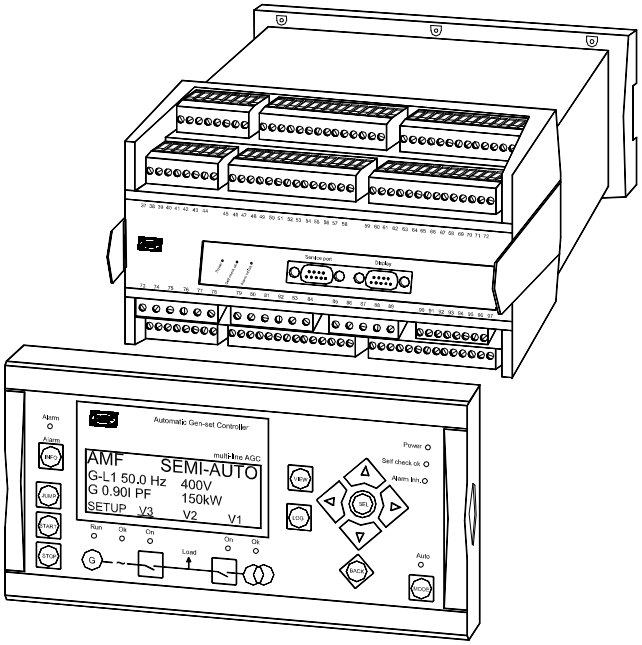
DEIF A/S

Description of option

Option H4,
CCM communication
Automatic Gen-set Controller

4189340374C
SW version 2.1X.X



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1. Warnings and legal information

Legal information and responsibility

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the generator set controlled by the unit, the company responsible for the installation or the operation of the set must be contacted.

The units are not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

Safety issues

Installing the unit implies work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

Definitions

Throughout this document a number of notes and warnings will be presented. To ensure that these are noticed, they will be highlighted in order to separate them from the general text.

Notes

The notes provide general information which will be helpful for the reader to bear in mind.

Warning

The warnings indicate a potentially dangerous situation which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

2. Description of option

H4 option

Option H4 is a hardware option, and therefore a separate PCB is installed in slot #8 in addition to the standard installed hardware.

Function	ANSI no.
Caterpillar® CCM communication	-

Terminal description

Connections to CCM

The PCB for the CCM module is placed in slot #8.

Term.	Function	Description
126	Not used	
127	Not used	
128	RxD	RS232 receive data from other unit
129	Not used	
130	TxD	RS232 transmit data to other unit
131	Not used	
132	GND	Ground
133	Not used	

Connections to modbus

The PCB for the modbus card is placed in slot #2, if the controller unit is equipped with option H2 (modbus).

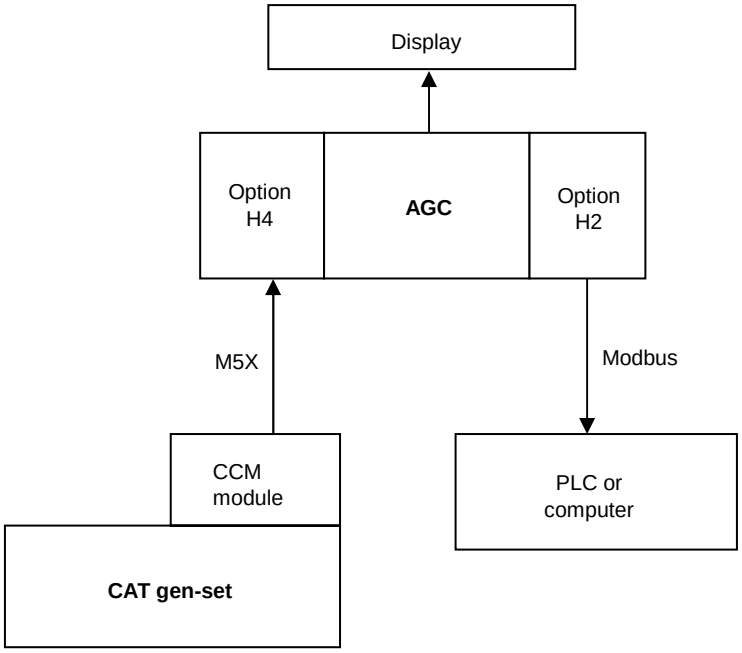
Term.	Function	Description
29	DATA + (A)	Modbus RTU/ASCII, RS485
30	GND	
31	DATA - (B)	
32	Not used	
33	DATA + (A)	
34	Not used	
35	DATA - (B)	
36	Not used	

Terminals 29 and 33 are internally connected.
Terminals 31 and 35 are internally connected.

Only modbus can be used to transmit the data to the PLC. Profibus cannot be used.

Wirings

Principle diagram



For actual wiring diagrams, please refer to the installation instructions.

3. Functional description

Through the CCM communication a number of engine data can be transmitted from the CAT gen-set to the controller unit. The sixteen first data entries from list #1 and list #2 can be displayed in the unit display/GDU, or the data from all lists can be collected from a PLC, if modbus communication is selected (option H2).

Protocol description

In order to make it possible to communicate with Caterpillar's Customer Communication Module (CCM) a part of the M5X protocol is implemented in option H4. Option H4 offers to collect up to 128 parameters via lists and up to 10 parameters via single parameter reads; the parameters collected from the CCM are placed in the modbus address areas.

The communication can handle 16 bit values, when reading one of the 16 possible lists. Reading of 32 bit values is only possible by means of single parameter readings.

When the lists of the H4 communication are switched on in the unit, they will be created in the CCM module. The lists will be created only, when they are enabled in the controller unit. When the lists are being created, they will be activated and the CCM module will start collecting the data and begin transmitting.

The controller unit will automatically restart the communication in case of error. Single parameter read request and response of the security level (IID $24 with PID $F0 $12) are used for verifying the connection.

If the lists contain any errors, such as wrong PID numbers or wrong MID numbers, they will be switched off automatically, and the CCM does not communicate any value of the specific list.

If no changes are made to the lists, then they will consist of the default PIDs. When the CCM module has received the lists, it will begin to send the requested data to the controller unit. The values are stored in the modbus addresses: Output value (37000 - 37627).

Principle

The owner's manual of the Customer Communication Module contains the description of the parameter identifiers, PIDs. Each PID is identified with a specific hex value. An example is the engine RPM, which is identified as 00 40h. Another example is the system battery voltage, which is identified as F0 13h.

If the system battery voltage is to be read, the hex value F0 13h has to be added to a list at a specific input PID address. This must be done using a PC modbus interfacing program.

When the value F0 13h has been added to an input PID address, the CCM will send back the specific value representing the RPM to the output PID address that matches the input PID address. E.g. the input PID address 35000 matches the output PID address 37000.

Example

The system battery voltage PID F013 is defined as PID #7 in list 1. The hex value F0 13h is entered to the input PID address 35006. The CCM sends back the value representing the system battery voltage to the modbus register 37006.

Resolution

When the CCM sends back a value representing the requested PID, it can be necessary to recalculate that value depending on the resolution of the returned value.

Example

The system battery voltage has a resolution of 0.5 volts per bit. This means that the returned value (37006) will be 48, meaning that the actual system battery voltage is 48 * 0.5 = 24 volt.

Single parameter readings for reading 32 bits data

The IID $24 and IID $25 (single parameter read request and response) are used. The controller unit is set up to poll the CCM and to deliver the read data in specific modbus addresses. The PLC (or the like) can then poll the controller unit. Up to ten 32 bits values are readable by means of option H2 modbus communication (not readable by the display). Up to 10 values can access values from different MID/UNIT (example: The 1st one for reading a value from the MID/UNIT number $61 and the 2nd one for reading a value from the MID/UNIT number $28). Even if this function is for reading 32 bits values, it can also be used for reading fewer bits values (e.g. 16 or 8 bits values).

Log-on

The controller unit requires that the password value is blank (default). The password value is used when logging into the CCM module.

Module identifier, MID

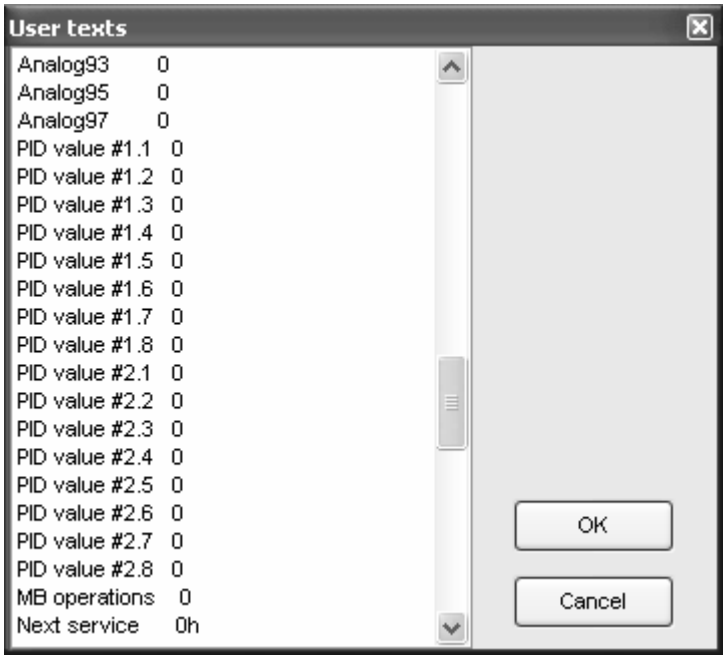
The table below includes some typical MID numbers used; please refer to the CAT owner's manual for further details.

Number (hex values)	Description
33-38 ($21-$26)	Electronic engine controller (nos. 1-6)
40-41($28-$29)	Electronic engine controller (nos. 7-8)
88-95($58-$5F)	EMCP II generator set unit number (nos. 1-8)
97($61)	CCM customer communication module number

The MID numbers must be entered as decimal values in the system setup from the display or the utility software.

Displayed values

The values in list 1 and list 2 can be displayed. Select PID values in the view configuration box, which is selected in the settings menu.



For further information about the configuration of the view menu system, please see the Designer's Reference Handbook.

4. Parameter list

It is possible to change the parameters used in the communication between the controller unit and the CCM. The parameters, which can be changed via the utility software and the display, have menu numbers 7200 to 7360. The other parameters have no menu numbers and are accessible by means of the USW in the category CCM.

The following parameters can be changed:

Parameter	Explanation	Comment
Baud rate	Set the Baud rate to 9600 or 19200. The default setting is 9600	Some CCMs can only use 9600 Baud
MID number	The ID of the gen-set that the list corresponds to. Default the ID is set to 36 (24 hex) for single gen-set	
ACT – activate	Turns the lists ON or OFF. Default all lists are turned OFF	Only the new CCM can use more that 8 lists. When using an old CCM, be sure that lists 9-16 are turned off
Update rate	The time setting indicates how often the CCM must return an update of the activated lists	

7200 CCM control

No.	Setting		Min. setting	Max. setting	Factory setting
7201	CCM control	CCM Baud rate	9600	19200	9600

PID read (16 bit readings)

7210 List 1 setup

No.	Setting		Min. setting	Max. setting	Factory setting
7211	List 1 setup	MID/UNIT number	0	255	36
7212	List 1 setup	Activate list	OFF	ON	OFF
7213	List 1 setup	Update rate	0.5 s	127.0 s	3.0 s

The setup of the lists is done in the same way as list 1, channel 4780. The following lists are available:

Channel number	List number
7210	List 1 setup
7220	List 2 setup
7230	List 3 setup
7240	List 4 setup
7250	List 5 setup
7260	List 6 setup
7270	List 7 setup
7280	List 8 setup
7290	List 9 setup
7300	List 10 setup

Channel number	List number
7310	List 11 setup
7320	List 12 setup
7330	List 13 setup
7340	List 14 setup
7350	List 15 setup
7360	List 16 setup

Single parameter read setup (32 bits readings)

No.	Setting		Min. setting	Max. setting	Factory setting
CCM	SPR 1 setup	MID/UNIT number	0	255	36 (24hex)
CCM	SPR 1 setup	Activate list	0 (OFF)	1 (ON)	0 (OFF)
CCM	SPR 1 setup	Update rate	1.0 s	127.0 s	10.0 s

The setup of the other single parameter reads is done in the same way as for number 1, utility software category 'CCM'. The following single parameter reads are available:

USW category	Single parameter read number
CCM	Single parameter read 1 setup
CCM	Single parameter read 2 setup
CCM	Single parameter read 3 setup
CCM	Single parameter read 4 setup
CCM	Single parameter read 5 setup
CCM	Single parameter read 6 setup
CCM	Single parameter read 7 setup
CCM	Single parameter read 8 setup
CCM	Single parameter read 9 setup
CCM	Single parameter read 10 setup

For single parameter read numbers 5 to 10, the MID/UNIT number factory setting is 88 (58hex).

Single parameter read is set up in the utility software. The display cannot be used for setting up the single parameter read

5. CCM lists

The PID setup varies from the different gen-sets. The lists below are just for guidance.

Default lists 1-8

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
1	1	00 03	Detonation	35000	37000
	2	00 15	Throttle position	35001	37001
	3	00 40	Generator set engine RPM	35002	37002
	4	00 44	Engine coolant temperature	35003	37003
	5	00 46	Desired engine speed	35004	37004
	6	00 54	Engine oil pressure	35005	37005
	7	F0 13	System battery voltage	35006	37006
	8	F0 E8	Engine coolant pump pressure status	35007	37007
2	9	F1 13	Engine operation	35008	37008
	10	F1 18	Engine load factor	35009	37009
	11	F1 89	Engine power derate percentage	35010	37010
	12	F1 D0	Jacket water outlet to engine oil differential temperature	35011	37011
	13	F4 0E	Engine oil filter differential pressure	35012	37012
	14	F4 4C	Generator set relay status	35013	37013
	15	F4 4E	Actual exhaust oxygen	35014	37014
	16	00 00	Empty	35015	37015
3	17	F4 4F	Desired oxygen	35016	37016
	18	F4 60	Engine alarm status	35017	37017
	19	F4 6D	Cooldown time remaining	35018	37018
	20	F4 8D	Engine coolant pressure (absolute)	35019	37019
	21	F4 EA	Unfiltered engine oil pressure (gauge)	35020	37020
	22	F5 0E	Engine fuel pressure (absolute)	35021	37021
	23	F5 11	Intake manifold air temperature	35022	37022
	24	F5 12	Actual air/fuel ratio	35023	37023
4	25	F5 1A	Fuel quality	35024	37024
	26	F5 1D	Fuel temperature	35025	37025
	27	F5 1E	Intake manifold air flow	35026	37026
	28	F5 24	Desired exhaust oxygen at full load	35027	37027
	29	F5 3E	Engine oil temperature	35028	37028
	30	F5 8E	Gas fuel flow	35029	37029
	31	F5 b1	Gas specific gravity	35030	37030
	32	F5 BA	Inlet manifold air pressure	35031	37031
5	33	F5 97	Engine average exhaust port temperature	35032	37032
	34	F5 5D	Right bank average exhaust port	35033	37033

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
			temperature		
	35	F5 5C	Left bank average exhaust port temperature	35034	37034
	36	F5 93	Right bank turbine inlet temperature	35035	37035
	37	F5 95	Right bank turbine outlet temperature	35036	37036
	38	F5 94	Left bank turbine inlet temperature	35037	37037
	39	F5 96	Left bank turbine outlet temperature	35038	37038
	40	00 00	Empty	35039	37039
6	41	F4 30	Cylinder #1 exhaust port temperature	35040	37040
	42	F4 31	Cylinder #2 exhaust port temperature	35041	37041
	43	F4 32	Cylinder #3 exhaust port temperature	35042	37042
	44	F4 33	Cylinder #4 exhaust port temperature	35043	37043
	45	F4 34	Cylinder #5 exhaust port temperature	35044	37044
	46	F4 35	Cylinder #6 exhaust port temperature	35045	37045
	47	F4 36	Cylinder #7 exhaust port temperature	35046	37046
	48	F4 37	Cylinder #8 exhaust port temperature	35047	37047
7	49	F4 38	Cylinder #9 exhaust port temperature	35048	37048
	50	F4 39	Cylinder #10 exhaust port temperature	35049	37049
	51	F4 3A	Cylinder #11 exhaust port temperature	35050	37050
	52	F4 3B	Cylinder #12 exhaust port temperature	35051	37051
	53	F4 3C	Cylinder #13 exhaust port temperature	35052	37052
	54	F4 3D	Cylinder #14 exhaust port temperature	35053	37053
	55	F4 3E	Cylinder #15 exhaust port temperature	35054	37054
	56	F4 3F	Cylinder #16 exhaust port temperature	35055	37055
8	57	F5 98	Cylinder #17 exhaust port temperature	35056	37056
	58	F5 99	Cylinder #18 exhaust port temperature	35057	37057
	59	F5 9A	Cylinder #19 exhaust port temperature	35058	37058
	60	F5 9B	Cylinder #20 exhaust port temperature	35059	37059
	61	00 00	Empty	35060	37060
	62	00 00	Empty	35061	37061
	63	00 00	Empty	35062	37062
	64	00 00	Empty	35063	37063

Description of list 9-16

While the older type CCMs can only handle 8 lists, the newer type CCMs have the ability to use up to 16 lists of 8 PIDs.

The new CCM, which is used on NES (New Engine System), has the possibility to use PIDs consisting of 3 bytes. These PIDs' MSB (Most Significant Byte) has a hex value between D0 and D4. The two MSBs must be placed in the first modbus register, and the LSB must be placed in the 'space for extra PID byte'. If 3 bytes PIDs are not used, then 'space for extra PID byte' must be 0. This type of PIDs can only be used in lists 9-16.

Example
To place the PID: *D0 01 0A* (fuel valve differential pressure) as the first PID in list 9 (PID #65), *D0 01* must be written to modbus register (35064), and *0A* must be written to modbus register (35065). As before the output is read in the address 37064.

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
9	65	D0 01	Fuel valve differential pressure	35064	37064
		00 0A	Space for extra PID byte	35065	

Default lists 9-16

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
9	65	D0 00	Cylinder #1 detonation level	35064	37064
		00 20	Space for extra PID byte	35065	
	66	D0 00	Cylinder #2 detonation level	35066	37065
		00 21	Space for extra PID byte	35067	
	67	D0 00	Cylinder #3 detonation level	35068	37066
		00 22	Space for extra PID byte	35069	
	68	D0 00	Cylinder #4 detonation level	35070	37067
		00 23	Space for extra PID byte	35071	
	69	D0 00	Cylinder #5 detonation level	35072	37068
		00 24	Space for extra PID byte	35073	
	70	D0 00	Cylinder #6 detonation level	35074	37069
		00 25	Space for extra PID byte	35075	
	71	D0 00	Cylinder #7 detonation level	35076	37070
		00 26	Space for extra PID byte	35077	
	72	D0 00	Cylinder #8 detonation level	35078	37071
		00 27	Space for extra PID byte	35079	
10	73	D0 00	Cylinder #1 ignition timing	35080	37072
		00 40	Space for extra PID byte	35081	
	74	D0 00	Cylinder #2 ignition timing	35082	37073
		00 41	Space for extra PID byte	35083	
	75	D0 00	Cylinder #3 ignition timing	35084	37074
		00 42	Space for extra PID byte	35085	

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
	76	D0 00	Cylinder #4 ignition timing	35086	37075
		00 43	Space for extra PID byte	35087	
	77	D0 00	Cylinder #5 ignition timing	35088	37076
		00 44	Space for extra PID byte	35089	
	78	D0 00	Cylinder #6 ignition timing	35090	37077
		00 45	Space for extra PID byte	35091	
	79	D0 00	Cylinder #7 ignition timing	35092	37078
		00 46	Space for extra PID byte	35093	
	80	D0 00	Cylinder #8 ignition timing	35094	37079
		00 47	Space for extra PID byte	35095	
11	81	D0 00	Cylinder #1 transformer secondary output voltage percentage	35096	37080
		00 EB	Space for extra PID byte	35097	
	82	D0 00	Cylinder #2 transformer secondary output voltage percentage	35098	37081
		00 EC	Space for extra PID byte	35099	
	83	D0 00	Cylinder #3 transformer secondary output voltage percentage	35100	37082
		00 ED	Space for extra PID byte	35101	
	84	D0 00	Cylinder #4 transformer secondary output voltage percentage	35102	37083
		00 EE	Space for extra PID byte	35103	
	85	D0 00	Cylinder #5 transformer secondary output voltage percentage	35104	37084
		00 EF	Space for extra PID byte	35105	
	86	D0 00	Cylinder #6 transformer secondary output voltage percentage	35106	37085
		00 F0	Space for extra PID byte	35107	
	87	D0 00	Cylinder #7 transformer secondary output voltage percentage	35108	37086
		00 F1	Space for extra PID byte	35109	
	88	D0 00	Cylinder #8 transformer secondary output voltage percentage	35110	37087
		00 F2	Space for extra PID byte	35111	
12	89	D0 00	Cylinder #9 detonation level	35112	37088
		00 28	Space for extra PID byte	35113	
	90	D0 00	Cylinder #10 detonation level	35114	37089
		00 29	Space for extra PID byte	35115	
	91	D0 00	Cylinder #11 detonation level	35116	37090
		00 2A	Space for extra PID byte	35117	
	92	D0 00	Cylinder #12 detonation level	35118	37091
		00 2B	Space for extra PID byte	35119	
	93	D0 00	Cylinder #13 detonation level	35120	37092

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
		00 2C	Space for extra PID byte	35121	
	94	D0 00	Cylinder #14 detonation level	35122	37093
		00 2D	Space for extra PID byte	35123	
	95	D0 00	Cylinder #15 detonation level	35124	37094
		00 2E	Space for extra PID byte	35125	
	96	D0 00	Cylinder #16 detonation level	35126	37095
		00 2F	Space for extra PID byte	35127	
13	97	D0 00	Cylinder #9 ignition timing	35128	37096
		00 48	Space for extra PID byte	35129	
	98	D0 00	Cylinder #10 ignition timing	35130	37097
		00 49	Space for extra PID byte	35131	
	99	D0 00	Cylinder #11 ignition timing	35132	37098
		00 4A	Space for extra PID byte	35133	
	100	D0 00	Cylinder #12 ignition timing	35134	37099
		00 4B	Space for extra PID byte	35135	
	101	D0 00	Cylinder #13 ignition timing	35136	371000
		00 4C	Space for extra PID byte	35137	
	102	D0 00	Cylinder #14 ignition timing	35138	37101
		00 4D	Space for extra PID byte	35139	
	103	D0 00	Cylinder #15 ignition timing	35140	37102
		00 4E	Space for extra PID byte	35141	
	104	D0 00	Cylinder #16 ignition timing	35142	37103
		00 4F	Space for extra PID byte	35143	
14	105	D0 00	Cylinder #9 transformer secondary output voltage percentage	35144	37104
		00 F3	Space for extra PID byte	35145	
	106	D0 00	Cylinder #10 transformer secondary output voltage percentage	35146	37105
		00 F4	Space for extra PID byte	35147	
	107	D0 00	Cylinder #11 transformer secondary output voltage percentage	35148	37106
		00 F5	Space for extra PID byte	35149	
	108	D0 00	Cylinder #12 transformer secondary output voltage percentage	35150	37107
		00 F6	Space for extra PID byte	35151	
	109	D0 00	Cylinder #13 transformer secondary output voltage percentage	35152	37108
		00 F7	Space for extra PID byte	35153	
	110	D0 00	Cylinder #14 transformer secondary output voltage percentage	35154	37109
		00 F8	Space for extra PID byte	35155	
	111	D0 00	Cylinder #15 transformer secondary output voltage percentage	35156	37110

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
		00 F9	Space for extra PID byte	35157	
	112	D0 00	Cylinder #16 transformer secondary output voltage percentage	35158	37111
		00 FA	Space for extra PID byte	35159	
15	113	D0 00	Cylinder #17 detonation level	35160	37112
		00 30	Space for extra PID byte	35161	
	114	D0 00	Cylinder #18 detonation level	35162	37113
		00 31	Space for extra PID byte	35163	
	115	D0 00	Cylinder #19 detonation level	35164	37114
		00 32	Space for extra PID byte	35165	
	116	D0 00	Cylinder #20 detonation level	35166	37115
		00 33	Space for extra PID byte	35167	
	117	D0 00	Cylinder #17 ignition timing	35168	37116
		00 50	Space for extra PID byte	35169	
	118	D0 00	Cylinder #18 ignition timing	35170	37117
		00 51	Space for extra PID byte	35171	
	119	D0 00	Cylinder #19 ignition timing	35172	37118
		00 52	Space for extra PID byte	35173	
	120	D0 00	Cylinder #20 ignition timing	35174	37119
		00 53	Space for extra PID byte	35175	
16	121	D0 00	Cylinder #17 transformer secondary output voltage percentage	35176	37120
		00 FB	Space for extra PID byte	35177	
	122	D0 00	Cylinder #18 transformer secondary output voltage percentage	35178	37121
		00 FC	Space for extra PID byte	35179	
	123	D0 00	Cylinder #19 transformer secondary output voltage percentage	35180	37122
		00 FD	Space for extra PID byte	35181	
	124	D0 00	Cylinder #20 transformer secondary output voltage percentage	35182	37123
		00 FE	Space for extra PID byte	35183	
	125	D0 01	Fuel valve position	35184	37124
		00 09	Space for extra PID byte	35185	
	126	D0 01	Fuel valve differential pressure	35186	37125
		00 0A	Space for extra PID byte	35187	
	127	00 00	Empty	35188	37126
		00 00	Empty	35189	
	128	00 00	Empty	35190	37127
		00 00	Empty	35191	

6. Customised lists

It is possible to change the PIDs if desired. The PIDs in all lists are determined by the value in the modbus register corresponding to the PID. This means for instance that the 8 PIDs in list #1 are determined by the values in modbus register 35000 - 35007.

To change the predefined lists it is necessary to change the content of the input PID addresses (example below 35000). To do so, use a modbus PC tool that can handle the address areas specified below.

Example 1
If the only parameter of interest is the engine RPM:

The PID for RPM (40 hex) must be written to modbus register 35000, and 0 must be written to the rest of the PIDs in list #1. Note that the CCM ignores any PIDs in a list which come after a PID = 0.

The update rate of list #1 can be set to the minimum value of 0.5 sec, and then a new RPM value can be read at modbus register 37000 every 0.5 second.

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
1	1	00 40	Generator set engine RPM	35000	37000
	2	00 00		35001	37001
	3	00 00		35002	37002
	4	00 00		35003	37003
	5	00 00		35004	37004
	6	00 00		35005	37005
	7	00 00		35006	37006
	8	00 00		35007	37007

Example 2
Change a PID in list #2:

To place the engine RPM (PID 40 hex) as the second PID in list #2, PID #10, 40 hex must be written to modbus register 35009. Then the RPM returned from the CCM can be read from the modbus register 37009.

List #	PID #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
2	9	F1 13	Engine operation	35008	37008
	10	**00 40**	**Generator set engine RPM**	**35009**	**37009**
	11	F1 89	Engine power derate percentage	35010	37010
	12	F1 D0	Jacket water outlet to engine oil differential temperature	35011	37011
	13	F4 0E	Engine oil filter differential pressure	35012	37012
	14	F4 4C	Generator set relay status	35013	37013
	15	F4 4E	Actual exhaust oxygen	35014	37014
	16	00 00	Empty	35015	37015

When a list is being changed, it must be turned off and then turned on again after the setup.

If just one of the PIDs in a list is not a correct request for this engine/EMC type, the CCM will stop the entire list from being transmitted.

For example, if one of the PIDs in list #1 is the request for 'Cylinder #20 exhaust port temperature', and this is asked from a 16 cylinder engine, then no values will be returned from the list #1.

7. Single parameter read

The PID setup varies in different gen-sets. The list below is just for guidance.

Default reads 1-10

SPR #	Default PID in Hex	Description	Input PID at modbus register	Output value at modbus register
1	00 C8	Total fuel	40000	41000[HI]
	00 00		40001	41001[LO]
2	FC 07	Warning status	40002	41002[HI]
	00 00		40003	41003[LO]
3	FC 08	Shutdown status	40004	41004[HI]
	00 00		40005	41005[LO]
4	FC 09	Engine derate status	40006	41006[HI]
	00 00		40007	41007[LO]
5	FC 0F	Generator total real power	40008	41008[HI]
	00 00		40009	41009[LO]
6	FC 17	Generator total reactive power	40010	41010[HI]
	00 00		40011	41011[LO]
7	FC 1C	Generator total kW-hours	40012	41012[HI]
	00 00		40013	41013[LO]
8	FC 1D	Generator total kvar-hours	40014	41014[HI]
	00 00		40015	41015[LO]
9	FC 1E	Generator shutdown status	40016	41016[HI]
	00 00		40017	41017[LO]
10	FC 1F	Generator alarm status	40018	41018[HI]
	00 00		40019	41019[LO]

The 10 single parameters above are accessible by the modbus communication only (not by the display).