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XCATM5X Driver Manual

Caterpillar CCM/M5X Protocol Driver

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XCATM5X technical specifications

General information

The XCATM5X driver allows you to connect to the Caterpillar's Customer Communication Modules (CCM) which uses the M5X protocol to transfer parameter's data via a standard RS-232C serial data link. The CCM provides the communication link between the host PC and the engine or the generator set.

COM port factory default settings for the CCM unit are 9600, N, 8, 1.

This driver does not support broadcast lists. Stable parameters should be requested less frequently in order to optimize data transfer. This will minimize communication loading. Some examples of stable parameters include the following items: hourmeters, atmospheric pressure, temperatures and diagnostics. Parameters that are more dynamic such as engine speed and oil pressure can be requested more frequently.

Do not attempt to read or write parameters until you are sure that the appropriate security level (Log In) has been established.

It might be necessary to set the CommT3Delay argument to 1000 ms to separate each command sent to the same CCM unit. According to the Caterpillar Operation and Maintenance Manual, Customer Communication Module (CCM) for Diesel Engines, a parameter cannot be read or sent until one second has elapsed and/or a reply from CCM has been received from previous request. Use the CommT3Delay argument in case you see that you are getting a response to the first request and the next request does not get a response from the CCM.

Also check setting extra carriage return charactes at the beginning of each message transmitted if you cannot get any reply from your units. We have found that in might be necessary to add up to two 0x0D characters in order to gain the device's attention.

Command list

Log In to the CCM

Description of this command:

The password protection for the CCM is initially enabled since password protection may be necessary for some applications. Changing the password protection can be done with the PC software of the CCM. If the password protection is enabled for the CCM, then before any parameters can be read from the CCM or from the electronic engine controller with this driver, the appropriate security level must be established. This process is called Log In. This command allows you to Log In using an existing password. The factory default password is blank for all security levels. This command returns the security level that corresponds to the password supplied.

Methods used to run this command:

Analog Input

Number of points accepted by this command:

1

Meaning of the DriverP0 parameter:

Unit Data Number For 3500B Marine Engine Units:

33 = Electronic engine controller (Port)

34 = Electronic engine controller (Starboard)

36 = Electronic engine controller (Single of Center) For 3500B Generator Set Units:

33 to 38 = Electronic engine controller

40 to 41 = Number 1-8 For EMCP II Generator Set Units:

88 to 95 = GSC Number (1-8) For Customer Communication Modules Units:

97 = CCM

Meaning of the DriverP1 parameter:

0

Meaning of the DriverP4 parameter:

Number of 'Carriage Return' characters that are added at the beginning of each message.

Meaning of the DriverP6 parameter:

Log In Password (leave empty for factory default) Example: 11112222 (Do not use quotes)

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Values that are returned:

Value in PointValue (0) = Security level for password supplied (0-3)

Read Multiple Numeric Parameters

Description of this command:

This command requests data from a set of parameters (PID) and then uses the CCM reply to build a numeric value for each parameter data received. Selected parameters should be of numeric type (1, 2 and 4 bytes only). Values will be always returned as unsigned values. Your application should have the intelligence to transform the returned unsigned valued into the final scaled data or individual bit data. If values returned are longer than 4 bytes, they will be assumed as text and thus should be retrieved using PointText instead of PointValue. This condition will be indicated for each PointValue by returning a value of -2.0 in it. This will mean that you will have to look for the PointText contents. The CCM communication protocol originally does not support multiple parameters requests. This driver implements a multiple parameter request by automatically making several single parameter requests until all the selected parameter values have been retrieved. The number of parameters to be requested by a multiple request is defined in the DriverNumPoints argument. The particular PIDs to be requested are defined as a comma-separated string in the DriverP6 argument. Each parameter identification (PID) must be a 4-chars hexa number. This command does not show any parameter value until all the selected parameter values have been read from the CCM. If one single parameter request fails, the command will return an error and it will not show any parameter value. The driver permits that you specify a delay between each single parameter request in order to avoid saturating the CCM unit. This parameter is only applied between consecutive readings of PIDs in the same request, and is not applied after the last PID in the group was read. If you want to indicate a delay after the last PID was read, use the CommT3Delay property. According to the CCM protocol specification, each parameter can be requested one time per second (this might not be true for your particular working conditions). This delay is assumed as 0 by default but it could be necessary that you set it to a minimum of 1000 ms. The suggestion is that you try with 0 ms and then increase this delay in 250 ms intervals until the CCM responds to all parameters correctly. You can also specify a number of retries to be used when a single request which is part of a multiple request fails. Use retries > 0 in DriverP3 to be tolerant to sporadic timeout errors that could invalidate the whole multiple request.

Methods used to run this command:

Analog Input

Number of points accepted by this command:

1-100

Meaning of the DriverP0 parameter:

Unit Data Number For 3500B Marine Engine Units:

33 = Electronic engine controller (Port)

34 = Electronic engine controller (Starboard)

36 = Electronic engine controller (Single of Center) For 3500B Generator Set Units:

33 to 38 = Electronic engine controller

40 to 41 = Number 1-8 For EMCP II Generator Set Units:

88 to 95 = GSC Number (1-8) For Customer Communication Modules Units:

97 = CCM

Meaning of the DriverP1 parameter:

1

Meaning of the DriverP2 parameter:

Delay in milliseconds between single requests (0-3000).

Meaning of the DriverP3 parameter:

Indicates the number of retries when a single request fails before abandoning the whole multiple request (0-25).

Meaning of the DriverP4 parameter:

Number of 'Carriage Return' characters that are added at the beginning of each message.

Meaning of the DriverP5 parameter:

Sets the behaviour on timeout when reading multiple PIDs:

0 = Continue with next PID and set PointValue to -1 for timeouted PID.

1 = Abort communication immediately and return -1 for all PIDs.

Meaning of the DriverP6 parameter:

List of parameter IDs (PID) to be requested as a series of 4-chars hexadecimal numbers separated by commas and with no spaces between numbers and commas. Example: F44B,F460,F462

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Important note:

Refer to the Caterpillar Operation and Maintenance Manual, Customer Communication Module (CCM) for Diesel Engines for the list of possible parameter identifiers and their valid ranges/scaling information.

- Parameter Identifiers for EMCP II = page 43
- Parameter Identifiers for 3400 Engines = page 59
- Parameter Identifiers for 3500B Engines = page 69

Values that are returned:

Value in PointValue (0) = Value of first parameter in list indicated in DriverP6
Value in PointValue (1) = Value of second parameter in list indicated in DriverP6
...
Value in PointValue (n-1) = Value of last parameter in list indicated in DriverP6

Important note:

When PointValue is -2.0, it means that the PID could not be converted to a number and that it is returned as a text in the associated PointText property.

Write Single Numeric Parameter

Description of this command:

This command is used to write data for an individual parameter. The particular PID to be written is defined in the DriverP6 property. The PID must be a 4-chars hexa number. The value to be sent must be previously loaded in the PointValue(0) value and should always be an unsigned value. The value in PointValue(0) will be transmitted as a 1, 2, 3 or 4 unsigned hexa number depending on how the DriverP3 parameter is set. Your application should provide the intelligence to build a proper value to be loaded in the PointValue(0) value in order to produce the desired results in the CCM module. If you need to write several values, the data should be sent at a rate of one time per second. Another Write Single Numeric Parameter cannot be sent until one second has elapsed and/or until a reply has been received for the previous writing request. It is recommended that you use the CommT3Delay argument to assure a minimum interval of 1000 ms between two consecutive write operations.

Methods used to run this command:

Analog Output

Number of points accepted by this command:

1

Meaning of the DriverP0 parameter:

Unit Data Number For 3500B Marine Engine Units:
33 = Electronic engine controller (Port)
34 = Electronic engine controller (Starboard)
36 = Electronic engine controller (Single of Center) For 3500B Generator Set Units:
33 to 38 = Electronic engine controller
40 to 41 = Number 1-8 For EMCP II Generator Set Units:
88 to 95 = GSC Number (1-8) For Customer Communication Modules Units:
97 = CCM

Meaning of the DriverP1 parameter:

0

Meaning of the DriverP2 parameter:

Indicates what is the format of the PID value to be transmitted:
1 = Transmit as 1-byte value between 0 and 255 (\$00-\$FF)
2 = Transmit as 2-bytes value between 0 and 65535 (\$0000-\$FFFF)
3 = Transmit as 3-bytes value between 0 and 16777215 (\$000000-\$FFFFFF)
4 = Transmit as 4-bytes value between 0 and 4294967295 (\$00000000-\$FFFFFFFF)

Meaning of the DriverP4 parameter:

Number of 'Carriage Return' characters that are added at the beginning of each message.

Meaning of the DriverP6 parameter:

Writable parameter ID (PID) as a 4-chars hexadecimal number. Example: FC0D

Important note:

Refer to the Caterpillar Operation and Maintenance Manual, Customer Communication Module (CCM) for Diesel Engines for the list of possible parameter identifiers and their valid ranges/scaling information.

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Values that are sent:

Value in PointValue (0) = New value for the indicated parameter, according to range limits indicated in the DriverP2 property.

Error messages

The following list shows the possible error messages that can be returned by the driver during a failed communication in the 'Status' property.

[1005] DRIVER (Internal): Invalid driver stage
[1300] PROTOCOL (Timeout): No answer
[1416] PROTOCOL (Format): Invalid unit code received
[1423] PROTOCOL (Format): No data in response
[1427] PROTOCOL (Format): Unexpected response
[1433] PROTOCOL (Format): Validation error in device response
[1441] PROTOCOL (Format): Returned PID is other than sent
[2002] CONFIG (DataType): Digital inputs are not supported by this driver
[2003] CONFIG (DataType): Digital outputs are not supported by this driver
[2143] CONFIG (NumValues): Only one PID can be written at a time
[2148] CONFIG (NumValues): Only one value can be requested
[2166] CONFIG (NumValues): Too many PIDs requested (max=100)
[3509] CONFIG (P1): Invalid command (0 only)
[3510] CONFIG (P1): Invalid command (0 or 1 only)
[4054] CONFIG (P2): Invalid delay between requests (0-3000)
[4143] CONFIG (P2): Invalid data format (1 to 4 only)
[4550] CONFIG (P3): Invalid number of retries (0-25)
[5042] CONFIG (P4): Invalid number of carriage returns (0-9)
[6023] CONFIG (P6): Invalid PID or PID not supplied
[6033] CONFIG (P6): Not enough PIDs are supplied for indicated number of values

Supported devices

This driver can communicate with these devices, but is not necessarily limited to this list:

CATERPILLAR CCM Units
CATERPILLAR 3500B Marine Engine Units
CATERPILLAR 3500B Generator Set Units
CATERPILLAR EMCP II Generator Set Units
CATERPILLAR 3400 Engine Units
CATERPILLAR 1LS1-Up Engine Units
CATERPILLAR 1NW1-Up Engine Units
CATERPILLAR 1PW1-Up Engine Units
CATERPILLAR 1TW1-Up Engine Units
CATERPILLAR 1ZF1-Up Engine Units
CATERPILLAR 2321-Up Engine Units
CATERPILLAR 2421-Up Engine Units
CATERPILLAR 2521-Up Engine Units
CATERPILLAR 2BM1-Up Engine Units
CATERPILLAR 2EZ1-Up Engine Units
CATERPILLAR 2FW1-Up Engine Units
CATERPILLAR 2GW1-Up Engine Units
CATERPILLAR 2HW1-UB Engine Units
CATERPILLAR 2JW1-Up Engine Units
CATERPILLAR 2RD1-Up Engine Units
CATERPILLAR 2TD1-Up Engine Units
CATERPILLAR 2WB1-Up Engine Units
CATERPILLAR 3CW1-Up Engine Units
CATERPILLAR 3DM1-Up Engine Units
CATERPILLAR 3DW1-Up Engine Units
CATERPILLAR 3LS1-Up Engine Units
CATERPILLAR 3MS1-Up Engine Units

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CATERPILLAR 3NS1-Up Engine Units
CATERPILLAR 3PS1-Up Engine Units
CATERPILLAR 3RS1-Up Engine Units
CATERPILLAR 3SS1-Up Engine Units
CATERPILLAR 3TS1-Up Engine Units
CATERPILLAR 3WS1-Up Engine Units
CATERPILLAR 3XS1-Up Engine Units
CATERPILLAR 3YF1-Up Engine Units
CATERPILLAR 3ZW1-Up Engine Units
CATERPILLAR 4AW1-Up Engine Units
CATERPILLAR 4BW1-Up Engine Units
CATERPILLAR 4GM1-Up Engine Units
CATERPILLAR 4RG1-Up Engine Units
CATERPILLAR 4TN1-Up Engine Units
CATERPILLAR 4XF1-Up Engine Units
CATERPILLAR 4ZR1-Up Engine Units
CATERPILLAR 5AW1-Up Engine Units
CATERPILLAR 5PS1-Up Engine Units
CATERPILLAR 5SJ1-Up Engine Units
CATERPILLAR 5XM1-Up Engine Units
CATERPILLAR 6721-Up Engine Units
CATERPILLAR 6HN1-Up Engine Units
CATERPILLAR 6HZ1-Up Engine Units
CATERPILLAR 6PM1-Up Engine Units
CATERPILLAR 6PN1-Up Engine Units
CATERPILLAR 6WN1-Up Engine Units
CATERPILLAR 7021-Up Engine Units
CATERPILLAR 7321-Up Engine Units
CATERPILLAR 7821-Up Engine Units
CATERPILLAR 7HM1-Up Engine Units
CATERPILLAR 7KM1-Up Engine Units
CATERPILLAR 7RN1-Up Engine Units
CATERPILLAR 7SM1-Up Engine Units
CATERPILLAR 8121-Up Engine Units
CATERPILLAR 8CN1-Up Engine Units
CATERPILLAR 8EM1-Up Engine Units
CATERPILLAR 8FS1-Up Engine Units
CATERPILLAR 8KN1-Up Engine Units
CATERPILLAR 8RM1-Up Engine Units
CATERPILLAR 9AN1-Up Engine Units
CATERPILLAR 9BZ1-Up Engine Units
CATERPILLAR 9NN1-Up Engine Units

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