active.

  Repair: Exit this procedure. Troubleshoot the active code or indicator. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 2. CHECK THE SETPOINTS.

A. View the setpoints (number of generator poles) and (flywheel teeth). Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

i02199208

Engine Overspeed Warning

SMCS Code: 4490

System Operation Description:

If the engine speed rises above the Engine Overspeed Threshold setpoint value, the Engine Overspeed event is made active.

If a overspeed condition is detected, “ENGINE OVERSPEED SHUTDOWN” will be displayed on the EMCP 3 in order to inform the operator of an overspeed condition. The Engine Overspeed Shutdown will always be a hard shutdown and may not be disabled.

Conditions Which Generate This Code:

The code for engine overspeed is generated when the EMCP 3 determines that a engine overspeed condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the overspeed condition.

Expected Result:

A overspeed was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the overspeed condition, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The overspeed condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the Engine Speed Monitor and Generator Desired Engine Speed Request setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to test step 3 for EUI engines. Proceed to test step 4 for MUI engines

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. VERIFY ENGINE SPEED CAN BE VIEWED AND ADJUSTED FROM THE EMCP 3 (EUI ENGINES ONLY)

Verify the engine speed can be viewed and adjusted from the EMCP 3 Display Screen.

Expected Result:

The engine speed can be viewed and adjusted from the EMCP 3 Display Screen.

Results:

- OK – The engine speed can be viewed and adjusted from the EMCP 3 Display Screen.

  Repair: Adjust the engine speed to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The engine speed cannot be adjusted. Proceed to test step 7

- NOT OK – The engine speed reads zero on the EMCP Display Screen.

  Repair: The Engine Speed Sensor may have failed or needs to be adjusted. See Testing And Adjusting, “Speed Sensor (Engine) - Adjust”. If the problem remains, replace the Engine Speed Sensor.

  STOP.

Test Step 4. CHECK THE SYSTEM BY USING THE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. With the engine running, adjust the speed of the engine by turning the speed potentiometer.

Expected Result:

The engine can be adjusted to the desired speed.

Results:

- OK – The engine speed can be adjusted.

  Repair: Adjust the engine speed to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The engine speed cannot be adjusted with the speed potentiometer. Proceed to test step 5

Test Step 5. CHECK THE RESISTANCE OF THE ENGINE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. Shut down the engine.

B. Disconnect the speed potentiometer from the terminals “11” and “12” on the 2301A Governor.

C. At the speed potentiometer, measure the resistance of the speed potentiometer.

Expected Result:

The resistance should be adjustable between 0 and 100 ohms.

Results:

- OK – The resistance of the sensor is correct. Proceed to Test Step 6.
- NOT OK – The resistance of the speed potentiometer is not correct.

  Repair: Replace the speed potentiometer. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 6. CHECK THE SPEED POTENTIOMETER HARNESS FOR A OPEN CIRCUIT. (MUI ENGINES ONLY)

A. Disconnect the speed potentiometer harness from the 2301A governor.

B. Check for an open circuit. Check the resistance from the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less.

C. Check for an open circuit. Check the resistance from the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less

Expected Result:

When the resistance is measured between the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

When the resistance is measured between the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

Results:

- OK – The harness functions properly.

  Repair: The EMCP 3 may have failed. It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this entire procedure again. If the problem remains, replace the EMCP 3. See Testing And Adjusting, “ Electronic Control Module (Generator Set) - Replace”.

  STOP.

- NOT OK – The harness wiring with the incorrect resistance measurement has failed. Replace the failed harness from the 2301A governor to the speed potentiometer or repair the failed harness from the 2301A governor to the speed potentiometer. Resume normal operation and verify that the problem has been corrected. STOP.

Test Step 7. CHECK J1939 DATA LINK BETWEEN THE EMCP 3 AND THE ENGINE ECM (EUI ENGINES ONLY)

Refer to the Genset Electrical System Schematic in the Service Manual and check the Data Link wiring between the EMCP 3 and the Engine ECM. For more information on troubleshooting the Data Link, see Troubleshooting, “Data Link Circuit Fault ”.

Results:

- OK – The J1939 Data Link wiring is correct.

  Repair: The EMCP 3 may have failed. It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this entire procedure again. If the problem remains, replace the EMCP 3. See Testing And Adjusting, “ Electronic Control Module (Generator Set) - Replace”.

  STOP.

- NOT OK – The wiring is not correct

  Repair: Repair the Data Link wiring or Replace the Data Link wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

i02199252

Engine Underspeed Warning

SMCS Code: 4490

System Operation Description:

If the engine speed drops below the Engine Underspeed Threshold setpoint value, the underspeed timer will begin timing. When the timer expires, the Engine Underspeed event is made active (if the engine speed has been below the threshold level continuously while timing). If the engine speed rises above the Engine Underspeed Threshold, the Engine Underspeed event will be made inactive and the timer will be reset.

If a underspeed condition is detected, “ENGINE UNDERSPEED SHUTDOWN” or “ENGINE UNDERSPEED WARNING” will be displayed on the EMCP 3 in order to inform the operator of an underspeed condition.

Note: The severity of the underspeed condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

The code for engine underspeed is generated when the EMCP 3 determines that a engine underspeed condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the underspeed condition.

Expected Result:

A underspeed was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the underspeed condition, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The underspeed condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the Engine Speed Monitor and Generator Desired Engine Speed Request setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to test step 3 for EUI engines. Proceed to test step 4 for MUI engines

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. VERIFY ENGINE SPEED CAN BE VIEWED AND ADJUSTED FROM THE EMCP 3 (EUI ENGINES ONLY)

Verify the engine speed can be viewed and adjusted from the EMCP 3 Display Screen.

Expected Result:

The engine speed can be viewed and adjusted from the EMCP 3 Display Screen.

Results:

- OK – The engine speed can be viewed and adjusted from the EMCP 3 Display Screen.

  Repair: Adjust the engine speed to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The engine speed cannot be adjusted. Proceed to test step 7

- NOT OK – The engine speed reads zero on the EMCP Display Screen.

  Repair: The Engine Speed Sensor may have failed or needs to be adjusted. See Testing And Adjusting, “Speed Sensor (Engine) - Adjust”. If the problem remains, replace the Engine Speed Sensor.

  STOP.

Test Step 4. CHECK THE SYSTEM BY USING THE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. With the engine running, adjust the speed of the engine by turning the speed potentiometer.

Expected Result:

The engine can be adjusted to the desired speed.

Results:

- OK – The engine speed can be adjusted.

  Repair: Adjust the engine speed to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The engine speed cannot be adjusted with the speed potentiometer. Proceed to test step 5

Test Step 5. CHECK THE RESISTANCE OF THE ENGINE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. Shut down the engine.

B. Disconnect the speed potentiometer from the terminals “11” and “12” on the 2301A Governor.

C. At the speed potentiometer, measure the resistance of the speed potentiometer.

Expected Result:

The resistance should be adjustable between 0 and 100 ohms.

Results:

- OK – The resistance of the sensor is correct. Proceed to Test Step 6.

- NOT OK – The resistance of the speed potentiometer is not correct.

  Repair: Replace the speed potentiometer. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 6. CHECK THE SPEED POTENTIOMETER HARNESS FOR A OPEN CIRCUIT. (MUI ENGINES ONLY)

A. Disconnect the speed potentiometer harness from the 2301A governor.

B. Check for an open circuit. Check the resistance from the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less.

C. Check for an open circuit. Check the resistance from the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less

Expected Result:

When the resistance is measured between the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

When the resistance is measured between the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

Results:

- OK – The harness functions properly.

  Repair: The EMCP 3 may have failed. It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this entire procedure again. If the problem remains, replace the EMCP 3. See Testing And Adjusting, “ Electronic Control Module (Generator Set) - Replace”.

  STOP.

- NOT OK – The harness wiring with the incorrect resistance measurement has failed. Replace the failed harness from the 2301A governor to the speed potentiometer or repair the failed harness from the 2301A governor to the speed potentiometer. Resume normal operation and verify that the problem has been corrected. STOP.

Test Step 7. CHECK THE J1939 DATA LINK BETWEEN THE EMCP 3 AND THE ENGINE ECM (EUI ENGINES ONLY)

Refer to the Genset Electrical System Schematic in the Service Manual and check the Data Link wiring between the EMCP 3 and the Engine ECM. For more information on troubleshooting the Data Link, see Troubleshooting, “Data Link Circuit Fault ”.

Results:

- OK – The J1939 Data Link wiring is correct.

  Repair: The EMCP 3 may have failed. It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this entire procedure again. If the problem remains, replace the EMCP 3. See Testing And Adjusting, " Electronic Control Module (Generator Set) - Replace".

  STOP.

- NOT OK – The wiring is not correct

  Repair: Repair the Data Link wiring or Replace the Data Link wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

i02177111

Generator Control Not in Automatic Warning

SMCS Code: 4490

System Operation Description:

Pressing the Auto Key or a Modbus RS-485 SCADA Data Link message causes the engine to enter AUTO mode. When the engine is in AUTO mode and no shutdowns are active, continuous activation of the Remote Initiate input causes the engine to start and run (after a programmed Start Aid Activation delay and Crank Alert interval). When the Remote Initiate signal is removed, the engine will cool down and then stop. When the genset control is not in AUTO mode, "GEN CONTROL NOT IN AUTO WARNING" will be displayed on the EMCP 3 in order to inform the operator of the not in auto condition.

Note: The event can be disabled via the Generator Control Not in Automatic Warning Event Response Configuration setpoint).

Conditions Which Generate This Code:

The code is generated when the genset control is not in AUTO mode.

Talk to the Operator

Note: No repair to the engine is necessary.

A. Determine the conditions that caused the diagnostic code.

Expected Result:

The generator was place into a mode other than AUTO by the operator or by a Modbus RS-485 SCADA data link message .

Results:

- OK – STOP.

i02183223

Generator Output Sensing Circuit Fault

SMCS Code: 4490

System Operation Description:

If the engine is running and the EMCP 3 is receiving AC voltage and current information but not processing any AC measurements. then the "GENERATOR OUTPUT SENSING CIRCUIT FAULT" is made active. The EMCP 3 has failed.

Perform the following procedure: Electronic Control Module (Generator Set) - Replace

Results:

- OK – STOP.

i02177245

Generator Overcurrent Warning

SMCS Code: 4490

System Operation Description:

The EMCP 3 detects an overcurrent condition that persists for a duration that is a function of the over current level or a condition that exceeds a threshold for a programmed duration. If the RMS current of any phase goes above the Generator Definite Time Over Current (Amp) Percentage Threshold, then a timer is started and the Generator Over Current event is made active.

The tripping time for generator overcurrent detection is determined from the phase with the highest current, and is the smaller of two values: the Curve Time and the Generator Definite Time Over Current (Amp) Shutdown Event Notification Delay Time (setpoint value).

If a overcurrent condition is detected, "GEN OVER CURRENT SHUTDOWN" or "GEN OVERCURRENT WARNING" will be displayed on the EMCP 3 in order to inform the operator of an overcurrent condition.

Note: The severity of the overcurrent condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

The code for generator overcurrent is generated when the EMCP 3 determines that a generator overcurrent condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the overcurrent condition.

Expected Result:

A overcurrent was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the overcurrent condition, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The overcurrent condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the setpoints (Generator Current Transformer Primary Winding Rating), (Generator Current Transformer Secondary Winding Rating), and all of the overcurrent setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

i02178029

Generator Overfrequency Warning

SMCS Code: 4490

System Operation Description:

If the frequency rises above the Generator Overfrequency Percentage Threshold setpoint value, the overfrequency timer will begin timing. When the timer expires, the Generator Overfrequency event is made active (if the frequency has been above the threshold level continuously while timing). If the frequency rises above the Generator Overfrequency Percentage Threshold, the Generator Overfrequency event will be made inactive and the timer will be reset.

If a overfrequency condition is detected, “GEN OVERFREQUENCY SHUTDOWN” or “GEN OVERFREQUENCY WARNING” will be displayed on the EMCP 3 in order to inform the operator of an overfrequency condition.

Note: The severity of the overfrequency condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

The code for generator overfrequency is generated when the EMCP 3 determines that a generator overfrequency condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the overfrequency condition.

Expected Result:

A overfrequency condition was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the overfrequency condition, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The overfrequency condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the Generator Overfrequency and Generator Desired Engine Speed Request setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to test step 3 for EUI engines. Proceed to test step 4 for MUI engines

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. VERIFY FREQUENCY CAN BE VIEWED AND ADJUSTED FROM THE EMCP 3 (EUI ENGINES ONLY)

Verify the generator output frequency can be viewed and adjusted from the EMCP 3 Display Screen.

Expected Result:

The generator output frequency can be viewed and adjusted from the EMCP 3 Display Screen.

Results:

- OK – The generator output frequency can be viewed and adjusted from the EMCP 3 Display Screen.

  Repair: Adjust the generator output frequency to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The generator output frequency cannot be adjusted. Proceed to test step 7

- NOT OK – The generator frequency reads zero on the EMCP Display Screen. Proceed to test step 8

Test Step 4. CHECK THE SYSTEM BY USING THE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. With the engine running, adjust the generator output frequency by turning the speed potentiometer.

Expected Result:

The generator output frequency can be adjusted to the desired frequency.

Results:

- OK – The generator output frequency can be adjusted.

  Repair: Adjust the generator output frequency to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The generator output frequency cannot be adjusted with the speed potentiometer. Proceed to test step 5

Test Step 5. CHECK THE RESISTANCE OF THE ENGINE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. Shut down the engine.

B. Disconnect the speed potentiometer from the terminals “11” and “12” on the 2301A Governor.

C. At the speed potentiometer, measure the resistance of the speed potentiometer.

Expected Result:

The resistance should be adjustable between 0 and 100 ohms.

Results:

- OK – The resistance of the sensor is correct. Proceed to Test Step 6.

- NOT OK – The resistance of the speed potentiometer is not correct.

  Repair: Replace the speed potentiometer. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 6. CHECK THE SPEED POTENTIOMETER HARNESS FOR AN OPEN CIRCUIT. (MUI ENGINES ONLY)

A. Disconnect the speed potentiometer harness from the 2301A governor.

B. Check for an open circuit. Check the resistance from the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less.

C. Check for an open circuit. Check the resistance from the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less

Expected Result:

When the resistance is measured between the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

When the resistance is measured between the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

Results:

- OK – The harness functions properly. Proceed to test step 8

- NOT OK – The harness wiring with the incorrect resistance measurement has failed. Replace the failed harness from the 2301A governor to the speed potentiometer or repair the failed harness from the 2301A governor to the speed potentiometer. Resume normal operation and verify that the problem has been corrected. STOP.

Test Step 7. CHECK J1939 DATA LINK BETWEEN THE EMCP 3 AND THE ENGINE ECM (EUI ENGINES ONLY)

Refer to the Genset Electrical System Schematic in the Service Manual and check the Data Link wiring between the EMCP 3 and the Engine ECM. For more information on troubleshooting the Data Link, see Troubleshooting , “Data Link Circuit Fault ”.

Results:

- OK – The J1939 Data Link wiring is correct. Proceed to test step 8

- NOT OK – The wiring is not correct

  Repair: Repair the Data Link wiring or Replace the Data Link wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

Test Step 8. CHECK THE VOLTAGE INPUT FUSES.

A. Check the three fuses on the AC voltage inputs of the EMCP 3.

Expected Result:

The fuses should not be open.

Results:

- OK – The fuses are not open. Proceed to test step 9

- NOT OK – One or more of the fuses are open.

  Repair: Check for a shorted component or damaged wiring. Troubleshoot and repair the problem. See the Generator Set Wiring Diagram for your particular genset. After the problem has been repaired, replace the fuses.

  STOP.

Test Step 9. CHECK THE GENERATOR VOLTAGE OUTPUT.

A. Open the circuit breaker or remove the load.

B. Start the engine and run the genset.

C. Measure the voltage between all three AC input fuses.

Expected Result:

The line to line voltage should measure the rated voltage of the genset.

Results:

- OK – The voltages are correct and the problem remains. Proceed to Test Step 10.
- NOT OK – One or more of the voltages are NOT correct.

  Repair: The wiring or the connections the are damaged. Check for damaged wiring between the fuses and the generator output bus. See the Generator Set Wiring Diagram for your particular genset. Repair the wiring or replace the wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

Test Step 10. CHECK THE VOLTAGE INPUT CONNECTIONS

A. Shut down the engine.

B. Remove the EMCP 3 harness connector from the EMCP 3.

C. Check the EMCP 3 harness connector. See Testing And Adjusting, “Electrical Connector - Inspect”.

D. Check for one or more damaged wires between the EMCP 3 voltage inputs and the voltage input fuses. See the Generator Set Wiring Diagram for your particular genset.

Expected Result:

The wiring and the connectors should have been good.

Results:

- OK – NO problem was found with the connectors or with the wiring.

  Repair: The EMCP 3 may have failed. It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this entire procedure again. If the problem remains, replace the EMCP 3. See Testing And Adjusting, “ Electronic Control Module (Generator Set) - Replace”.

  STOP.

- NOT OK – The problem was with the connectors or with the wiring.

  Repair: Repair the connectors or replace the wiring harness. Resume normal operation and verify that the problem has been corrected.

  STOP.

i02178102

Generator Overvoltage Warning

SMCS Code: 4490

System Operation Description:

If the voltage rises above the Generator Overvoltage Percentage Threshold setpoint value, the overvoltage timer will begin timing. When the timer expires, the Generator Overvoltage event is made active (if the voltage has been above the threshold level continuously while timing). If the voltage drops below the Generator Overvoltage Percentage Threshold, the Generator Overvoltage event will be made inactive and the timer will be reset.

If a overvoltage condition is detected, “GEN OVERVOLTAGE SHUTDOWN” or “GEN OVERVOLTAGE WARNING” will be displayed on the EMCP 3 in order to inform the operator of an overvoltage condition.

Note: The severity of the overvoltage condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

The code for generator overvoltage is generated when the EMCP 3 determines that a generator overvoltage condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the overvoltage condition.

Expected Result:

A overvoltage was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the overvoltage condition, the condition has been repaired and the operator wants to put the genenset back into service.

Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

STOP.

- NOT OK – The overvoltage condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the Generator Overvoltage setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. VERIFY VOLTAGE CAN BE ADJUSTED

Verify the generator output voltage can be adjusted from the EMCP 3 Display Screen.

Expected Result:

The generator output voltage can be adjusted from the EMCP 3 Display Screen.

Results:

- OK – The generator output voltage can be changed from the EMCP 3 Display Screen.

  Repair: Adjust the generator output voltage to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The generator output voltage cannot be adjusted. Proceed to test step 4

Test Step 4. CHECK CAT DATA LINK BETWEEN THE EMCP 3 AND THE VOLTAGE REGULATOR

Refer to the Genset Electrical System Schematic in the Service Manual and check the Data Link wiring between the EMCP 3 and the Voltage Regulator. For more information on troubleshooting the Data Link, see Troubleshooting , “Data Link Circuit Fault ”.

Results:

- OK – The Data Link wiring is correct.

  Repair: Refer to the appropriate voltage regulator service manual and perform an operational check of the voltage regulator. Replace the voltage regulator if necessary. Resume normal operation and verify the problem has been corrected.

  STOP.

- NOT OK – The wiring is not correct

  Repair: Repair the Data Link wiring or Replace the Data Link wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

i02178170

Generator Reverse Power Warning

SMCS Code: 4490

System Operation Description:

If the current rises above the Generator Reverse Power Percentage Threshold setpoint value, the reverse power timer will begin timing. When the timer expires, the Generator Reverse Power event is made active (if the current has been above the threshold level continuously while timing). If the current drops below the Generator Reverse Power Percentage Threshold, the Generator Reverse Power event will be made inactive and the timer will be reset.

If a reverse power condition is detected, “GEN REVERSE POWER SHUTDOWN” or “GEN REVERSE POWER WARNING” will be displayed on the EMCP 3 in order to inform the operator of an reverse power condition.

Note: The severity of the reverse power condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

The code for generator reverse power is generated when the EMCP 3 determines that a generator reverse power condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the reverse power condition.

Expected Result:

A reverse power was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the reverse power condition, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The reverse power condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the Generator Reverse Power setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to Test Step 3.

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. CHECK THE POLARITY OF THE CURRENT TRANSFORMERS

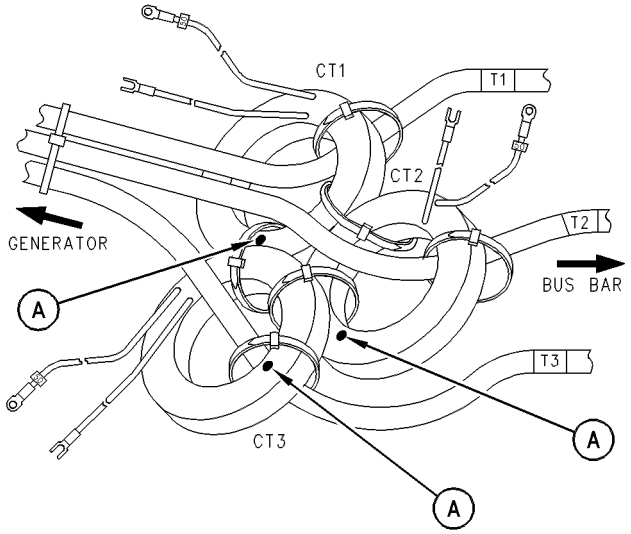


Illustration 12 g00607036

(A) Current Transformer Polarity Dot

A. Press the STOP key in order to shut down the engine.

B. Check the polarity of the current transformers. The polarity dots on all of the transformers should be towards the genset. Refer to Illustration 12.

Expected Result:

The polarity of the current transformers should be correct.

Results:

- OK – The polarity of the current transformers are correct.

  Repair: It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this procedure again. If the diagnostic code is still present, replace the EMCP 3. Refer to Testing and Adjusting, “ Electronic Control Module (Generator Set) - Replace”.

  STOP.

- NOT OK – The polarity of the current transformers are NOT correct.

Repair: Install the current transformers as shown on the wiring diagram for your particulart genset. Reset the genset. Resume normal operation and verify that the problem has been corrected.

STOP.

i02178486

Generator Underfrequency Warning

SMCS Code: 4490

System Operation Description:

If the frequency drops below the Generator Underfrequency Percentage Threshold setpoint value, the underfrequency timer will begin timing. When the timer expires, the Generator Underfrequency event is made active (if the frequency has been below the threshold level continuously while timing). If the frequency rises above the Generator Underfrequency Percentage Threshold, the Generator Underfrequency event will be made inactive and the timer will be reset.

If a underfrequency condition is detected, “GEN UNDERFREQUENCY SHUTDOWN” or “GEN UNDERFREQUENCY WARNING” will be displayed on the EMCP 3 in order to inform the operator of an underfrequency condition.

Note: The severity of the underfrequency condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

The code for generator underfrequency is generated when the EMCP 3 determines that a generator underfrequency condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the underfrequency condition.

Expected Result:

A underfrequency condition was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the underfrequency condition, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The underfrequency condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the Generator Underfrequency and Generator Desired Engine Speed Request setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to test step 3 for EUI engines. Proceed to test step 4 for MUI engines

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. VERIFY FREQUENCY CAN BE VIEWED AND ADJUSTED FROM THE EMCP 3 (EUI ENGINES ONLY)

Verify the generator output frequency can be viewed and adjusted from the EMCP 3 Display Screen.

Expected Result:

The generator output frequency can be viewed and adjusted from the EMCP 3 Display Screen.

Results:

- OK – The generator output frequency can be viewed and adjusted from the EMCP 3 Display Screen.

  Repair: Adjust the generator output frequency to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The generator output frequency cannot be adjusted. Proceed to test step 7

- NOT OK – The generator frequency reads zero on the EMCP Display Screen. Proceed to test step 8

Test Step 4. CHECK THE SYSTEM BY USING THE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. With the engine running, adjust the generator output frequency by turning the speed potentiometer.

Expected Result:

The generator output can be adjusted to the desired frequency.

Results:

- OK – The generator output frequency can be adjusted.

  Repair: Adjust the generator output frequency to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The generator output frequency cannot be adjusted with the speed potentiometer. Proceed to test step 5

Test Step 5. CHECK THE RESISTANCE OF THE ENGINE SPEED POTENTIOMETER. (MUI ENGINES ONLY)

A. Disconnect the speed potentiometer from the terminals “11” and “12” on the 2301A Governor.

B. At the speed potentiometer, measure the resistance of the speed potentiometer.

Expected Result:

The resistance should be adjustable between 0 and 100 ohms.

Results:

- OK – The resistance of the sensor is correct. Proceed to Test Step 6.

- NOT OK – The resistance of the speed potentiometer is not correct.

  Repair: Replace the speed potentiometer. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 6. CHECK THE SPEED POTENTIOMETER HARNESS FOR AN OPEN CIRCUIT. (MUI ENGINES ONLY)

A. Disconnect the speed potentiometer harness from the 2301A governor.

B. Check for an open circuit. Check the resistance from the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less.

C. Check for an open circuit. Check the resistance from the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer. The resistance should be 5 ohms or less

Expected Result:

When the resistance is measured between the wire connected to terminal “11” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

When the resistance is measured between the wire connected to terminal “12” of the 2301A governor to the same wire number at the speed potentiometer connector, the resistance should be 5 ohms or less.

Results:

- OK – The harness functions properly. Proceed to test step 8

- NOT OK – The harness wiring with the incorrect resistance measurement has failed. Replace the failed harness from the 2301A governor to the speed potentiometer or repair the failed harness from the 2301A governor to the speed potentiometer. Resume normal operation and verify that the problem has been corrected. STOP.

Test Step 7. CHECK J1939 DATA LINK BETWEEN THE EMCP 3 AND THE ENGINE ECM (EUI ENGINES ONLY)

Refer to the Genset Electrical System Schematic in the Service Manual and check the Data Link wiring between the EMCP 3 and the Engine ECM. For more information on troubleshooting the Data Link, see Troubleshooting , “Data Link Circuit Fault ”.

Results:

- OK – The J1939 Data Link wiring is correct. Proceed to test step 8

- NOT OK – The wiring is not correct

Repair: Repair the Data Link wiring or Replace the Data Link wiring. Resume normal operation and verify the problem has been corrected.

STOP.

Test Step 8. CHECK THE VOLTAGE INPUT FUSES.

A. Check the three fuses on the AC voltage inputs of the EMCP 3.

Expected Result:

The fuses should not be open.

Results:

- OK – The fuses are not open. Proceed to test step 9
- NOT OK – One or more of the fuses are open.

  Repair: Check for a shorted component or damaged wiring. Troubleshoot and repair the problem. See the Generator Set Wiring Diagram for your particular genset. After the problem has been repaired, replace the fuses.

  STOP.

Test Step 9. CHECK THE GENERATOR VOLTAGE OUTPUT.

A. Open the circuit breaker or remove the load.

B. Start the engine and run the genset.

C. Measure the voltage between all three AC input fuses.

Expected Result:

The line to line voltage should measure the rated voltage of the genset.

Results:

- OK – The voltages are correct and the problem remains. Proceed to Test Step 10.
- NOT OK – One or more of the voltages are NOT correct.

  Repair: The wiring or the connections the are damaged. Check for damaged wiring between the fuses and the generator output bus. See the Generator Set Wiring Diagram for your particular genset. Repair the wiring or replace the wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

Test Step 10. CHECK THE VOLTAGE INPUT CONNECTIONS

A. Shut down the engine.

B. Remove the EMCP 3 harness connector from the EMCP 3.

C. Check the EMCP 3 harness connector. See Testing And Adjusting, “Electrical Connector - Inspect”.

D. Check for one or more damaged wires between the EMCP 3 voltage inputs and the voltage input fuses. See the Generator Set Wiring Diagram for your particular genset.

Expected Result:

The wiring and the connectors should have been good.

Results:

- OK – NO problem was found with the connectors or with the wiring.

  Repair: The EMCP 3 may have failed. It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this entire procedure again. If the problem remains, replace the EMCP 3. See Testing And Adjusting, “ Electronic Control Module (Generator Set) - Replace”.

  STOP.

- NOT OK – The problem was with the connectors or with the wiring.

  Repair: Repair the connectors or replace the wiring harness. Resume normal operation and verify that the problem has been corrected.

  STOP.

i02178509

Generator Undervoltage Warning

SMCS Code: 4490

System Operation Description:

If the voltage drops below the Generator Undervoltage Percentage Threshold and Automatic Voltage Regulator (AVR) Request setpoint value, the undervoltage timer will begin timing. When the timer expires, the Generator Undervoltage event is made active (if the frequency has been below the threshold level continuously while timing). If the voltage rises above the Generator Undervoltage Percentage Threshold, the Generator Undervoltage event will be made inactive and the timer will be reset.

If a undervoltage condition is detected, “GEN UNDERVOLTAGE SHUTDOWN” or “GEN UNDERVOLTAGE WARNING” will be displayed on the EMCP 3 in order to inform the operator of an undervoltage condition.

Note: The severity of the undervoltage condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

The code for generator undervoltage is generated when the EMCP 3 determines that a generator undervoltage condition has occurred.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the undervoltage condition.

Expected Result:

A undervoltage was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the undervoltage condition, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The undervoltage condition was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the Generator Undervoltage, Automatic Voltage Regulator (AVR) Desired Voltage Request, and Generator AC Monitor setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to test step 3

- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. VERIFY VOLTAGE CAN BE ADJUSTED

Verify the generator output voltage can be adjusted from the EMCP 3 Display Screen.

Expected Result:

The generator output voltage can be adjusted from the EMCP 3 Display Screen.

Results:

- OK – The generator output voltage can be changed from the EMCP 3 Display Screen.

  Repair: Adjust the generator output voltage to meet site requirements. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The generator output voltage cannot be adjusted. Proceed to test step 4

Test Step 4. CHECK CAT DATA LINK BETWEEN THE EMCP 3 AND THE VOLTAGE REGULATOR

Refer to the Genset Electrical System Schematic in the Service Manual and check the Data Link wiring between the EMCP 3 and the Voltage Regulator. For more information on troubleshooting the Data Link, see Troubleshooting , “Data Link Circuit Fault ”.

Results:

- OK – The Data Link wiring is correct. Proceed to test step 5
- NOT OK – The wiring is not correct

  Repair: Repair the Data Link wiring or Replace the Data Link wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

Test Step 5. VERIFY VOLTAGE SENSING CIRCUITS

Verify all three phases of generator output voltage are shown on the EMCP 3 Display Screen.

Expected Result:

All three phases of generator output voltage are shown on the EMCP 3 Display Screen

Results:

- OK – All three phases of generator output voltage are shown on the EMCP 3 Display Screen

  Repair: Refer to appropriate voltage regulator service manual and perform an operational check of the voltage regulator. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – All phases of voltage are not shown on display. Proceed to test step 6

Test Step 6. CHECK THE VOLTAGE INPUT FUSES.

A. Check the three fuses on the AC voltage inputs of the EMCP 3.

Expected Result:

The fuses should not be open.

Results:

- OK – The fuses are not open. Proceed to test step 7
- NOT OK – One or more of the fuses are open.

  Repair: Check for a shorted component or damaged wiring. Troubleshoot and repair the problem. See the Generator Set Wiring Diagram for your particular genset. After the problem has been repaired, replace the fuses.

  STOP.

Test Step 7. CHECK THE GENERATOR VOLTAGE OUTPUT.

A. Open the circuit breaker or remove the load.

B. Start the engine and run the genset.

C. Measure the voltage between all three AC input fuses.

Expected Result:

The line to line voltage should measure the rated voltage of the genset.

Results:

- OK – The voltages are correct and the problem remains. Proceed to Test Step 8.
- NOT OK – One or more of the voltages are NOT correct.

  Repair: The wiring or the connections the are damaged. Check for damaged wiring between the fuses and the generator output bus. See the Generator Set Wiring Diagram for your particular genset. Repair the wiring or replace the wiring. Resume normal operation and verify the problem has been corrected.

  STOP.

Test Step 8. CHECK THE VOLTAGE INPUT CONNECTIONS

A. Shut down the engine.

B. Remove the EMCP 3 harness connector from the EMCP 3.

C. Check the EMCP 3 harness connector. See Testing And Adjusting, “Electrical Connector - Inspect”.

D. Check for one or more damaged wires between the EMCP 3 voltage inputs and the voltage input fuses. See the Generator Set Wiring Diagram for your particular genset.

Expected Result:

The wiring and the connectors should have been good.

Results:

- OK – NO problem was found with the connectors or with the wiring.

  Repair: The EMCP 3 may have failed. It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this entire procedure again. If the problem remains, replace the EMCP 3. See Testing And Adjusting, " Electronic Control Module (Generator Set) - Replace".

  STOP.

- NOT OK – The problem was with the connectors or with the wiring.

  Repair: Repair the connectors or replace the wiring harness. Resume normal operation and verify that the problem has been corrected.

  STOP.

i02178535

Service Maintenance Interval Warning

SMCS Code: 4490

System Operation Description:

A Service Maintenance Interval Warning event is detected when the number of engine hours or the number of days since the previous alarm occurrence was reset exceeds the number of hours or days specified by the Service Interval Setpoints. Once the event is active, it will not become inactive until a Reset Service Interval Counter Command is received over the data link or from the display.

Conditions Which Generate This Code:

The Service Maintenance Interval code is generated when the EMCP 3 determines a need for engine service based on engine hours or the number of days since last service, whichever occurs first.

Test Step 1. Talk to the Operator

A. Determine the conditions that caused the diagnostic code.

Expected Result:

Genset maintenance records indicate that the maintenance interval has been exceeded and maintenance is required

Results:

- OK – Records indicate service is required. Perform the required maintenance and reset the Service Maintenance Interval in order to indicate when the genset will need to be serviced again. STOP.

- NOT OK – Records indicate service is not required. Proceed to Test Step 2

Test Step 2. CHECK THE SETPOINTS.

A. View the setpoints (Service Maintenance Interval Hours), and (Service Maintenance Interval Days) and make note of the setpoints. See Testing and Adjusting, "Electronic Control Module (Generator Set) - Configure". Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct for your particular genset and application.

Results:

- OK – The setpoints are correct for your particular genset and application.

  Repair: It is possible the Service Maintenance Interval was not reset when the genset was last serviced. Reset the Service Maintenance Interval in order to indicate when the genset will need to be serviced again. Resume normal operation.

  STOP.

- NOT OK – The setpoints are NOT correct for your particular genset and application.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

i02179040

Analog Input Circuit Fault

SMCS Code: 4490

System Operation Description:

Spare Analog Inputs are connected to resistive type sensors either on the engine, generator or supporting systems. The EMCP 3 converts the resistive sensor values into levels, temperatures, and pressures depending on how the input is configured. Six programmable thresholds are provided – high/low thresholds for each of the three supported data types. The appropriate thresholds are selected based on the Spare Analog Input Type Configuration setpoints. The EMCP 3 will also detect sensor diagnostics for shorted high and shorted low conditions.

An active spare analog input can be programmed to cause an alarm or a shutdown. For programming of the spare inputs, see System Operation, “Spare Analog Input Programming”.

Conditions Which Generate This Code:

This code is generated when the measured Spare Analog Input value goes above or below the programmed threshold for a configurable duration.

Test Step 1. PERFORM THE INITIAL CHECK.

A. Use ET to Check for active diagnostic codes on the engine ECM. If any codes are present, correct the diagnostic codes first.

Expected Result:

No other diagnostic codes or indicators are active on the engine ECM.

Results:

- OK – No other diagnostic codes or indicators are active. Proceed to Test Step 2
- NOT OK – Another engine ECM diagnostic code is active.

  Repair: Exit this procedure. Troubleshoot the active code or indicator. Refer to the engine Troubleshooting manual for your particular genset.

  STOP.

Test Step 2. CHECK THE SETPOINTS.

A. View the Spare Analog Input setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to test step 3
- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. CHECK THE ANALOG INPUT DEVICE WIRING

A. Check the wiring to the corresponding spare analog input for an unwanted short circuit. The short can be to the battery negative (“B-”). The short can be to the battery positive terminal (“B+”). Carefully check ALL wires that are connected to the appropriate analog input for abrasion or worn spots in the insulation that could be causing the short. Check the wires in the generator control panel. Check the wires in the engine harness. Refer to the appropriate wiring diagrams for the circuit that is being checked.

Expected Result:

The wiring is correct.

Results:

- OK – No problems can be found with the analog input wiring. Proceed to test step 4
- NOT OK – The analog input wiring is defective.

  Repair: Repair the wiring or replace the wiring.

  Proceed to test step 4

Test Step 4. CHECK IF THE DIAGNOSTIC CODE REMAINS

A. Inspect the harness connectors and clean the contacts of the harness connectors.

B. Reconnect all harness connectors.

C. Reset the genset.

D. Operate the genset.

E. Check the status of the diagnostic code.

Expected Result:

The diagnostic code is not active.

Results:

- OK – The diagnostic code is not active. The diagnostic code does not exist at this time. The initial diagnostic code was probably caused by a poor connection or a short at one of the connectors that was disconnected and reconnected. Resume normal operation. STOP.
- NOT OK – The code is active. The diagnostic code has not been corrected. The ECM may have failed.

  Repair: It is unlikely that the ECM has failed. Exit this procedure and perform this procedure again. If the cause of the failure is not found, replace the ECM. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Replace”.

  STOP.

i02179474

Charging System

SMCS Code: 1401; 1405

System Operation Description:

The EMCP 3 monitors its battery supply voltage based on the +BATT and –BATT voltage inputs to the EMCP 3 control. If the battery voltage rises above the High Battery Voltage Event Threshold setpoint value, the high battery voltage event timer will begin timing. When the high battery voltage timer expires, the High Battery Voltage event is made active (if the battery voltage has been above the event threshold level continuously while timing). If the battery voltage drops below the High Battery Voltage Warning Threshold, the High Battery Voltage event will be made inactive and the timer will be reset.

If a battery overvoltage condition is detected, “HIGH BATTERY VOLTAGE SHUTDOWN” or “HIGH BATTERY VOLTAGE WARNING” will be displayed on the EMCP 3 in order to inform the operator of a high battery voltage condition.

If the battery voltage drops below the Low Battery Voltage Warning Threshold setpoint value, the low battery voltage event timer will begin timing. When the low battery voltage event timer expires, the Low Battery Voltage event is made active (if the battery voltage has been below the event threshold level continuously while timing). If the battery voltage rises above the Low Battery Voltage Event Threshold, the Low Battery Voltage event will be made inactive and the timer will be reset.

If a battery undervoltage condition is detected, “LOW BATTERY CHARGING SYS VOLT WARN” or “LOW BATTERY VOLTAGE WARNING” will be displayed on the EMCP 3 in order to inform the operator of an undervoltage condition.

Note: The severity of the battery over/under voltage condition will determine if a warning or shutdown event occurs.

Conditions Which Generate This Code:

This code is generated when the measured battery voltage value goes above or below the programmed thresholds for a configurable duration.

Test Step 1. PERFORM THE INITIAL CHECK.

A. The battery and charging system are located on the engine. Use ET to Check for active diagnostic codes on the engine ECM. If any codes are present, correct the engine diagnostic codes first.

Expected Result:

No other diagnostic codes or indicators are active on the engine ECM.

Results:

- OK – No other diagnostic codes or indicators are active. 2
- NOT OK – Another engine ECM diagnostic code is active.

  Repair: Exit this procedure. Troubleshoot the active code or indicator. Refer to the engine Troubleshooting manual for your particular genset.

  STOP.

Test Step 2. CHECK THE SETPOINTS.

A. View the Battery Voltage Monitor setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to test step 3
- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. COMPARE ACTUAL BATTERY VOLTAGE TO THE VOLTAGE DISPLAYED ON THE EMCP 3 DISPLAY

A. Shut down the engine.

B. Disconnect the harness connector from the EMCP 3.

C. At the harness connector, measure the battery voltage at between pin number 52 and pin number 65.

Expected Result:

The measured battery voltage should be the same as the battery voltage displayed on the EMCP 3 display screen.

Results:

- OK – The measured battery voltage is the same as the battery voltage displayed on the EMCP 3 Display Screen. Proceed to test step 4
- NOT OK – The measured battery voltage is not the same as the battery voltage displayed on the EMCP 3 Display Screen. The EMCP 3 may have failed.

  Repair: It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this procedure again. If the cause of the failure is not found, replace the EMCP 3. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Replace”.

  STOP.

Test Step 4. CHECK THE BATTERY VOLTAGE WIRING BETWEEN THE EMCP 3 AND THE BATTERY SOURCE

A. Check the battery negative (“B-”) wiring to the battery negative input for a short circuit or open circuit. Check the battery positive (“B+”) wiring to the battery positive input for a short circuit or open circuit. Check the wires in the generator control panel. Check the wires in the engine harness. Refer to the appropriate wiring diagrams for the circuit that is being checked.

Expected Result:

The wiring is correct.

Results:

- OK – No problems can be found with the battery voltage supply wiring. Proceed to test step 5
- NOT OK – The battery voltage supply wiring is defective.

  Repair: Repair the wiring or replace the wiring.

  Proceed to test step 5

Test Step 5. CHECK IF THE DIAGNOSTIC CODE REMAINS

A. Inspect the harness connectors and clean the contacts of the harness connectors.

B. Reconnect all harness connectors.

C. Reset the genset.

D. Operate the genset.

E. Check the status of the diagnostic code.

Expected Result:

The diagnostic code is not active.

Results:

- OK – The diagnostic code is not active. The diagnostic code does not exist at this time. The initial diagnostic code was probably caused by a poor connection or a short at one of the connectors that was disconnected and reconnected. Resume normal operation. STOP.
- NOT OK – The code is active. The diagnostic code has not been corrected. The ECM may have failed.

Repair: It is unlikely that the ECM has failed. Exit this procedure and perform this procedure again. If the cause of the failure is not found, replace the ECM. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Replace”.

STOP.

i02180062

Data Link Circuit Fault

SMCS Code: 4490

System Operation Description:

Note: There are three data links associated with the EMCP 3. The Data Links are the (J1939 Accessory Data Link), (J1939 Primary Data Link), and the (Modbus RS-485 SCADA Data Link). Refer to Systems Operation, “General Information” for details. This procedure checks for an open circuit or a short circuit in one of the Data Links

Note: Use the wiring diagram for your particular genset in order to troubleshoot the Data Links.

Test Step 1. Inspect the Electrical Connectors and the Wiring

A. Turn the keyswitch to the OFF position.

B. Thoroughly inspect the EMCP 3 connector, the service tool connector, and all other connectors in the circuit for the data link. Refer to Troubleshooting, “Electrical Connectors - Inspect” for details.

Expected Result:

All connectors, pins, and sockets are completely inserted and coupled. The harness and wiring are free of corrosion, of abrasion, and of pinch points.

Results:

- OK **–** In order to troubleshoot the Modbus RS-485 SCADA Data Link, proceed to Test Step 2
- OK **–** In order to troubleshoot the J1939 Primary or the J1939 Accessory Data Link, proceed to Test Step 4
- Not OK

  Repair: Repair the wiring or replace the wiring.

  STOP.

Test Step 2. Check for Shorts in the Modbus RS-485 SCADA Data Link Harness

A. Disconnect all connectors from the suspected data link.

B. Measure the resistance between (data link +) and data link −).

C. Measure the resistance between (data link +) and chassis ground.

D. Measure the resistance between (data link −) and chassis ground.

Expected Result:

The resistance is greater than 20,000 Ohms for each measurement.

Results:

- OK **–** Proceed to Test Step 5
- Not OK – There is a short circuit in the harness or connectors.

  Repair: Repair the wiring or replace the wiring.

  Proceed to Test Step 5

Test Step 3. Check the Resistance through the Modbus RS-485 SCADA Data Link Harness

A. Disconnect all connectors from the suspected data link.

B. Use a suitable piece of wire to short (Data Link +) and (Data Link −) at the EMCP 3.

C. Measure the resistance between (Data Link +) and (Data Link −) at all other connectors in the circuit for the data link.

Expected Result:

The resistance is less than 10 Ohms.

Results:

- OK – The Data Link is OK. Proceed to test step 5
- Not OK – There is an open circuit or excessive resistance in the harness or connectors.

  Repair: Repair the wiring or replace the wiring.

  Proceed to Test Step 5

Test Step 4. Check for Shorts in the J1939 Data Link Harness

A. Disconnect all connectors from the suspected data link.

B. Measure the resistance between (data link +) and data link −).

Expected Result:

The resistance is approximately 60 Ohms.

Results:

- OK **–** Proceed to Test Step 5.
- Not OK – If the resistance is approximately 120 ohms, a termination resistor is missing. If the resistance is much greater than 120 ohms, both termination resistors are missing or there is a open data link circuit. if the resistance is much less than 60 ohms, there is a short circuit

  Repair: Repair the wiring or replace the wiring.

  Proceed to Test Step 5

Test Step 5. CHECK IF THE DIAGNOSTIC CODE REMAINS

A. Inspect the Data Link harness connectors and clean the contacts of the harness connectors.

B. Reconnect all Data Link harness connectors.

C. Reset the genset.

D. Operate the genset.

E. Check the status of the diagnostic code.

Expected Result:

The diagnostic code is not active.

Results:

- OK – The diagnostic code is not active. The diagnostic code does not exist at this time. The initial diagnostic code was probably caused by a poor connection or a short at one of the connectors that was disconnected and reconnected. Resume normal operation. STOP.
- NOT OK – The code is active. The diagnostic code has not been corrected. The ECM may have failed.

  Repair: It is unlikely that the ECM has failed. Exit this procedure and perform this procedure again. If the cause of the failure is not found, replace the ECM. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Replace”.

  STOP.

i02180563

Digital Input Circuit Fault

SMCS Code: 4490

System Operation Description:

Digital inputs are used to bring on/off information such as switch closures to the Genset Control. The EMCP 3 associates the inputs with levels, temperatures, pressures, and status conditions depending on how the input is programmed. Two of the Digital Inputs are used by the EMCP 3 to control Emergency Stop and Remote Initiate functions and are programmed at the factory. The spare digital inputs must be programmed before use.

For additional information on programming digital inputs, see System Operation, “Digital Input Programming”

Conditions Which Generate This Code:

This code is generated when the digital input is active. The code may a indicate a problem exists with the genset or the code may also indicate a status that does not need to be repaired.

Test Step 1. PERFORM THE INITIAL CHECK.

A. Use ET to Check for active diagnostic codes on the engine ECM. If any codes are present, correct the diagnostic codes first.

Expected Result:

No other diagnostic codes or indicators are active on the engine ECM.

Results:

- OK – No other diagnostic codes or indicators are active. Proceed to Test Step 2
- NOT OK – Another engine ECM diagnostic code is active.

Repair: Exit this procedure. Troubleshoot the active code or indicator. Refer to the engine Troubleshooting manual for your particular genset.

STOP.

Test Step 2. CHECK THE SETPOINTS.

A. View the Digital Input setpoints. Make a note of the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to Test Step 3
- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. CHECK THE DIGITAL INPUT WIRING

A. Check the wiring to the corresponding digital inputs for an unwanted short circuit. The short can be to the battery negative (“B-”). Carefully check ALL wires that are connected to the appropriate digital input for abrasion or worn spots in the insulation that could be causing the short. Check the wires in the generator control panel. Check the wires in the engine harness. Refer to the appropriate wiring diagrams for the circuit that is being checked.

Expected Result:

The wiring is correct.

Results:

- OK – No problems can be found with the digital input wiring. Proceed to test step 4
- NOT OK – The digital input wiring is defective.

  Repair: Repair the wiring or replace the wiring.

  Proceed to test step 4

Test Step 4. CHECK IF THE DIAGNOSTIC CODE REMAINS

A. Inspect the harness connectors and clean the contacts of the machine harness connectors.

B. Reconnect all harness connectors.

C. Reset the genset.

D. Operate the genset.

E. Check the status of the diagnostic code.

Expected Result:

The diagnostic code is not active.

Results:

- OK – The diagnostic code is not active. The diagnostic code does not exist at this time. The initial diagnostic code was probably caused by a poor connection or a short at one of the connectors that was disconnected and reconnected. Resume normal operation. STOP.
- NOT OK – The code is active. The diagnostic code has not been corrected. The ECM may have failed.

  Repair: It is unlikely that the ECM has failed. Exit this procedure and perform this procedure again. If the cause of the failure is not found, replace the ECM. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Replace”.

  STOP.

i02180829

Digital Output Circuit Fault

SMCS Code: 4490

System Operation Description:

Digital Outputs are used to convey on/off information from the Genset Control for energizing loads such as relays, solenoids, and indicator lamps. The digital output must not be connected directly to battery positive (B+).

Conditions Which Generate This Code:

This code is occurs when the digital output wiring is shorted to battery positive (B+).

Test Step 1. CHECK FOR A SHORTED HARNESS

A. Turn the key start switch and the disconnect switch to the OFF position.

B. Disconnect the harness connector from the EMCP 3.

C. Disconnect the digital output from the device it is connected to.

D. At the harness connector for the EMCP 3, measure the resistance from the failed digital output contact to all other EMCP 3 harness contacts.

Expected Result:

Each resistance measurement is greater than 5000 ohms.

Results:

- OK – Each resistance measurement is greater than 5000 ohms. The harness is correct. Proceed to Test Step 2
- NOT OK – Each resistance measurement is not greater than 5000 ohms. There is a short in the harness on the wire that has that has a low resistance measurement.

  Repair: Repair the harness or replace the harness.

  STOP.

Test Step 2. CHECK THE DEVICE CONNECTED TO THE DIGITAL OUTPUT CIRCUIT WIRING FOR SHORT TO THE +BATTERY CIRCUIT.

A. Press the Emergency Stop Push Button to prevent the engine from running while performing this procedure. Turn the battery disconnect switch to the ON position.

B. At the digital output device, measure the DC voltage on the wire connected to the failed digital output.

Expected Result:

The voltage is at or near 0 volts DC and not shorted to battery positive (B+).

Results:

- OK – The digital output device is not shorted to battery positive (B+). Proceed to Test Step 3
- NOT OK – The digital output device is shorted to battery positive (B+)

  Repair: Repair the digital output device or replace the digital output device.

  STOP.

Test Step 3. CHECK IF THE DIAGNOSTIC CODE REMAINS

A. Inspect the EMCP 3 connector and clean the contacts of the EMCP 3 connector.

B. Reconnect the harness connector.

C. Reset the genset.

D. Operate the genset.

E. Check the status of the diagnostic code.

Expected Result:

The diagnostic code is not active.

Results:

- OK – The diagnostic code is not active. The diagnostic code does not exist at this time. The initial diagnostic code was probably caused by a poor connection or a short at one of the connectors that was disconnected and reconnected. Resume normal operation. STOP.
- NOT OK – The code is active. The diagnostic code has not been corrected. The ECM may have failed.

  Repair: It is unlikely that the ECM has failed. Exit this procedure and perform this procedure again. If the cause of the failure is not found, replace the ECM. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Replace”.

  STOP.

i02181532

Engine Speed Circuit Fault

SMCS Code: 4490

System Operation Description:

The EMCP 3 determines the engine speed, in rpm, from the Magnetic Pickup (Engine Speed Sensor) input pins, detects diagnostics on the sensor, and annunciates an engine over/under speed condition. The engine speed sensor used for these determinations is an independent sensor to be used by the EMCP 3 only.

The engine speed sensor is mounted on the flywheel housing of the engine.

The sensor creates a sine wave signal. The signal is created from passing ring gear teeth. The rate of the signal is one pulse per tooth. The sensor sends the sine wave signal to the EMCP 3. The frequency of the signal is directly proportional to the speed of the engine.

Conditions Which Generate This Code:

This code is generated when the EMCP 3 has determined that an incorrect signal from the engine speed sensor has occurred or a overspeed/underspeed condition has occurred.

Refer to the engine Troubleshooting manual to for more information on engine over/under speed conditions for your particular genset.

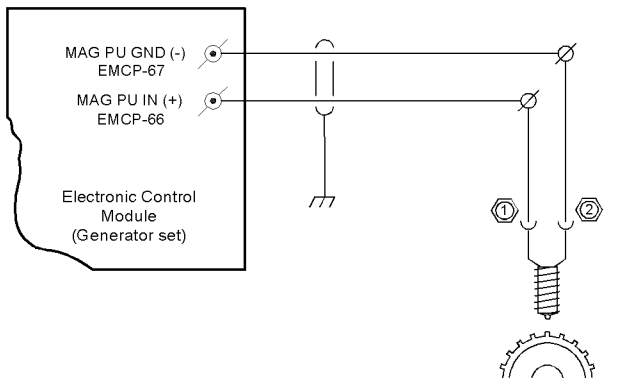


Illustration 13 g01103901

Note: The Engine Speed Sensor is commonly referred to as magnetic pickup.

Test Step 1. PERFORM THE INITIAL CHECK.

A. Check for active diagnostic codes on the engine ECM and the EMCP 3. If any codes are present, correct the diagnostic codes first.

Expected Result:

No other diagnostic codes or indicators are active.

Results:

- OK – No other diagnostic codes or indicators are active. Proceed to Test Step 2
- NOT OK – Another diagnostic code is active or an indicator is active.

  Repair: Exit this procedure. Troubleshoot the active code or indicator. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 2. CHECK THE SETPOINTS.

A. View the Engine Speed Monitor Setpoints. Make a note of all the setpoints. See Testing and Adjusting, “Electronic Control Module (Generator Set) - Configure”. Compare the setpoints against the default setpoints of the particular generator set.

Expected Result:

The setpoints are correct.

Results:

- OK – The setpoints are correct for your particular genset. Proceed to Test Step 3
- NOT OK – The setpoints are NOT correct.

  Repair: Reprogram the setpoints. Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

Test Step 3. CHECK THE HARNESS AND THE SPEED SENSOR.

A. Press the Stop Key on the EMCP 3 control.

B. Disconnect the harness connector from the EMCP 3.

C. At the EMCP 3 harness connector, measure the resistance from contact “66” to contact “67”.

Expected Result:

The resistance should be from 100 to 350 ohms.

Results:

- OK – There is probably an intermittent problem. Proceed to Test Step 4.
- NOT OK – The harness wiring or the speed sensor has failed. Proceed to Test Step 4.

Test Step 4. CHECK FOR AN INTERMITTENT FAULT.

A. Press the Stop Key on the EMCP 3 control.

B. Check the EMCP 3 display for a speed sensor diagnostic code.

Expected Result:

A speed sensor diagnostic code should not appear on the upper display.

Results:

- OK – A speed sensor diagnostic code does not appear on the EMCP 3 display. This step has corrected the problem. STOP.
- NOT OK – A speed sensor diagnostic code appears on the EMCP 3 display. Proceed to Test Step 5.

Test Step 5. CHECK THE RESISTANCE OF THE ENGINE SPEED SENSOR.

A. Disconnect the sensor from the engine harness. The sensor remains fastened to the engine.

B. At the connector of the sensor, measure the resistance between contact “1” and contact “2”.

Expected Result:

The resistance should be between 100 to 350 ohms.

Results:

- OK – The resistance of the sensor is correct. Proceed to Test Step 6.
- NOT OK – Replace the sensor.

  Repair: Refer to Testing And Adjusting, “Speed Sensor (Engine) - Adjust”.

  STOP.

Test Step 6. CHECK THE HARNESS FOR AN OPEN OR A SHORT.

A. Press the Stop Key on the EMCP 3 control.

B. Disconnect the sensor from the engine harness. The sensor remains fastened to the engine.

C. Disconnect the harness connector from the EMCP 3.

D. Check for an open circuit. Check the resistance from contact “1” of the sensor harness connector to contact “66” of the EMCP 3 harness connector. The resistance should be 5 ohms or less.

E. Check for an open circuit. Check the resistance from contact “2” of the sensor harness connector to contact “67” of the EMCP 3 harness connector. The resistance should be 5 ohms or less.

F. Check for a short circuit. Check the resistance from contact “66” to contact “67” of the EMCP 3 harness connector. The resistance should be greater than 5000 ohms.

Expected Result:

When the resistance is measured between contact “1” of the sensor harness connector and contact “66” of the EMCP 3 harness connector, there should be 5 ohms or less.

The resistance from contact “2” of the sensor harness connector to contact “67” of the EMCP 3 harness connector should be 5 ohms or less.

The resistance from contact “66” to contact “67” of the EMCP 3 harness connector should be greater than 5000 ohms.

Results:

- OK – The harness functions properly. Proceed to Test Step 7.
- NOT OK – The ciruit with the incorrect resistance measurement has failed. Replace the failed harness from the sensor to the EMCP 3 connector or repair the failed harness from the sensor to the EMCP 3 connector. STOP.

Test Step 7. CHECK THE SHIELD AND THE CONNECTORS.

A. Press the Stop Key on the EMCP 3 control.

B. Disconnect the sensor from the engine harness. The sensor remains fastened to the engine.

C. Disconnect the harness connector from the EMCP 3.

D. The harness has a shield (bare wire) which protects the sensor signal wire from electrical interference. This shield must be securely fastened and the shield must make a good electrical connection to ground.

E. Check that the shield is securely fastened to ground.

F. Check the connection between the sensor and the mating harness connector. Refer to Testing and Adjusting, “Electrical Connector - Inspect”.

Expected Result:

The shield should be securely fastened. The connection between the sensor and the mating harness connector should be secure.

Results:

- OK – The shield is securely fastened. The connection between the sensor and the mating harness connector is secure. Proceed to Test Step 8.
- NOT OK – One of the items is not correct. Repair the harness or replace the harness. STOP.

Test Step 8. INSPECT THE SENSOR AND ADJUST THE SENSOR.

A. Remove the sensor from the engine flywheel housing.

B. Inspect the sensor for damage and remove any debris from the tip.

Expected Result:

No damage should be present.

Results:

- OK – No damage is present. Reinstall the engine speed sensor. Adjust the sensor.

  Repair: For more information, refer to Testing And Adjusting, “Speed Sensor (Engine) - Adjust”.

  Proceed to Test Step 9.

- NOT OK – Damage is present. Replace the engine speed sensor.

  Repair: Refer to Testing And Adjusting, “Speed Sensor (Engine) - Adjust”.

  STOP.

Test Step 9. CHECK THE STATUS OF THE FAULT.

A. Reconnect the harness connector to the EMCP 3 and the sensor.

B. Press the Stop Key on the EMCP 3 control.

C. Check the EMCP 3 display for a sensor diagnostic code.

Expected Result:

A speed sensor diagnostic code should still be active.

Results:

- OK – A speed sensor diagnostic code is showing on the EMCP 3 display. The diagnostic code is still active and the engine will not start.

  Repair: It is unlikely that the EMCP 3 has failed. Exit this procedure and perform this procedure again. If the diagnostic code is still present, replace the EMCP 3. Refer to Testing and Adjusting, “Electronic Control (Generator Set) - Replace”.

  STOP.

- NOT OK – A speed sensor diagnostic code is not showing on the upper display. These procedures have corrected the problem. The operator may continue with this procedure. Proceed to Test Step 10.

Test Step 10. CHECK THE SIGNAL VOLTAGE.

A. This is an additional check of the circuit. Make sure that all of the harness connectors are connected.

B. Use a multimeter and 7x-1710 Multimeter Probes in order to measure the AC signal voltage. Measure the AC signal voltage between contact “66” and contact “67” of the EMCP 3 connector.

C. Start and run the engine at rated speed.

D. Measure the AC signal voltage of the engine speed sensor.

Expected Result:

The voltage should be equal to 2 ACV or greater.

Results:

- OK – The voltage is equal to 2 ACV or greater. The speed sensor circuit is correct. STOP.
- NOT OK – The voltage is not equal to 2 ACV or greater. The most likely cause is improper air gap of the pickup.

  Repair: For more information, refer to Testing And Adjusting, “Speed Sensor (Engine) - Adjust”.

  STOP.

i02182892

Unexpected Engine Shutdown

SMCS Code: 4490

System Operation Description:

While the engine is running, if engine speed suddenly becomes zero and the Auto Start/Stop function block has not initiated a shutdown, an “UNEXPECTED ENGINE SHUTDOWN” event will be activated.

The EMCP 3 determines the engine speed, in rpm, from the Magnetic Pickup (Engine Speed Sensor) input pins, detects diagnostics on the sensor, and annunciates an engine over/under speed condition. The engine speed sensor used for these determinations is an independent sensor to be used by the EMCP 3 only.

Conditions Which Generate This Code:

While the engine is running, if engine speed suddenly becomes zero and the Auto Start/Stop function block has not initiated a shutdown, an “UNEXPECTED ENGINE SHUTDOWN” event will be activated.

Test Step 1. TALK TO THE OPERATOR

A. Determine the conditions that caused the unexpected shutdown.

Expected Result:

A unexpected shutdown was caused by a occurrence known to the operator and the operator would like to put the genset back into service.

Results:

- OK – The operator can determine the cause for the “UNEXPECTED ENGINE SHUTDOWN”, the condition has been repaired and the operator wants to put the genenset back into service.

  Repair: Reset the genset. Resume normal operation and verify that the problem has been corrected.

  STOP.

- NOT OK – The “UNEXPECTED ENGINE SHUTDOWN” was not caused by a occurrence known to the operator. Proceed to Test Step 2

Test Step 2. CHECK FOR OTHER DIAGNOSTIC CODES.

A. Check for active diagnostic codes on the engine ECM and the EMCP 3. If any codes are present, correct the diagnostic codes first.

Expected Result:

No other diagnostic codes or indicators are active.

Results:

- OK – No other diagnostic codes or indicators are active.

  Repair: Refer to the engine Troubleshooting manual to for more information on engine unexpected engine shutdowns for your particular genset.

  STOP.

- NOT OK – Another diagnostic code is active or an indicator is active.

  Repair: Exit this procedure. Troubleshoot the active code or indicator. Resume normal operation and verify that the problem has been corrected.

  STOP.

Testing and Adjusting Section

Testing and Adjusting

i01988161

Electrical Connector - Inspect

SMCS Code: 7553-040

Intermittent electrical problems are often caused by poor connections. Use the following checks as a reference for inspecting connectors.

1. **Check the connection of the connectors.**
   - Ensure that the locking rings are properly locked.
   - Ensure that locking clips are used on Sure Seal connectors.
   - Ensure that the center of the connector is tight.
   - Ensure that the connector pins and sockets align properly.
2. **Check the wires at the connector.**
   - Ensure that the wires enter the back of the connector straight.
   - Ensure that each wire is properly crimped into the proper connector contact.
   - Ensure that each connector contact is properly locked into the connector contact. When the connector contact is locked properly, the contact (wire) cannot be pulled out of the connector body without excessive force.
3. **Check each wire for nicks or signs of abrasion in the insulation.**
4. **Check for moisture at the connector.**
   - Check for damaged connector seals or lost connector seals.
   - Check for missing or loose wire hole plugs.
   - Check for wires that do not enter the connector properly.
   - If the wires enter the connector at an angle, there may not be a good seal between the connector and the wire insulation.
   - Moisture can enter the connector through the wire insulation.
5. **Check for dirty contacts or corroded contacts.**
   - Clean contacts with a cotton swab or a soft brush and denatured alcohol only.
6. **Check each pin and each socket.**
   - Check each contact of the connector for a snug fit by using a new pin and socket. The new contact should stay connected if the connector is held with the contacts that are facing down.

i02148670

Wiring Harness (Open Circuit) - Test

SMCS Code: 1408-081

An open is a failure of an electrical circuit that results in no flow of electrical current. An open circuit is usually caused by failed electrical wires or a poor connection of electrical connectors. If an electrical wire or a connection is broken, the flow of electrical current through the circuit is interrupted. A normally closed circuit will have less than 5 ohms of resistance. The following procedure explains the test for an open circuit:

Reference: For a complete electrical schematic, refer to Electrical System Schematic for the genset that is being serviced.

TEST FOR AN OPEN CIRCUIT.

1. Identify the connectors and the wire numbers of the suspect circuits. Use the Electrical System Schematic of the genset to identify the circuits.
2. Turn the disconnect switch to the OFF position.
3. Disconnect the components and the ECM from the wiring harness.
4. At one of the disconnected harness connections, place a jumper wire from the contact of the suspect wire to frame ground.
5. At the other connector of the genset harness, use the multimeter probes to measure the resistance from the contact of the suspect wire to frame ground.

   Expected Result: The resistance is less than 5 ohms.

   OK – The resistance is less than 5 ohms. The harness circuit is correct.

Stop.

NOT OK – The resistance is greater than 5000 ohms. There is an open in the genset harness.

Repair: Repair the genset harness or replace the genset harness.

Stop.

i02148682

Wiring Harness (Short Circuit) - Test

SMCS Code: 1408-081

A short circuit is a failure of an electrical circuit that results in undesired electrical current. Usually, a short circuit is a bypass of the circuit across a load. For example, a short across the wires in a circuit for a lamp produces too much current in the wires but no current is felt at the lamp. The lamp is shorted out. The resistance in a normal circuit can vary, but the resistance between a particular circuit and other unrelated circuits is always greater than 5000 ohms. The following procedure explains the test for a short circuit:

Reference: For a complete electrical schematic, refer to Electrical System Schematic for the genset that is being serviced.

TEST FOR A SHORT CIRCUIT.

1. Identify the connectors and the wire numbers of the suspect circuits. Use the Electrical System Schematic of the genset to identify the circuits.

2. Turn the key start switch and the disconnect switch to the OFF position.

3. Disconnect the component and the ECM from the wiring harness.

4. At the genset harness connector for the ECM, place one of the multimeter probes on the contact of the suspect wire.

5. Use the other multimeter probe to check the resistance across all other contacts in the connector(s) of the ECM and frame ground.

   Expected Result: The resistance is greater than 5000 ohms for all the measurements.

   OK – The resistance is greater than 5000 ohms for all the measurements. The harness circuits are correct.

   Stop.

   NOT OK – The resistance is less than 5000 ohms. There is a short in the genset harness. The short is between the suspected wire and the wire with the lowest resistance measurement.

   Repair: Repair the genset harness or replace the genset harness.

   Stop.

i01988211

External Potential Transformer Connections

SMCS Code: 1409-077

In order to monitor generator output voltages greater than 600 Volts, potential transformers will have to be used.

Note: The EMCP 3 must be programmed when connecting external PT's. See the Systems Operation, "Setpoint Viewing" and Testing and Adjusting, "Electronic Control Module (Generator Set) - Configure".

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.

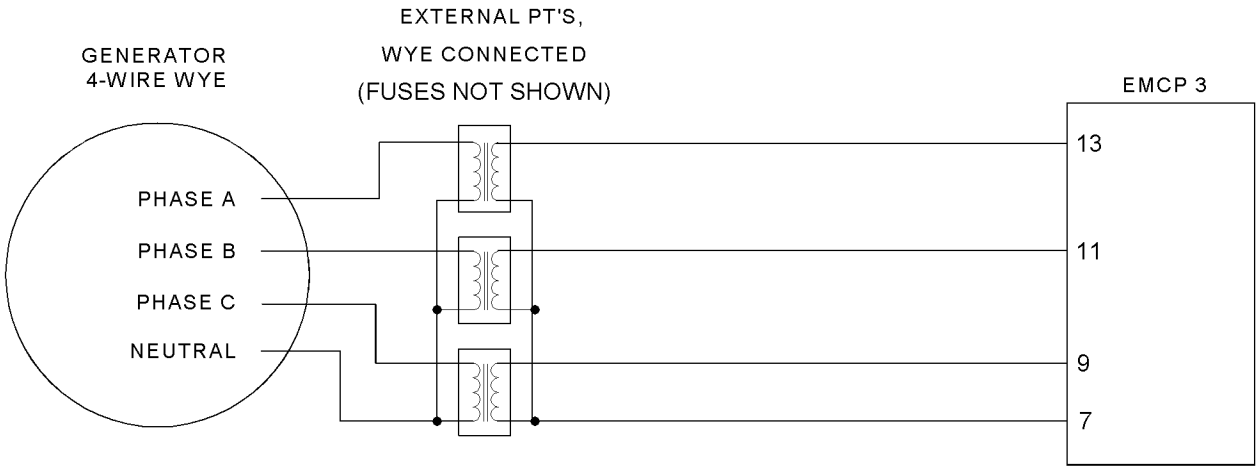


Illustration 14 g01047743

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

This configuration allows the accurate measurement of all power parameters by the EMCP 3 including when the loads are unbalanced and neutral current is present. All power parameters are shown on the display of the EMCP 3.

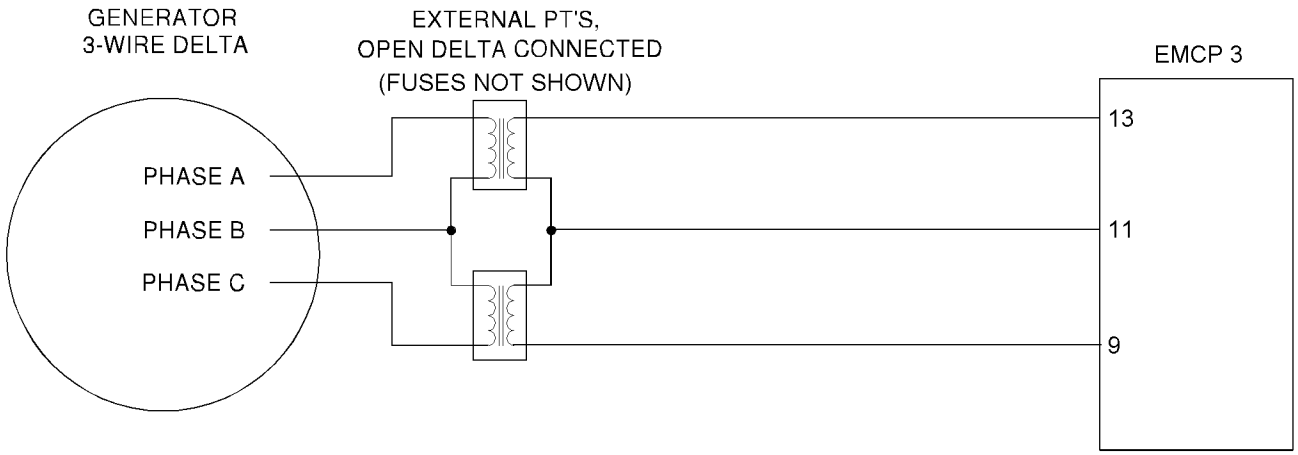


Illustration 15 g01047744

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 EMCP 3 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 EMCP 3 display.

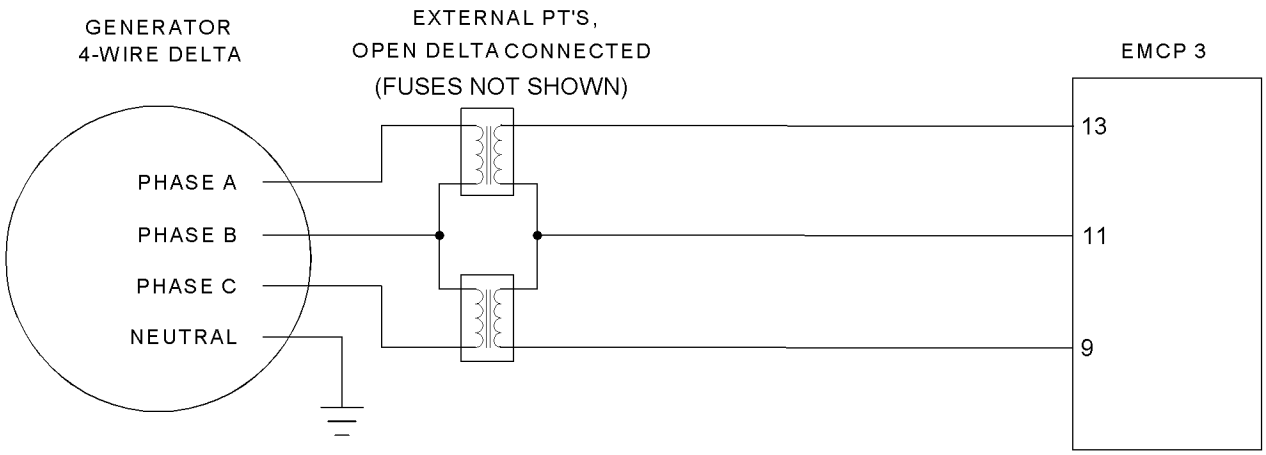


Illustration 16 g01047747

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 “EMCP 3” 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 “EMCP 3” display.

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 “EMCP 3” display: real power phase A, B, C and power factor phase A, B, C.

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 “EMCP 3” display.

i01988213

Speed Sensor (Engine) - Adjust

SMCS Code: 1907-025

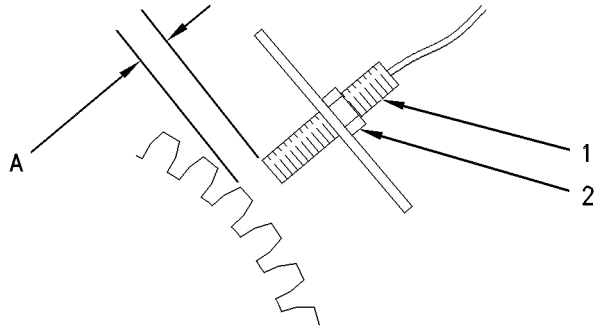


Illustration 17 g00289497

Speed Sensor

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

Note: The engine speed sensor is commonly referred 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 ± 5 N·m (18 ± 4 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.

i02148734

Electronic Control Module (Generator Set) - Flash Program

SMCS Code: 4490-591

Perform the following procedure in order to flash program the Electronic Control Module (ECM) for the Generator Set. The ECM is flashed in order to upgrade the software. Flash programming of the ECM must also be done if the ECM has been replaced. The Caterpillar Electronic Technician (ET) contains the program WinFlash. WinFlash is used in order to load software into the ECM. The following procedure is used in order to FLASH software into the ECM.

Procedure

1. Connect the Data Link Cable between the Communication Adapter and the Electronic Technician.

2. Connect the Data Link Cable between the Communication Adapter and the Service Connector of the genset.

3. Turn the disconnect switch to the ON position.

4. Use WinFlash in order to load the software.

i02010071

Electronic Control Module (Generator Set) - Configure

SMCS Code: 4490-025

Initial Setup

Information from the EMCP 3 is displayed on the Display Screen (1). Press the Scroll Up Key (11) or the Scroll 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 Scroll Up Key (11) or the Scroll Down Key (15) in order to increase or decrease the value. Press the Scroll Left Key (16) or the Scroll Right Key (13) in order to change the digit that is to be adjusted.

Note: The EMCP 3 panel will power up to the main menu screen. If the EMCP 3 panel is already powered up, press the Escape Key (12) in order to return to the main menu.

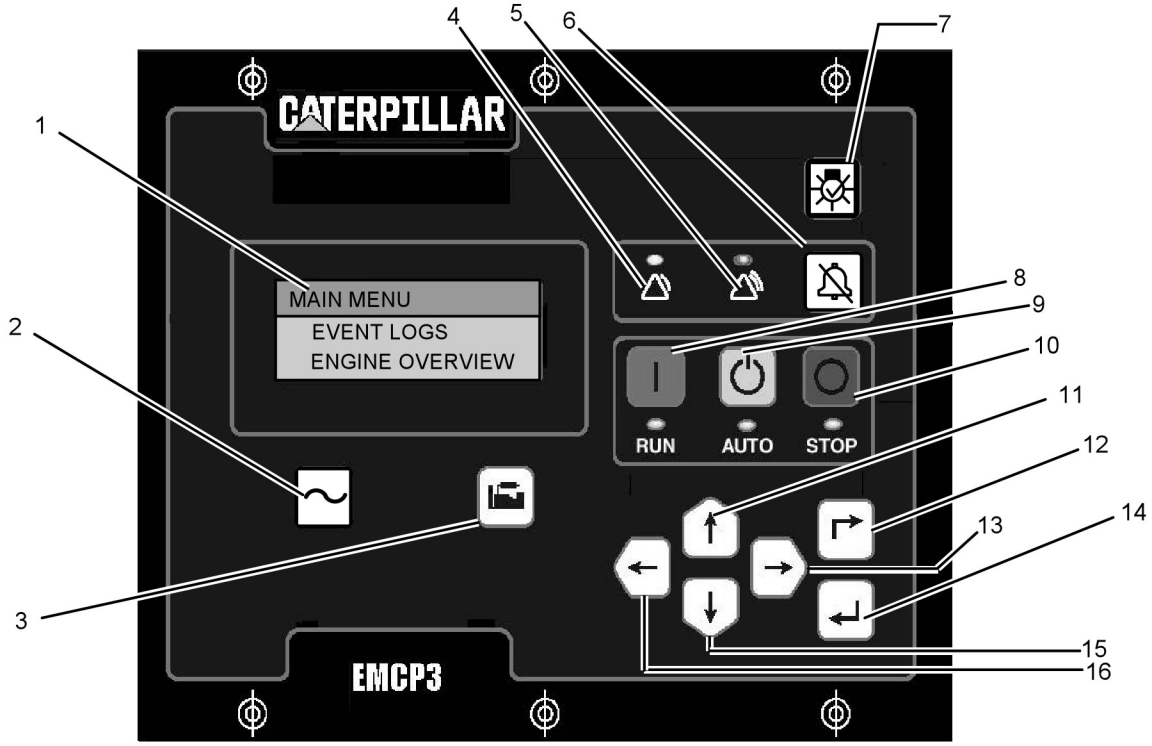


Illustration 18 g01045431

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

Setpoints

Within each setpoint category there are one or more function blocks. Each of those function blocks may contain one or more setpoints. Each of these setpoint categories and its corresponding function blocks are shown below.

Control

- Automatic Start/Stop
- Automatic Voltage Regulator (AVR) Desired Voltage Request
- Generator Breaker Control
- Generator Desired Engine Speed Request
- Transfer Switch
- Utility Breaker Control

Engine Monitor/Protect

- Battery Voltage Monitor
- Crank Attempt/Successful start Counter
- Engine Coolant Temperature Monitor
- Engine Oil Pressure Monitor
- Engine Speed Monitor
- Enhanced Engine Monitor
- Service Maintenance Interval

Events

- Diagnostics Configuration
- Engine protection Events Configuration
- Generator Protection Events Configuration
- Other System Events Configuration

- Event Input Function
- Event Output Function
- Event System

Generator Monitor/Protect

- Enhanced Generator Monitor
- Generator AC Monitor
- Generator AC Power Monitor
- Generator Over Current
- Generator Over/Under Frequency
- Generator Over/Under Voltage
- Generator Reverse Power

Discrete Input Output (I/O)

- Digital Inputs
- Digital Outputs
- Relay Outputs
- Spare Analog Input

Network

- Data Link - SCADA

Other

- Digital Selectors
- Reduced Power Mode

Programming the Display Preferences

The preferences affect the way data is viewed on the display screen. The configuration may need to be changed to meet local requirements.

1. In order program the display preferences, go through the following menu options.

2. Press the “ESCAPE” key (12) in order to go back to the main menu.

3. From the main menu, press the Scroll Up Key (11) or the Scroll 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. Use the right/left arrows to adjust the Contrast. Press the Enter Key to save.

c. Press the Scroll Down Key (15) in order to highlight “BACKLIGHT”.

d. Press the Enter Key (14) in order to select “BACKLIGHT”. Adjust the backlight as needed. Use the Scroll Left Key (16) or the Scroll Right Key (13) in order to adjust the backlight. Press the Enter Key (14)to save.

e. Press the Scroll Down Key (15) in order to highlight “PRESSURE”.

f. Press the Enter Key (14) in order to select “PRESSURE”. Use the Scroll Left Key (16) or the Scroll 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 Scroll Down Key (15) in order to highlight “TEMPERATURE”.

i. Press the Enter Key key (14) in order to select “TEMPERATURE”. Use the Scroll Left Key (16) or the Scroll 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 Scroll Down Key (15) in order to highlight “VOLUME”.

l. Press the Enter Key (14) in order to select “VOLUME”. Use the Scroll Left Key (16) or the Scroll 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 Scroll Down Key (15) in order to highlight “LANGUAGE”.

o. Press the Enter Key (14) in order to select “LANGUAGE”. Use the Scroll Left Key (16) or the Scroll Right Key (13) in order to highlight “ENGLISH”, or the other language that is available.

p. Press the Enter Key (14) in order to save the selection.

q. Press the Escape Key in order to go back to the main menu

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 EMCP 3 setpoints are programmed at the factory.

The setpoints may require changing when the EMCP 3 is moved from one engine to another engine. The setpoints may also require changing in order to satisfy the site requirements. The setpoints that are stored in the EMCP 3 must match the specified setpoints of the particular generator set.

See the Setpoint Tables following these procedures for a complete list of all the setpoint blocks. All of the setpoints listed in the tables should be verified and reprogrammed if required.

The first setpoint block to program is the Automatic Start/Stop Block. The Automatic Start/Stop Block is part of the Control Category.

1. In order program the Automatic Start/Stop Setpoints, go through the following menu options.

2. Press the Escape Key (12) in order to go to the main menu.

3. From the main menu, Press the Scroll Down Key (11) until “CONFIGURE” is highlighted.

4. Press the Enter Key (14) in order to select “CONFIGURE”.

5. Press the Scroll Down Key (15) until “SETPOINTS” is highlighted. Press the Enter Key (14) in order to select “SETPOINTS”.

6. Press the Scroll Down Key (15) in order to scroll through the setpoint options until “CONTROL” is highlighted.

7. Press the Enter Key (14) in order to select “CONTROL”. “AUTOMATIC START / STOP” is highlighted.

8. Press the Enter Key (14) in order to select “AUTOMATIC START / STOP”

9. Use the Scroll Up Key (11) and the Scroll Down Key (15) in order to select the next setpoint that you want to program. Press the Enter Key.

10. Press the Enter Key (14) again. The current configuration will be highlighted.

11. Use the Scroll Up Key (11) and the Scroll Down Key (15) in order to change the current configuration to the desired setting.

12. Press the Enter Key (14) in order to save the setting.

13. Repeat steps 9 through step 12 in order to program all of the Automatic Start/Stop setpoints.

14. After all of the Automatic Start/Stop Setpoints are programmed correctly, press the Escape Key (12) in order to go back to the “CONTROL” menu.

15. The next block of setpoints to program is the Automatic Voltage Regulator (AVR) Request block. Press the “DOWN” Key (15) in order to scroll through the setpoint options until “AVR DESIRED VOLTAGE” is highlighted.

16. Press the Enter Key (14) in order to select “AVR DESIRED VOLTAGE”

17. Repeat step 9 through step 12 in order to program all of the Automatic Voltage Regulator (AVR) Request Setpoints.

18. Continue to program all of the function blocks in the “CONTROL” menu.

19. Press the Escape Key (12) twice in order to go back to the “SETPOINTS MENU” menu.

20. Press the Scroll Down Key (15) in order to scroll through the setpoint options until “ENGINE MONITOR/PROTECT” is highlighted.

21. Press the Enter Key in order to select the “ENGINE MONITOR/PROTECT” menu.

22. Continue to program all of the function blocks in the “ENGINE MONITOR/PROTECT” menu.

23. Continue to program the rest of the setpoints until each setpoint in every setpoint category have been checked and programmed as required.

SETPOINT TABLES

All of the available setpoints on the EMCP3 are listed in the following tables. Refer to these tables while programming the setpoints.

CONTROL

Automatic Start/Stop

The Automatic Start/Stop block 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 24

Setpoints - Automatic Start/Stop[1]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Engine start fault protection activation delay time	0	300	sec.	30	Fault protection time delay prevents shut down during start up fro low oil pressure etc.
Crank Duration	5	300	sec.	7	Amount of time the EMCP 3 energizes (cranks) the starting motor
Crank Cycle Rest Interval	5	300	sec.	7	Amount of time the EMCP 3 deenergizes the starting motor between crank cycles
Engine Purge Cycle Time	0	20	sec.	0	
Maximum Number of Crank Cycles	1	20	n/a	3	Number of crank/rest cycles that the EMCP 3 uses to declare that a overcrank fault exists
Cooldown Duration	0	30	min.	0	Amount of time the EMCP 3 allows the engine to run after a normal shutdown is initiated
Start Aid Activation Time	0	240	sec.	0	Amount of time the EMCP 3 activates start aid control output
Crank Alert Activation Time	0	60	sec.	0	Amount of time the EMCP activates crank alert output
Crank Terminate RPM	100	1000	rpm	400	Engine speed setting used in order to disengage the starting motor during engine cranking.
Engine Fuel Type Configuration	n/a	n/a	n/a	Diesel	Setpoint allows for selection of “Diesel” or “Natural Gas”.
Fuel Shutoff Solenoid Type Configuration	n/a	n/a	n/a	Energize to Run	Type of fuel system solenoid used on the generator set Select energized to run (ETR) or energized to shut off (ETS)
Engine Type Configuration	n/a	n/a	n/a	Mechanical	Select mechanical or electronic
Engine Controller J1939 Data Link Support Configuration	n/a	n/a	n/a	No Data Link	Setpoint allows for selection of “No Data Link”, “Basic Data Link”, or “Enhanced Data” Link.
Engine Cool Down Speed Configuration	0	1	n/a	Rated	Setpoint allows for selection of engine speed during cooldown. Select rated or idle.

(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 the CDVR. The AVR Desired Voltage Request block is used in synchronization load control and reactive import/export control.

Table 25

Setpoints - AVR Desired Voltage Request[2]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Maximum Generator Voltage Output Bias Percentage	0	100	%	5	The Maximum Generator Output voltage Bias Percent is the maximum value above and below the Nominal Voltage that the EMCP 3 will send a request for when adjusting the voltage from the control screen.
Generator Nominal Output Voltage	100	50000	V	100	The Generator Nominal Output Voltage is the desired output voltage of the generator set.

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

Maximum Generator Output Voltage Bias Percent

The following settings will only apply if there is a CDVR installed on the generator.

Note: It is possible to set the “MAXIMUM GEN OUTPUT VOLTAGE BIAS PERCENT” from 0 to 100% but the CDVR will only allow the voltage to change by a maximum of 15%.

1. From the “MAIN MENU”, press the Scroll Up Key or the Scroll Down Key to highlight the “CONFIGURE” menu.
   - **a.** Press the Enter Key in order to select “CONFIGURE”. “SECURITY” will be highlighted.
   - **b.** Press the Scroll Down Key in order to highlight “SETPOINTS”. Press the Enter Key in order to select “SETPOINTS”.
   - **c.** “AUTOMATIC START/STOP” will be highlighted. Press the Scroll Down Key in order to highlight “AVR DESIRED VOLTAGE”
   - **d.** Press the Enter key in order to select “AVR DESIRED VOLTAGE”. “MAXIMUM GEN OUTPUT VOLTAGE BIAS PERCENT” will be displayed.
   - **e.** Press the Enter Key to select “MAXIMUM GEN OUTPUT VOLTAGE BIAS PERCENT”. “MAXIMUM GEN OUTPUT VOLTAGE BIAS PERCENT” is displayed with the current voltage bias percent.
   - **f.** Press the Scroll Up Key or the Scroll Down Key in order to increment or decrement the highlighted digit to the desired value.
   - **g.** Press the Scroll Right Key or the Scroll Left Key in order to highlight the next character to be entered. Press the Scroll Up Key or the Scroll Down Key in order to increment or decrement the highlighted digit to the desired value.
   - **h.** Continue until the desired “MAXIMUM GEN OUTPUT VOLTAGE BIAS PERCENT” is entered. When the “MAXIMUM GEN OUTPUT VOLTAGE BIAS PERCENT” is correctly entered, press the Enter key.

Note: The voltage bias percent setpoint will determine the amount of voltage change for each key press on the voltage control screen. A higher value will result in a larger change in voltage per key press. A lower value will result in a smaller change in voltage per key press.

Generator Breaker Control

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

Table 26

Setpoints - Generator Breaker Control[22]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Generator Breaker Closing Pulse Active Time	0.1	10	sec.	1.0	
Generator Breaker Closing Pulse Rest Interval	0	60	sec.	1.0	
Generator Breaker Maximum Closing Time	1	120	sec.	60	
Generator Breaker Maximum Opening Time	1	20	sec.	3	
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 Desired Engine Speed Request

The Generator Desired Engine Speed Request block generates a data link request over the J1939 data link in order to request a desired generator frequency from a generator.

Table 27

Setpoints - Generator Desired Engine Speed Request[27]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Maximum Engine Speed Range	0	2000	rpm	100	The Maximum Engine Speed Range is the maximum value above and below the Nominal Engine Speed that the EMCP 3 will send a request for when adjusting the speed from the control screen.
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.

Transfer Switch

The purpose of the Transfer Switch block 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 28

Setpoints - Transfer Switch[33]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Generator/Utility Automatic Transfer Enable Status	N/A	N/A	N/A	1	
Loss of Utility Event Notification Delay Time	0	30	sec.	10	
Utility to Generator Transfer Delay Time	1	60	sec.	3	
Generator to Utility Transfer Delay Time	1	60	min.	180	
Generator to Utility Fast Transfer Delay Time	1	60	sec.	10	
Utility to Generator Transfer Failure Warning Event Threshold	1	240	sec.	60	
Utility to Generator Transfer Failure Shutdown Event Threshold	1	240	sec.	90	
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 block is to open and close the utility breaker and to generate alarms on failure of the utility breaker to open or close.

Table 29

Setpoints - Utility Breaker Control[34]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Utility Breaker Closing Pulse Active Time	0.1	10.0	sec.	1.0	
Utility Breaker Closing Pulse Rest Interval	0	60	sec.	15	
Utility Breaker Maximum Closing Time	1	20	sec.	60	
Utility Breaker Maximum Opening Time	1	20	sec.	3	
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.

ENGINE MONITOR / PROTECT

Battery Voltage Monitor

The Battery Voltage Monitor block is used to measure the battery supply voltage to the EMCP 3. The EMCP3 will have the ability to monitor the battery supply voltage based on the “+BATT” and “−BATT”.

Table 30

Setpoints - Battery Voltage Monitor[3]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
High Battery Voltage Warning Event Threshold	12	50	VDC	29.4	
High Battery Voltage Warning Event Notification Delay Time	0	240	sec.	30	
High Battery Voltage Shutdown Event Threshold	12	50	VDC	30.0	
High Battery Voltage Shutdown Event Notification Delay Time	0	240	sec.	30	
Low Battery Voltage Warning Event Threshold	0.0	25.0	VDC	23.4	
Low Battery Voltage Warning Event Notification Delay Time	0	240	sec.	30	
Low Battery Charging System Voltage Warning Event Threshold	0	30	VDC	26	
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.

Crank Attempt/Successful Start Counter

The Crank Attempt/Successful Start Counter block is used to track the number of times the engine has been cranked and the number of times the engine the engine has been successfully started

Table 31

Setpoints - Crank Attempt / Successful Start Counter[31]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Customer Security Password Level to Reset Crank/Start Counters	0	4	n/a	2	Password level required in order to reset the Crank/Start Counters

(31) 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 block is used to convert a raw sensor value into coolant temperature and to detect sensor diagnostics.

Table 32

Setpoints - Engine Coolant Temperature Monitor[10]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Engine Coolant Temp Sensor Configuration	N/A	N/A	N/A	0	Select Sensor or Data Link
High Engine Coolant Temp Warning Event Threshold	85 °C (185 °F)	120 °C (248 °F)	deg.	100 °C (215 °F)	
High Engine Coolant Temp Warning Event Notification Delay Time	0	30	sec.	15	
High Engine Coolant Temp Shutdown Event Threshold	85 °C (185 °F)	120 °C (248 °F)	deg.	120 °C (225 °F)	
High Engine Coolant Temp Shutdown Event Notification Delay Time	0	30	sec.	15	
Low Engine Coolant Temp Warning Event Threshold	0 °C (32°F)	36 °C (99 °F)		21 °C (70 °F)	
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 Oil Pressure Monitor block is used to convert a raw sensor value into oil pressure and to detect sensor diagnostics.

Table 33

Setpoints - Engine Oil Pressure Monitor[11]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Engine Oil Pressure Sensor Configuration	N/A	N/A	N/A	0	Select Sensor or Data Link
Low Engine Oil Pressure Warning Event Threshold	34 kPa (5 psi)	420 kPa (61 psi)	kPa	160 kPa (40 psi)	
Low Idle Low Engine Oil Pressure Warning Event Threshold	34 kPa (5 psi)	420 kPa (61 psi)	kPa	160 kPa (20 psi)	
Low Engine Oil Pressure Warning Event Notification Delay Time	0	30	sec.	10	
Low Engine Oil Pressure Shutdown Event Threshold	34 kPa (5 psi)	420 kPa (61 psi)	kPa	34 kPa (30 psi)	
Low Idle Low Engine Oil Pressure Shutdown Event Threshold	34 kPa (5 psi)	420 kPa (61 psi)	kPa	160 kPa (10 psi)	
Low Engine Oil Pressure Shutdown Event Notification Delay Time	0	30	sec.	10	
Low Engine Oil Pressure Step Speed	400	1800	rpm	1350	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 block 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 EMCP 3 only.

Note: All Engine Speed Monitor setpoints all require a “LEVEL 3” password. Engine Speed Monitor setpoints may also be changed with Electronic Technician (ET) software without a password.

Table 34

Setpoints - Engine Speed Monitor[12]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Flywheel Teeth	95	350	N/A	350	
Engine Over Speed Shutdown Threshold	400	4330	rpm	400	
Engine Under Speed Warning Event Threshold	400	4330	rpm	4330	
Engine Under Speed Warning Event Notification Delay Time	0.0	20.0	sec.	2.0	
Engine Under Speed Shutdown Event Threshold	400	4330	rpm	4330	
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.

Enhanced Engine Monitor

The Enhanced Engine Monitor block provides a method to access the engine mounted parameters from the Primary Data Link for use in configuration logic

Table 35

Setpoints - Enhanced Engine Monitor (31)					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Engine Cylinder Temp Sensor Installation Status	0	1	n/a	0	Choose Installed or Not installed
Number of Engine Cylinders	1	223	n/a	1	

(31) 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

The purpose of the Service Maintenance Interval block is to annunciate a need for engine service based on engine hours or duration since last service, whichever occurs first.

Table 36

Setpoints - Service Maintenance Interval[31]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Service Maintenance Interval Hours	0	2000	hours	500 hours	
Service Maintenance Interval Days	0	365	days	180 days	

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

EVENTS

Diagnostics Configuration

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

The Diagnostics Configuration block is subdivided into 4 subcategories as follows: Pressures, Temperatures, Levels, and Others. Each of the Diagnostics Configuration subcategories is shown in it’s own table.

Note: Table 37 lists the available options for each setpoint in the “PRESSURES” category. The options that are available for each setpoint are designated by an “X” in the option column.

Table 37

“PRESSURE” Setpoints - Diagnostics Configuration[15]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Air Filter Differential Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
Engine Oil Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
Fire Extinguisher Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
Fuel Filter Differential Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
Engine Oil Filter Differential Pressure Sensor Diagnostic Response Config	X	X	X	X		X	X		
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.

Note: Table 38 lists the available options for each setpoint in the “TEMPERATURE” category. The options that are available for each setpoint are designated by an “X” in the option column.

Table 38

"TEMPERATURE" Setpoints - Diagnostics Configuration[15]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Ambient Air Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
Engine Coolant Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
Engine Oil Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
Exhaust Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
Right Exhaust Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
Left Exhaust Temp Sensor Diagnostic Response Config	X	X	X	X		X	X		
Generator Bearing #1 Temp 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.

Note: Table 39 lists the available options for each setpoint in the "LEVEL" category. The options that are available for each setpoint are designated by an "X" in the option column.

Table 39

"LEVEL" Setpoints - Diagnostics Configuration[15]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Engine Coolant Level Sensor Diagnostic Response Config	X	X	X	X		X	X		
Engine Oil Level Sensor Diagnostic Response Config	X	X	X	X		X	X		
Fuel Level Sensor Diagnostic Response Config	X	X	X	X		X	X		
External Tank Fuel Level 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.

Note: Table 40 lists the available options for each setpoint in the "OTHER" setpoints category. The options that are available for each setpoint are designated by an "X" in the option column.

Table 40

"OTHER" Setpoints - Diagnostics Configuration[15]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Accessory Data Link Diagnostic Response Config	X	X	X	X		X	X		
Digital Output #1 Diagnostic Response Config	X	X	X	X		X	X		
Digital Output #2 Diagnostic Response Config	X	X	X	X		X	X		
Engine Speed Sensor Diagnostic Response Config		X		X[16]		X	X		
Generator Output Sensing System Diagnostic Response Config	X	X	X	X		X	X		
Primary Data Link Diagnostic Response Config	X	X	X	X		X	X		
SCADA Data Link 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.

The Engine Protection events Configuration block is subdivided into 4 categories as follows: Pressures, Temperatures, Levels, and Others. Each of the Diagnostics Configuration subcategories is shown in it's own table.

Note: Table 41 lists the available options for each "PRESSURE" setpoint. The options that are available for each setpoint are designated by an "X" in the option column.

Table 41

"PRESSURE" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
High Air Filter Differential Pressure Warning Event Response Config	X	X				X	X		
High Air Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X		
Low Air Filter Differential Pressure Warning Event Response Config	X	X				X	X	X	
Low Air Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X	X	
Low Engine Oil Pressure Warning Event Response Config	X	X				X	X	X	
Low Engine Oil Pressure Shutdown Event Response Config		X	X	X		X	X	X	
High Fuel Filter Differential Pressure Warning Event Response Config	x	x				x	X		
High Fuel Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X		
Low Fuel Filter Differential Pressure Warning Event Response Config	X	X				X	X	X	

(continued)

(Table 41, contd)

"PRESSURE" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Low Fuel Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X	X	
High Engine Oil Filter Differential Pressure Warning Event Response Config	X	X				X	X		
High Engine Oil Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X		
Low Engine Oil Filter Differential Pressure Warning Event Response Config	X	X				X	X	X	
Low Engine Oil Filter Differential Pressure Shutdown Event Response Config		X	X	X		X	X	X	
High Starting Air Pressure Warning Event Response Config	X	X				X	X		
High Starting Air Pressure Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 41, contd)

"PRESSURE" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Low Starting Air Pressure Warning Event Response Config	X	X				X	X	X	
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.

Table 42 lists the available options for each "TEMPERATURE" setpoint. The options that are available for each setpoint are designated by an "X" in the option column.

Table 42

"TEMPERATURE" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
High Engine Coolant Temp Warning Event Response Config	X	X				X	X	X	
High Engine Coolant Temp Shutdown Event Response Config		X	X	X		X	X	X	
Low Engine Coolant Temp Warning Event Response Config	X	X				X	X	X	
High Engine Oil Temp Warning Event Response Config	X	X				X	X		
High Engine Oil Temp Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 42, contd)

"TEMPERATURE" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Low Engine Oil Temp Warning Event Response Config	X	X				X	X	X	
Low Engine Oil Temp Shutdown Event Response Config		X	X	X		X	X	X	
High Exhaust Temp Warning Event Response Config	X	X				X	X		
High Exhaust Temp Shutdown Event Response Config	X		X	X		X	X		
Low Exhaust Temp Warning Event Response Config	X	X				X	X	X	
Low Exhaust Temp Shutdown Event Response Config		X	X	X		X	X	X	
High Right Exhaust Temp Warning Event Response Config	X	X				X	X		
High Right Exhaust Temp Shutdown Event Response Config		X	X	X		X	X		
Low Right Exhaust Temp Warning Event Response Config	X	X				X	X	X	

(continued)

(Table 42, contd)

"TEMPERATURE" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Low Right Exhaust Temp Shutdown Event Response Config		X	X	X		X	X	X	
High Left Exhaust Temp Warning Event Response Config	X	X				X	X		
High Left Exhaust Temp Shutdown Event Response Config		X	X	X		X	X		
Low Left Exhaust Temp Warning Event Response Config	X	X				X	X	X	
Low Left Exhaust Temp 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.

Table 43 lists the available options for each "LEVEL" setpoint. The options that are available for each setpoint are designated by an "X" in the option column.

Table 43

"LEVEL" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
High Engine Coolant Level Warning Event Response Config	X	X				X	X		
High Engine Coolant Level Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 43, contd)

"LEVEL" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Low Engine Coolant Level Warning Event Response Config	X	X				X	X		
Low Engine Coolant Level Shutdown Event Response Config		X	X	X		X	X		
High Engine Oil Level Warning Event Response Config	X	X				X	X		
High Engine Oil Level Shutdown Event Response Config		X	X	X		X	X		
Low Engine Oil Level Warning Event Response Config	X	X				X	X		
Low Engine Oil Level Shutdown Event Response Config		X	X	X		X	X		
High Fuel Level Warning Event Response Config	X	X				X	X		
High Fuel Level Shutdown Event Response Config		X	X	X		X	X		
Low Fuel Level Warning Event Response Config	X	X				X	X		

(continued)

(Table 43, contd)

"LEVEL" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Low Fuel Level Shutdown Event Response Config		X	X	X		X	X		
External Tank High Fuel Level Warning Event Response Config	X	X				X	X		
External Tank High Fuel Level Shutdown Event Response Config		X	X	X		X	X		
External Tank Low Fuel Level Warning Event Response Config	X	X				X	X		
External Tank Low Fuel Level Shutdown Event Response Config		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.

Table 44 lists the available options for each of the "OTHER" setpoints. The options that are available for each setpoint are designated by an "X" in the option column.

Table 44

"OTHER" Setpoints - Engine Protection Events Configuration[17]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Air Damper Closed Event Response Config	x	X							X
Emergency Stop Shutdown Event Response Config		X		X[16]		X	X		
Engine Failure to Start Shutdown Event Response Config		X		X[16]		X	X		
Unexpected Engine Shutdown Event Response Config		X		X[16]		X	X		
Engine Over Speed Shutdown Event Response Config		X		X[16]		X	X		
Engine Under Speed Warning Event Response Config	X	X				X	X	X	
Engine Under Speed Shutdown Event Response Config		X	X	X		X	X	X	
Fuel Tank Leak Event Response Config	X	X				X	X		
Service Maintenance Interval Warning Event Response Config	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 45 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 45

Setpoints - Generator Protection Events Configuration[18]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
High Generator Bearing #1 Temp Warning Event Response Config	X	X				X	X		
High Generator Bearing #1 Temp Shutdown Event Response Config		X	X	X		X	X		
Low Generator Bearing #1 Temp Warning Event Response Config	X	X				X	X	X	
Low Generator Bearing #1 Temp Shutdown Event Response Config		X	X	X		X	X	X	
Generator Over Current (Amp) Warning Event Response Config	X	X				X	X		
Generator Over Current (Amp) Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 45, contd)

Setpoints - Generator Protection Events Configuration[18]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Generator Over Frequency Warning Event Response Config	X	X				X	X		
Generator Over Frequency Shutdown Event Response Config		X	X	X		X	X		
Generator Under Frequency Warning Event Response Config	X	X				X	X	X	
Generator Under Frequency Shutdown Event Response Config		X	X	X		X	X	X	
Generator Reverse Power Warning Event Response Config	X	X				X	X		
Generator Reverse Power Shutdown Event Response Config		X	X	X		X	X		
Generator Over Voltage Warning Event Response Config	X	X				X	X		
Generator Over Voltage Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 45, contd)

Setpoints - Generator Protection Events Configuration[18]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Generator Under Voltage Warning Event Response Config	X	X				X	X	X	
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.

Other System Events Configuration

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 46 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 46

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
High Ambient Air Temp Warning Event Response Config	X	X				X	X	x	
High Ambient Air Temp Shutdown Event Response Config		X	X	X		X	X		
Low Ambient Air Temp Warning Event Response Config	X	X				X	X		
Low Ambient Air Temp Shutdown Event Response Config		X	X	X		X	X		

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Automatic Transfer Switch in Normal Position Event Response Config	X	X							X
Automatic Transfer Switch in Emergency Position Event Response Config	X	X							X
Battery Charger Failure Diagnostic Response Config	X	X							X
High Battery Voltage Warning Event Response Config	X	X				X	X		
High Battery Voltage Shutdown Event Response Config		X	X	X		X	X		
Low Battery Voltage Warning Event Response Config	X	X				X	X	X	
Low Battery Charging System Voltage Warning Event Response Config	X	X				X	X	X	
Generator Breaker Failure to Open Event Response Config	X	X		X		X	X		

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Generator Breaker Failure to Close Event Response Config	X	X		x		X	X		
Generator Breaker Open Event Response Config	X	X							X
Generator Breaker Closed Event Response Config	X	X							X
Utility Breaker Failure to Open Event Response Config	X	X		X		X	X		
Utility Breaker Failure to Close Event Response Config	X	X		X		X	X		
Utility Breaker Open Event Response Config	X	X							X
Utility Breaker Closed Event Response Config	X	X							X
Emergency Shutdown Override Mode Active Warning Event Response Config	X[16]	X							
Engine in Cooldown Event Response Config	X	X							X

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Engine Speed-Generator Output Frequency Mismatch Warning Event Response Config	X	X				X	X		
Event Input Function #1 High Warning Event Response Config	X	X				X	X	X	
Event Input Function #1 High Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #1 Low Warning Event Response Config	X	X				X	X	X	
Event Input Function #1 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #1 Event Response Config	X	X						X	X
Event Input Function #2 High Warning Event Response Config	X	X				X	X	x	
Event Input Function #2 High Shutdown Event Response Config		X	X	X		X	X	X	

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Event Input Function #2 Low Warning Event Response Config	X	X				X	X	X	
Event Input Function #2 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #2 Event Response Config	X	X						X	X
Event Input Function #3 High Warning Event Response Config	X	X				X	X	X	
Event Input Function #3 High Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #3 Low Warning Event Response Config	X	X				X	X	X	
Event Input Function #3 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #3 Event Response Config	X	X						X	X

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Event Input Function #4 High Warning Event Response Config	X	X				X	X	X	
Event Input Function #4 High Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #4 Low Warning Event Response Config	X	X				X	X	X	
Event Input Function #4 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #4 Event Response Config	X	X						X	X
Event Input Function #5 High Warning Event Response Config	X	X				X	X	X	
Event Input Function #5 High Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #5 Low Warning Event Response Config	X	X				X	X	X	

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Event Input Function #5 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #6 High Warning Event Response Config	X	X				X	X	X	
Event Input Function #6 High Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #6 Low Warning Event Response Config	X	X				X	X	X	
Event Input Function #6 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #6 Event Response Config	X	X						X	X
Event Input Function #7 High Warning Event Response Config	X	X				X	X	X	
Event Input Function #7 High Shutdown Event Response Config		X	X	X		X	X	X	

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Event Input Function #7 Low Warning Event Response Config	X	X				X	X	X	
Event Input Function #7 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #7 Event Response Config	X	X						X	X
Event Input Function #8 High Warning Event Response Config	X	X				X	X	X	
Event Input Function #8 High Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #8 Low Warning Event Response Config	X	X				X	X	X	
Event Input Function #8 Low Shutdown Event Response Config		X	X	X		X	X	X	
Event Input Function #8 Event Response Config	X	X						X	X

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
High Fire Extinguisher Pressure Warning Event Response Config	X	X				X	X		
High Fire Extinguisher Pressure Shutdown Event Response Config		X	X	X		X	X		
Low Fire Extinguisher Pressure Warning Event Response Config	X	X				X	X	X	
Low Fire Extinguisher Pressure Shutdown Event Response Config		X	X	X		X	X	X	
Generator Control Not in Automatic Warning Event Response Config	X	X							X
Loss of Utility Event Response Config	X	X							X
Utility to Generator Transfer Failure Warning Event Response Config	X	X				X	X		

(continued)

(Table 46, contd)

Setpoints - Other System Events Configuration[19]									
Setpoint Name	**Warning**	**Audible Alert**	**Soft Shutdown**	**Hard Shutdown**	**Loss of Utility**	**Breaker Trip #1**	**Breaker Trip #2**	**FPT**	**Active Only**
Utility to Generator Transfer Failure Shutdown Event Response Config		X	X			X	X		
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 Input Functions

The Event Input Function block allows the user of the genset to define selected inputs to cause user-defined events to become active.

Table 47

Setpoints - Event Input Functions[13]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Event Input Function #NN Active State Configuration	N/A	N/A	N/A	N/A	Settings for event input functions #1- #8
Event Input Function #NN Event Notification Delay Time	0	250	sec.	0	Settings for event input functions #1- #8
Event Input Function #NN Suspect Parameter Number	N/A	N/A	N/A	107	Settings for event input functions #1- #8
Event Input Function #NN Failure Mode Identifier	0	20	N/A	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

The Event Output function block provides a method to access the active status of an event for use in configuration logic

Table 48

Setpoints - Event Output Functions[14]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Event Output Function #NN Trigger Condition	N/A	N/A	N/A	0	Settings for event output functions #1- #30
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 System

Event System block provides a method to log system events to non-volatile memory. The Event System block also manages the status of the events in order to provide overall status outputs to the system.

Table 49

Setpoints - Event System[20]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Event Warning Condition Response Auto Reset Enable Status		N/A	N/A	1	
Event Audible Alert Response Auto Reset Enable Status	N/A	N/A	N/A	1	
Event Loss of Utility Response Auto Reset Enable Status	N/A	N/A	N/A	1	
Event Breaker #1 Trip Response Auto Reset Enable Status	N/A	N/A	N/A	1	
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.

GEN MONITOR / PROTECT

Enhanced Generator Monitor

The Enhanced Generator Monitor block provides a method to access the generator monitored parameters from the Accessory Data Link for use in configuration logic. The following generator values will be monitored:

- Front bearing temperature
- Rear bearing temperature
- Winding #1 temperature
- Winding #2 temperature
- Winding #3 temperature

Table 50

Setpoints - Enhanced Generator Monitor[31]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Generator Winding Temp Sensor Installation Status				Not Installed	
Number of Generator Bearing Temp Sensors	0	2			

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

Table 51

Setpoints - Generator AC Monitor[21]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
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”
Generator Potential Transformer Primary Winding Rating	1	50000	V	1	
Generator Potential Transformer Secondary Winding Rating	1	150	V	1	
Generator Current Transformer Primary Winding Rating	1	7000	A	75	
Generator Current Transformer Secondary Winding Rating	1	5	A	5	Can only be set to 1 or 5
Number of Generator Poles	0	200	N/A	4	
Generator Rated Frequency	N/A	N/A	Hz	60	Frequency can be set to 50Hz, 60Hz or 400Hz
Generator Rated Voltage	100	50000	V	100	
Generator Rated Power	1	50000	kW	1	
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 AC Power Monitor

The Generator AC Power Monitor Block measures all generator power quantities following generator values will be monitored:

- Per phase kW (for star/wye configurations)
- Total kW
- Total kW hours imported
- Total kW hours exported
- Percent kW output
- Per phase kVAr (for star/wye confutations)
- Total kVAr
- Total kVAr hours imported
- Total kVAr hours imported
- Percent kVAr output
- Per phase kVA (for star/wye confutations)
- Total kVA
- Percent kVA output
- Per phase genset output Power Factor with lead/lag indication (for star/wye confutations)
- Average output Power Factor with lead/lag indication

Note: Per phase quantities (kW, kVAr, KVA, and Power Factor) will be monitored for 3-phase, 4-wire star-connected configurations)

Table 52

Setpoints - Generator AC Power Monitor[31]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Customer Password Security Level to Reset Generator Energy Meters	0	4			

[31] 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

The generator overcurrent block detects an overcurrent condition that persists for a duration that is a function of the overcurrent level or a condition that exceeds a threshold for a programmed duration.

Table 53

Setpoints - Generator Over Current[23]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Generator Definite Time Over Current (Amp) Warning Event Percentage Threshold	80	130	%	100	Threshold for the Over Current Warning
Generator Inverse Time Over Current (Amp) Shutdown Event Time Multiplier	0.05	10.00	sec.	.27	Time multiplier setpoint
Generator Definite Time Over Current (Amp) Shutdown Event Percentage Threshold	100	300	%	125	If current is above this setpoint value for the specified time (setpoint #4) there will be an over current shutdown.
Generator Definite Time Over Current (Amp) Shutdown Event Notification Delay Time	0.1	20.0	sec.	10	Time delay 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 block detects bus frequency above or below programmable thresholds for a programmable duration and activates an alarm.

Table 54

Setpoints - Generator Over / Under Frequency[24]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Generator Over Frequency Warning Event Percentage Threshold	80	120	%	105	
Generator Over Frequency Warning Event Notification Delay Time	0	120	sec.	10	
Generator Over Frequency Shutdown Event Percentage Threshold	80.0	120	%	110	
Generator Over Frequency Shutdown Event Notification Delay Time	0	120	sec.	2	
Generator Under Frequency Warning Event Percentage Threshold	80.0	120.0	%	95.0	
Generator Under Frequency Warning Event Notification Delay Time	0	120	sec.	10	
Generator Under Frequency Shutdown Event Percentage Threshold	80.0	120.0	%	90.0	
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 block detects generator output voltage above or below programmable thresholds for a programmable duration and activates an alarm.

Table 55

Setpoints - Generator Over / Under Voltage[25]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Generator Over Voltage Warning Event Percentage Threshold	100	125	%	105	
Generator Over Voltage Warning Event Notification Delay Time	0	120	sec.	10	
Generator Over Voltage Shutdown Event Percentage Threshold	100	125	%	110	
Generator Over Voltage Shutdown Event Notification Delay Time	0	120	sec.	2	
Generator Under Voltage Warning Event Percentage Threshold	60	100	%	95.0	
Generator Under Voltage Warning Event Notification Delay Time	0	120	sec.	10	
Generator Under Voltage Shutdown Event Threshold	60	100	%	90.0	
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 block detects a reverse power condition that persists for a duration above a programmed level.

Table 56

Setpoints - Generator Reverse Power[26]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Generator Reverse Power Warning Event Percentage Threshold	1	20	%	5	
Generator Reverse Power Warning Event Notification Delay Time	0	30	sec.	10	
Generator Reverse Power Shutdown Event Percentage Threshold	1	20	%	10	
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.

DISCRETE INPUT/OUTPUT (I/O)

Digital Inputs

The Digital Input block is used to bring on/off information such as switch closures to the EMCP 3.

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

Table 57

Setpoints - Digital Inputs[5]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
E-STOP	Active Low	Active High	N/A	Active Low	Activating the E-STOP input will cause the generator set to stop immediately.
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.
Digital #3[6]	Active Low	Active High	N/A	Active Low	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 Rear Bearing Temperature Right Exhaust Temperature Left Exhaust Temperature **LEVELS** Engine Coolant Level Engine Oil Level Fuel Level External Tank 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 Detected Custom Event
Digital #4[6]	Active Low	Active High	N/A	Active Low	
Digital #5[6]	Active Low	Active High	N/A	Active Low	
Digital #6[6]	Active Low	Active High	N/A	Active Low	
Digital #7[6]	Active Low	Active High	N/A	Active Low	
Digital #8[6]	Active Low	Active High	N/A	Active Low	

(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

The Digital Output block is used in order to convey on/off information from the EMCP 3 for purposes such as operating relays, solenoids and indicator lamps.

There are 2 digital outputs on “EMCP 3.3”. There is 1 digital output on “EMCP 3.2”. There are no digital outputs on “EMCP 3.1”

Table 58

Setpoints - Digital Outputs[7]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Digital Output #1 Active State Configuration	N/A	N/A	N/A	0	
Digital Output #2 Active State Configuration	N/A	N/A	N/A	0	

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

Relay Outputs

The Relay Output block is used in order to convey on/off information from the EMCP 3 for purposes such as operating relays, solenoids and indicator lamps.

There are 8 relay outputs on “EMCP 3.2” and “EMCP 3.3”. Six of the “EMCP 3.2” and “EMCP 3.3”outputs have normally open contacts and 2 outputs have normally open and normally closed contacts.

There are 6 normally open relay outputs on “EMCP 3.1”. There are no normally closed outputs on the“EMCP 3.1”.

Table 59

Setpoints - Relay Outputs[29]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Relay Output #1 Active State Configuration	N/A	N/A	N/A	1	Relay Output #1 is always configured as the “Starter Motor Relay”
Relay Output #2 Active State Configuration	N/A	N/A	N/A	1	Relay #2 is always configured as the “Fuel Control Relay”
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”
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”
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”
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”
Relay Output #7 Active State Configuration	N/A	N/A	N/A	1	Relay Output #7 is controlled by Digital Selector #5 The output can be set to “Active High” or“ Active Low”
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.

Spare Analog Input

The Spare Analog Input block is used to convert a resistive sender value to engineering units, detect sender diagnostics, and detect a high or low condition on the spare sender input.

Note: If you have selected a spare input to be a temperature, setpoints 6, 7, 10, and 11 will not appear since they are associated with pressures and levels. If you have selected a spare input to be a pressure, setpoints 5, 7, 9, and 11 will not appear since they are associated with temperatures and levels. If you have selected a spare input to be a level, setpoints 5, 6, 9, and 10 will not appear since they are associated with temperatures and pressures.

Table 60

Setpoints - Spare Analog Input[29]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Spare Analog Input Enable Status	N/A	N/A	N/A	Enabled	
Spare Analog Input Type Configuration	N/A	N/A	N/A	Temperature	Can be set to Temperature, Pressure, or Level .
Spare Analog Input Suspect Parameter Number(SPN)	N/A	N/A	N/A	107	
Spare Analog Input High Level Warning Event Threshold	0	100	%	0	
Spare Analog Input High Temperature Warning Event Threshold	-273	1,735	Deg. C	-273	
Spare Analog Input High Pressure Warning Event Threshold	-250	10,000	kPa	-250	
Spare Analog Input High Warning Event Notification Delay Time	0	60	sec.	0	
Spare Analog Input High Level Shutdown Event Threshold	0	100	%	0	
Spare Analog Input High Temperature Shutdown Event Threshold	-273	1,735	Deg. C	-273	
Spare Analog Input High Pressure Shutdown Event Threshold	-250	10,000	kPa	-250	
Spare Analog Input High Shutdown Event Notification Delay Time	0	60	sec.	0	
Spare Analog Input Low Level Warning Event Threshold	0	100	%	0	

(continued)

(Table 60, contd)

Setpoints - Spare Analog Input[29]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Spare Analog Input Low Temperature Warning Event Threshold	-273	1735	Deg. C	-273	
Spare Analog Input Low Level Warning Event Threshold	-250	10000	kPa	-250	
Spare Analog Input Low Warning Event Notification Delay Time	0	60	sec.	0	
Spare Analog Input Low Level Shutdown Event Threshold	0	100	%	0	
Spare Analog Input Low Temperature Shutdown Event Threshold	-273	1735	Deg. C	-273	
Spare Analog Input Low Pressure Shutdown Event Threshold	-250	10000	kPa	-250	
Spare Analog Input Low Shutdown Event Notification Delay Time	0	60	sec.	0	

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

NETWORK

Data Link - SCADA

The SCADA Data Link block 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 61

Setpoints - Data Link - SCADA[4]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
SCADA Data Link Baud Rate	N/A	N/A	N/A	2	
SCADA Data Link Parity	N/A	N/A	N/A	0	
SCADA Data Link Slave Address	1	247	N/A	1	
SCADA Data Link Access Password	0	0xfffff	N/A	0	
SCADA Data Link Connection Time-out Interval	0.1	3600.0	sec.	30	
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.

OTHER

Digital Selectors

The Digital Selector block is used in order to determine what “EVENTS” or “STATUS” will cause each of the relays to activate.

Table 62

Setpoints - Digital Selectors[8]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Digital Selector #1 Source Configuration				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
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

(continued)

(Table 62, contd)

Setpoints - Digital Selectors[8]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
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
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
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
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

(continued)

(Table 62, contd)

Setpoints - Digital Selectors[8]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
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
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

[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

The Electronic Control Module block Reduced Power Mode block minimizes drain on the battery when the engine is stopped and the control is operating in a standby mode.

Table 63

Setpoints - Electronic Control Module Reduced Power Mode[9]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Electronic Control Module Reduced Power Mode Enable Status	N/A	N/A	N/A	Enabled	Allows control to go into reduced power mode
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.

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 64

Setpoints - Remote Callback[30]					
Setpoint Name	**Min Value**	**Max Value**	**Units**	**Factory Default**	**Description**
Remote Dial Enable Status	N/A	N/A	N/A	1	Setpoints for relay Outputs #1 - #8
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.

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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

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ECM Connections

SMCS Code: 4490; 7566

The following drawings are simplified electrical schematics of the Electronic Control Module (ECM) for the Generator Set. The schematics are correct but the schematics do not show all possible harness connectors.

Reference: For additional information about the electrical system, refer to the Service Manual Electrical System Schematic for the genset that is being serviced.

Electronic Control Module Wiring Diagram - EMCP 3.3

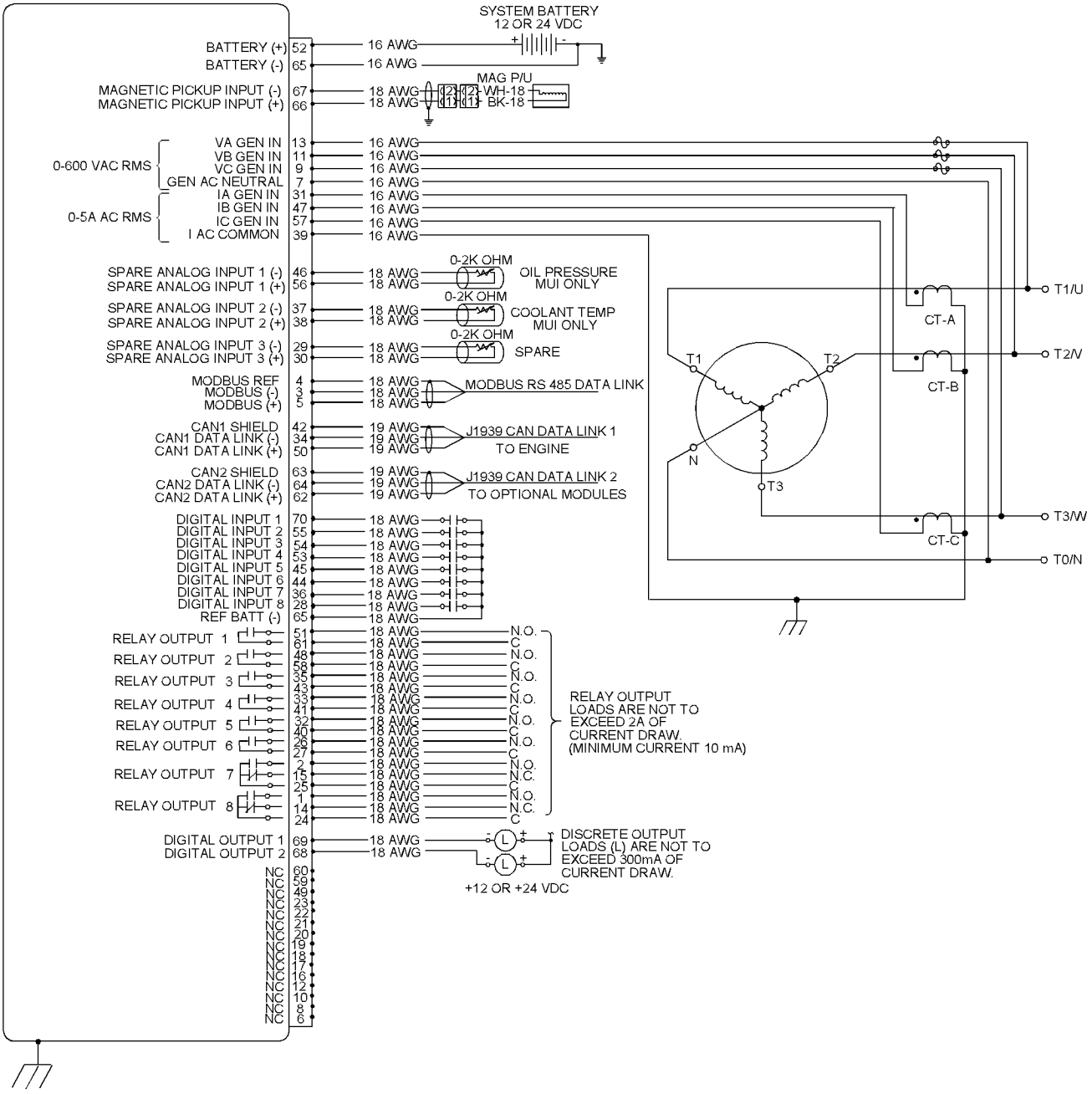

Illustration 19

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Electronic Control Module Wiring Diagram - EMCP 3.2

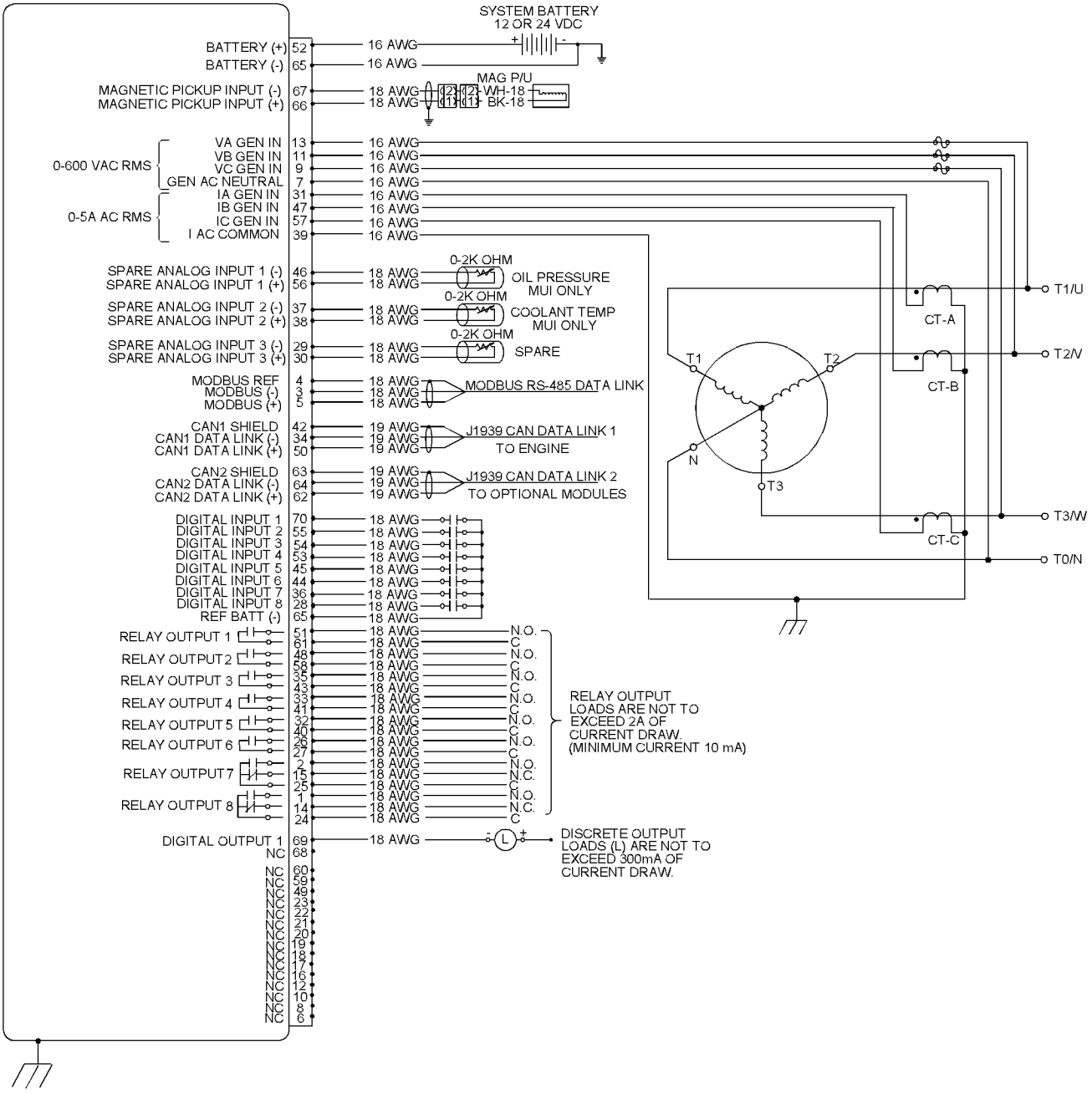

Illustration 20

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Electronic Control Module Wiring Diagram - EMCP 3.1

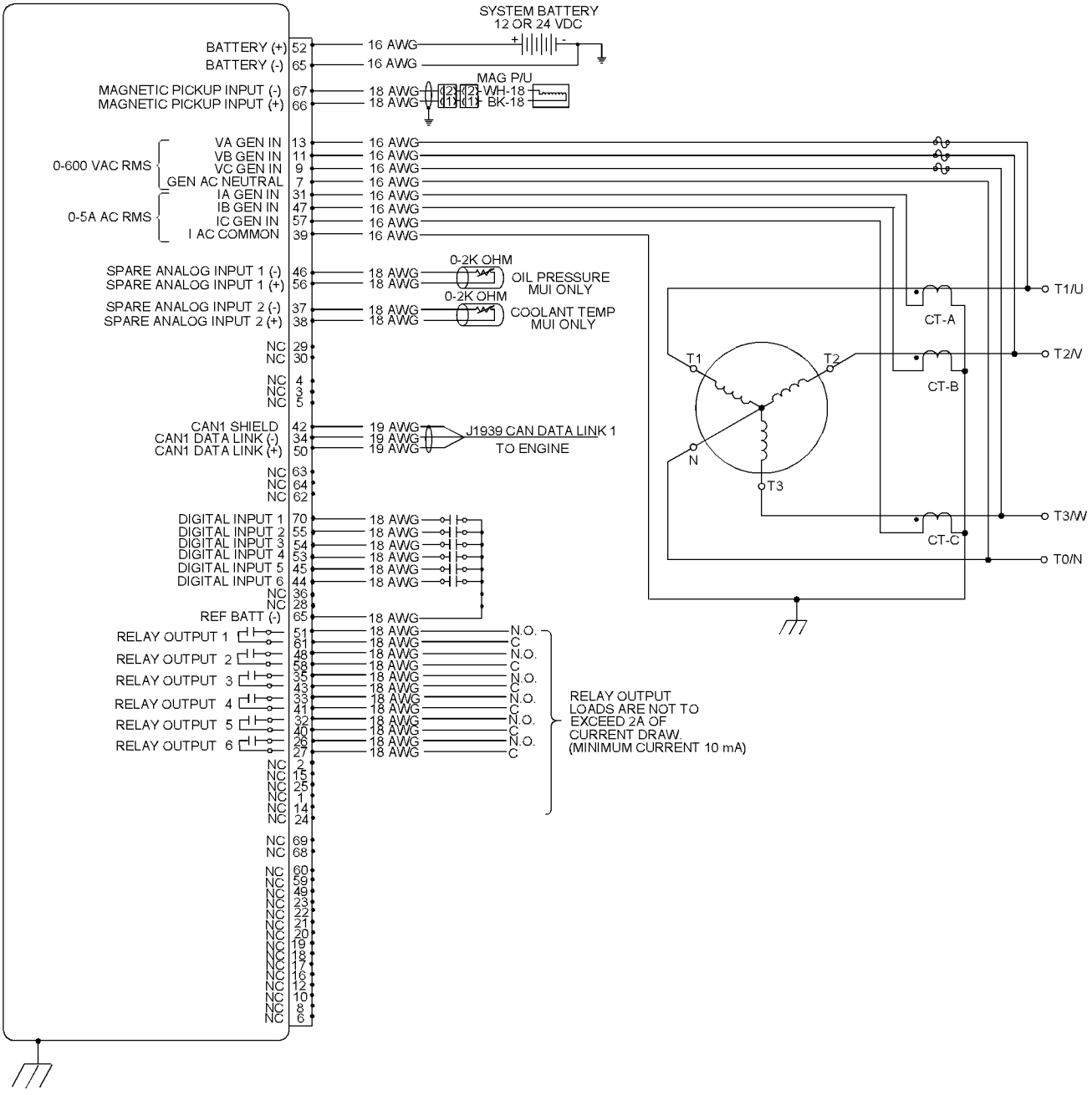

Illustration 21

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