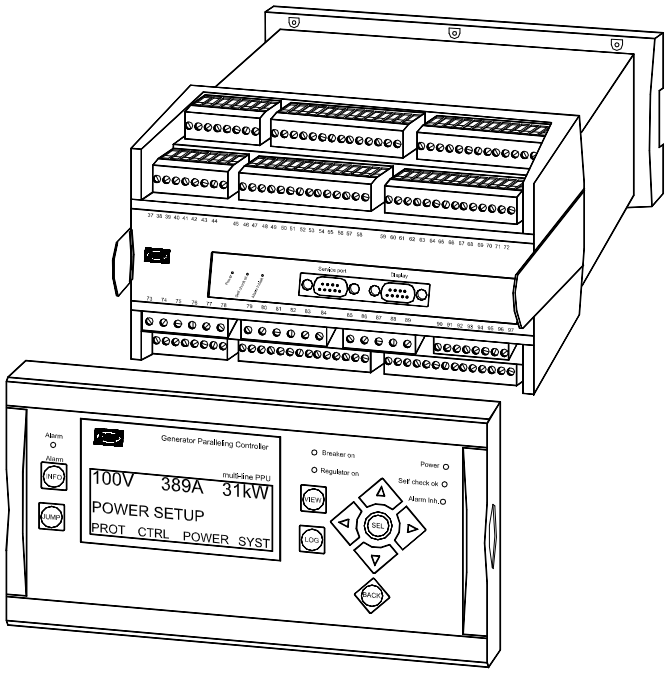
DEIF A/S

Description of options

Option H4
Serial comm. – CAT CCM communication
Multi-line 2 – version 2

4189340280F
SW version 2.4X.X



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This manual is valid for standard multi-line 2 GPU/GPC/PPU units with firmware version 2.40.0 or later.

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).

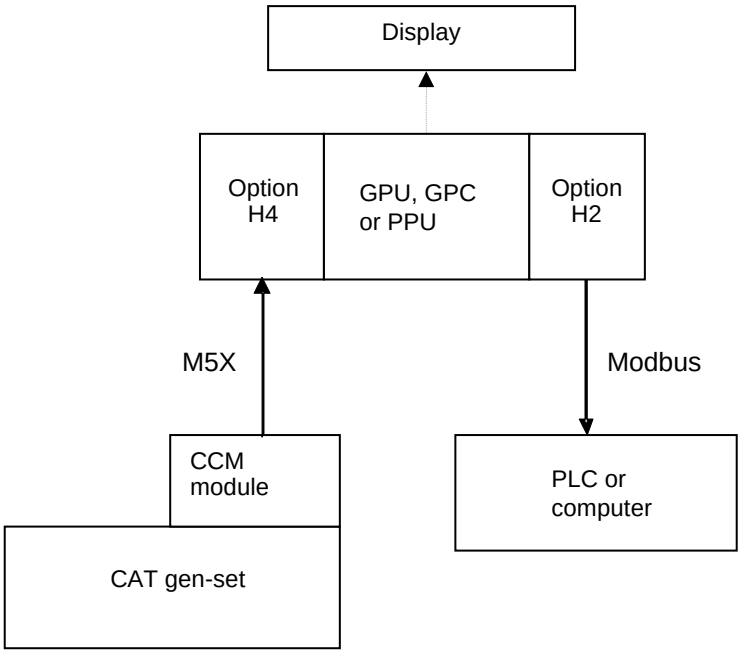
Term.	Function	Description
29	DATA + (A)	Modbus RTU/ASCII, RS485
30	GND	
31	DATA - (B)	
32	Not used	
33	DATA + (A)	
34	Not used	
35	DATA - (B)	
36	Not used	

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 or CAN open cannot be used.

Wirings

Principle diagram



For 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 genset to the multi-line 2. The 16 first data from list #1 and list #2 can be displayed in the normal multi-line 2 display/graphical display unit (see the Designer's Reference Handbook, the display unit part), or the data from all lists can be collected from a PLC, if the Modbus communication is selected (option H2).

Protocol description

In the option H4, a part of the M5X protocol is implemented to make it possible to communicate with Caterpillar's Customer Communication Module (CCM). The H4 option 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 as shown in the lists below.

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 (see chapter 6).

When the lists of the H4 communication are switched on in the multi-line 2 they are being created in the CCM module. The lists will be created only when they are enabled in the multi-line 2. When the lists are being created they will be activated, and the CCM module will start collecting the data and will begin transmitting.

The multi-line 2 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) is 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 return any value of the specific list.

If no changes are made to the lists, they will consist of the default PIDs which are shown in the table below. When the CCM module has received the lists it will begin to send the requested data to the multi-line 2. The values are stored in the Modbus addresses: Output value (18500-18627).

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, or the system battery voltage which is identified as F0 13h.

If we want to read the system battery voltage, we must add the hex value F0 13h 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 return the specific value representing the RPM to the output PID address that matches the input PID address. E.g. the input PID address 17500 matches the output PID address 18500.

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 17506. The CCM returns the value representing the system battery voltage to the Modbus register 18506.

Resolution

When the CCM returns 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 (18506) 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) is used. The multi-line 2 unit is set up to poll the CCM and 'delivers' the read data in specific Modbus addresses. The PLC (or the like) can then poll the multi-line 2 unit. These up to ten 32 bits values are readable by means of the option H2 Modbus communication (not readable by the display). These max. 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, like 16 or 8 bits values.

Log-on

The multi-line 2 requires that the password value is blank (as it is default). The password value is used when logging into the CCM module.

Module identifier, MID

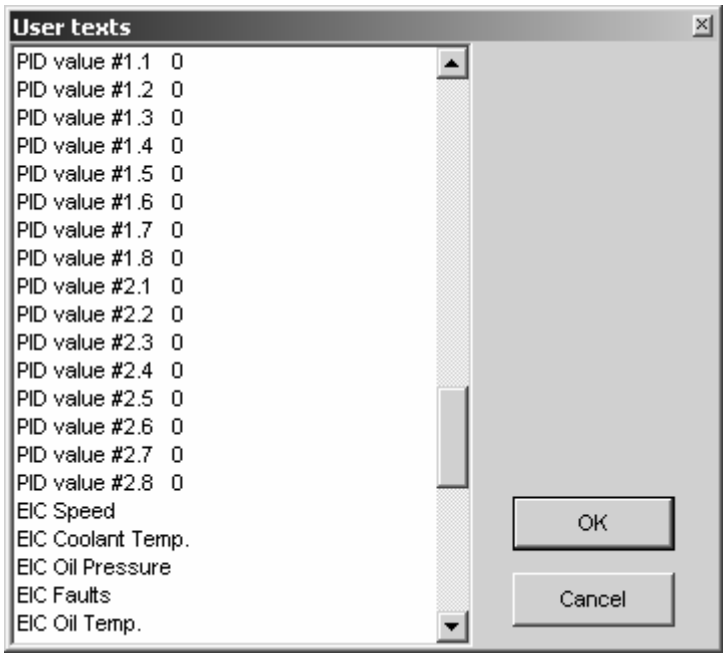
The table below includes some typical MID numbers used; refer to the CAT owner's manual for further details.

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 GPU, GPC or PPU and the CCM. The parameters, which can be changed via the utility software and the display, have the menu numbers 4771 to 4933. The other parameters have the menu numbers 5201 to 5293 and are accessible by means of the utility software.

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	

4770 CCM control

No.	Setting		Min. setting	Max. setting	Factory setting
4771	CCM control	CCM Baud rate	9600	19200	9600

PID read (16 bit readings)

4780 List 1 setup

No.	Setting		Min. setting	Max. setting	Factory setting
4781	List 1 setup	MID/UNIT number	0	255	36
4782	List 1 setup	Activate list	OFF	ON	OFF
4783	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
4780	List 1 setup
4790	List 2 setup
4800	List 3 setup
4810	List 4 setup
4820	List 5 setup
4830	List 6 setup
4840	List 7 setup
4850	List 8 setup
4860	List 9 setup
4870	List 10 setup
4880	List 11 setup
4890	List 12 setup
4900	List 13 setup
4910	List 14 setup
4920	List 15 setup
4930	List 16 setup

Single Parameter Read setup (32 bits readings)

5200 SPR 1 setup

No.	Setting		Min. setting	Max. setting	Factory setting
5201	SPR 1 setup	MID/UNIT number	0	255	36 (24hex)
5202	SPR 1 setup	Activate list	0 (OFF)	1 (ON)	0 (OFF)
5203	SPR 1 setup	Update rate	1.0 s	127.0 s	10.0 s

The setup of the other Single Parameter Reads are done in the same way as for number 1, channel 5200. The following Single Parameter Reads are available:

Channel number	Single Parameter Read number
5200	Single Parameter Read 1 setup
5210	Single Parameter Read 2 setup
5220	Single Parameter Read 3 setup
5230	Single Parameter Read 4 setup
5240	Single Parameter Read 5 setup
5250	Single Parameter Read 6 setup
5260	Single Parameter Read 7 setup
5270	Single Parameter Read 8 setup
5280	Single Parameter Read 9 setup
5290	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	17500	18500
	2	00 15	Throttle position	17501	18501
	3	00 40	Generator set engine RPM	17502	18502
	4	00 44	Engine coolant temperature	17503	18503
	5	00 46	Desired engine speed	17504	18504
	6	00 54	Engine oil pressure	17505	18505
	7	F0 13	System battery voltage	17506	18506
	8	F0 E8	Engine coolant pump pressure status	17507	18507
2	9	F1 13	Engine operation	17508	18508
	10	F1 18	Engine load factor	17509	18509
	11	F1 89	Engine power derate percentage	17510	18510
	12	F1 D0	Jacket water outlet to engine oil differential temperature	17511	18511
	13	F4 0E	Engine oil filter differential pressure	17512	18512
	14	F4 4C	Generator set relay status	17513	18513
	15	F4 4E	Actual exhaust oxygen	17514	18514
	16	00 00	Empty	17515	18515
3	17	F4 4F	Desired oxygen	17516	18516
	18	F4 60	Engine alarm status	17517	18517
	19	F4 6D	Cooldown time remaining	17518	18518
	20	F4 8D	Engine coolant pressure (absolute)	17519	18519
	21	F4 EA	Unfiltered engine oil pressure (gauge)	17520	18520
	22	F5 0E	Engine fuel pressure (absolute)	17521	18521
	23	F5 11	Intake manifold air temperature	17522	18522
	24	F5 12	Actual air/fuel ratio	17523	18523
4	25	F5 1A	Fuel quality	17524	18524
	26	F5 1D	Fuel temperature	17525	18525
	27	F5 1E	Intake manifold air flow	17526	18526
	28	F5 24	Desired exhaust oxygen at full load	17527	18527
	29	F5 3E	Engine oil temperature	17528	18528
	30	F5 8E	Gas fuel flow	17529	18529
	31	F5 b1	Gas specific gravity	17530	18530
	32	F5 BA	Inlet manifold air pressure	17531	18531
5	33	F5 97	Engine average exhaust port temperature	17532	18532

List #	PID #	Default PID in Hex	Description	Input PID at Modbus register	Output value at Modbus register
	34	F5 5D	Right bank average exhaust port temperature	17533	18533
	35	F5 5C	Left bank average exhaust port temperature	17534	18534
	36	F5 93	Right bank turbine inlet temperature	17535	18535
	37	F5 95	Right bank turbine outlet temperature	17536	18536
	38	F5 94	Left bank turbine inlet temperature	17537	18537
	39	F5 96	Left bank turbine outlet temperature	17538	18538
	40	00 00	Empty	17539	18539
6	41	F4 30	Cylinder #1 exhaust port temperature	17540	18540
	42	F4 31	Cylinder #2 exhaust port temperature	17541	18541
	43	F4 32	Cylinder #3 exhaust port temperature	17542	18542
	44	F4 33	Cylinder #4 exhaust port temperature	17543	18543
	45	F4 34	Cylinder #5 exhaust port temperature	17544	18544
	46	F4 35	Cylinder #6 exhaust port temperature	17545	18545
	47	F4 36	Cylinder #7 exhaust port temperature	17546	18546
	48	F4 37	Cylinder #8 exhaust port temperature	17547	18547
7	49	F4 38	Cylinder #9 exhaust port temperature	17548	18548
	50	F4 39	Cylinder #10 exhaust port temperature	17549	18549
	51	F4 3A	Cylinder #11 exhaust port temperature	17550	18550
	52	F4 3B	Cylinder #12 exhaust port temperature	17551	18551
	53	F4 3C	Cylinder #13 exhaust port temperature	17552	18552
	54	F4 3D	Cylinder #14 exhaust port temperature	17553	18553
	55	F4 3E	Cylinder #15 exhaust port temperature	17554	18554
	56	F4 3F	Cylinder #16 exhaust port temperature	17555	18555
8	57	F5 98	Cylinder #17 exhaust port temperature	17556	18556
	58	F5 99	Cylinder #18 exhaust port temperature	17557	18557
	59	F5 9A	Cylinder #19 exhaust port temperature	17558	18558
	60	F5 9B	Cylinder #20 exhaust port temperature	17559	18559
	61	00 00	Empty	17560	18560
	62	00 00	Empty	17561	18561
	63	00 00	Empty	17562	18562
	64	00 00	Empty	17563	18563

Description of lists 9-16

While the older type CCMs can only handle 8 lists, the newer type CCMs 01-10-2002 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, '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 (17564), and *0A* must be written to Modbus register (17565).

As before the output is read in the address 18564.

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	17564	18564
		00 0A	Space for extra PID byte	17565	

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	17564	18564
		00 20	Space for extra PID byte	17565	
	66	D0 00	Cylinder #2 detonation level	17566	18565
		00 21	Space for extra PID byte	17567	
	67	D0 00	Cylinder #3 detonation level	17568	18566
		00 22	Space for extra PID byte	17569	
	68	D0 00	Cylinder #4 detonation level	17570	18567
		00 23	Space for extra PID byte	17571	
	69	D0 00	Cylinder #5 detonation level	17572	18568
		00 24	Space for extra PID byte	17573	
	70	D0 00	Cylinder #6 detonation level	17574	18569
		00 25	Space for extra PID byte	17575	
	71	D0 00	Cylinder #7 detonation level	17576	18570
		00 26	Space for extra PID byte	17577	
	72	D0 00	Cylinder #8 detonation level	17578	18571
		00 27	Space for extra PID byte	17579	
10	73	D0 00	Cylinder #1 ignition timing	17580	18572
		00 40	Space for extra PID byte	17581	

List #	PID #	Default PID in Hex	Description	Input PID at Modbus register	Output value at Modbus register
	74	D0 00	Cylinder #2 ignition timing	17582	18573
		00 41	Space for extra PID byte	17583	
	75	D0 00	Cylinder #3 ignition timing	17584	18574
		00 42	Space for extra PID byte	17585	
	76	D0 00	Cylinder #4 ignition timing	17586	18575
		00 43	Space for extra PID byte	17587	
	77	D0 00	Cylinder #5 ignition timing	17588	18576
		00 44	Space for extra PID byte	17589	
	78	D0 00	Cylinder #6 ignition timing	17590	18577
		00 45	Space for extra PID byte	17591	
	79	D0 00	Cylinder #7 ignition timing	17592	18578
		00 46	Space for extra PID byte	17593	
	80	D0 00	Cylinder #8 ignition timing	17594	18579
		00 47	Space for extra PID byte	17595	
11	81	D0 00	Cylinder #1 transformer secondary output voltage percentage	17596	18580
		00 EB	Space for extra PID byte	17597	
	82	D0 00	Cylinder #2 transformer secondary output voltage percentage	17598	18581
		00 EC	Space for extra PID byte	17599	
	83	D0 00	Cylinder #3 transformer secondary output voltage percentage	17600	18582
		00 ED	Space for extra PID byte	17601	
	84	D0 00	Cylinder #4 transformer secondary output voltage percentage	17602	18583
		00 EE	Space for extra PID byte	17603	
	85	D0 00	Cylinder #5 transformer secondary output voltage percentage	17604	18584
		00 EF	Space for extra PID byte	17605	
	86	D0 00	Cylinder #6 transformer secondary output voltage percentage	17606	18585
		00 F0	Space for extra PID byte	17607	
	87	D0 00	Cylinder #7 transformer secondary output voltage percentage	17608	18586
		00 F1	Space for extra PID byte	17609	
	88	D0 00	Cylinder #8 transformer secondary output voltage percentage	17610	18587
		00 F2	Space for extra PID byte	17611	
12	89	D0 00	Cylinder #9 detonation level	17612	18588
		00 28	Space for extra PID byte	17613	
	90	D0 00	Cylinder #10 detonation level	17614	18589
		00 29	Space for extra PID byte	17615	
	91	D0 00	Cylinder #11 detonation level	17616	18590

List #	PID #	Default PID in Hex	Description	Input PID at Modbus register	Output value at Modbus register
		00 2A	Space for extra PID byte	17617	
	92	D0 00	Cylinder #12 detonation level	17618	18591
		00 2B	Space for extra PID byte	17619	
	93	D0 00	Cylinder #13 detonation level	17620	18592
		00 2C	Space for extra PID byte	17621	
	94	D0 00	Cylinder #14 detonation level	17622	18593
		00 2D	Space for extra PID byte	17623	
	95	D0 00	Cylinder #15 detonation level	17624	18594
		00 2E	Space for extra PID byte	17625	
	96	D0 00	Cylinder #16 detonation level	17626	18595
		00 2F	Space for extra PID byte	17627	
13	97	D0 00	Cylinder #9 ignition timing	17628	18596
		00 48	Space for extra PID byte	17629	
	98	D0 00	Cylinder #10 ignition timing	17630	18597
		00 49	Space for extra PID byte	17631	
	99	D0 00	Cylinder #11 ignition timing	17632	18598
		00 4A	Space for extra PID byte	17633	
	100	D0 00	Cylinder #12 ignition timing	17634	18599
		00 4B	Space for extra PID byte	17635	
	101	D0 00	Cylinder #13 ignition timing	17636	18600
		00 4C	Space for extra PID byte	17637	
	102	D0 00	Cylinder #14 ignition timing	17638	18601
		00 4D	Space for extra PID byte	17639	
	103	D0 00	Cylinder #15 ignition timing	17640	18602
		00 4E	Space for extra PID byte	17641	
	104	D0 00	Cylinder #16 ignition timing	17642	18603
		00 4F	Space for extra PID byte	17643	
14	105	D0 00	Cylinder #9 transformer secondary output voltage percentage	17644	18604
		00 F3	Space for extra PID byte	17645	
	106	D0 00	Cylinder #10 transformer secondary output voltage percentage	17646	18605
		00 F4	Space for extra PID byte	17647	
	107	D0 00	Cylinder #11 transformer secondary output voltage percentage	17648	18606
		00 F5	Space for extra PID byte	17649	
	108	D0 00	Cylinder #12 transformer secondary output voltage percentage	17650	18607
		00 F6	Space for extra PID byte	17651	
	109	D0 00	Cylinder #13 transformer secondary output voltage percentage	17652	18608
		00 F7	Space for extra PID byte	17653	

List #	PID #	Default PID in Hex	Description	Input PID at Modbus register	Output value at Modbus register
	110	D0 00	Cylinder #14 transformer secondary output voltage percentage	17654	18609
		00 F8	Space for extra PID byte	17655	
	111	D0 00	Cylinder #15 transformer secondary output voltage percentage	17656	18610
		00 F9	Space for extra PID byte	17657	
	112	D0 00	Cylinder #16 transformer secondary output voltage percentage	17658	18611
		00 FA	Space for extra PID byte	17659	
15	113	D0 00	Cylinder #17 detonation level	17660	18612
		00 30	Space for extra PID byte	17661	
	114	D0 00	Cylinder #18 detonation level	17662	18613
		00 31	Space for extra PID byte	17663	
	115	D0 00	Cylinder #19 detonation level	17664	18614
		00 32	Space for extra PID byte	17665	
	116	D0 00	Cylinder #20 detonation level	17666	18615
		00 33	Space for extra PID byte	17667	
	117	D0 00	Cylinder #17 ignition timing	17668	18616
		00 50	Space for extra PID byte	17669	
	118	D0 00	Cylinder #18 ignition timing	17670	18617
		00 51	Space for extra PID byte	17671	
	119	D0 00	Cylinder #19 ignition timing	17672	18618
		00 52	Space for extra PID byte	17673	
	120	D0 00	Cylinder #20 ignition timing	17674	18619
		00 53	Space for extra PID byte	17675	
16	121	D0 00	Cylinder #17 transformer secondary output voltage percentage	17676	18620
		00 FB	Space for extra PID byte	17677	
	122	D0 00	Cylinder #18 transformer secondary output voltage percentage	17678	18621
		00 FC	Space for extra PID byte	17679	
	123	D0 00	Cylinder #19 transformer secondary output voltage percentage	17680	18622
		00 FD	Space for extra PID byte	17681	
	124	D0 00	Cylinder #20 transformer secondary output voltage percentage	17682	18623
		00 FE	Space for extra PID byte	17683	
	125	D0 01	Fuel valve position	17684	18624
		00 09	Space for extra PID byte	17685	
	126	D0 01	Fuel valve differential pressure	17686	18625
		00 0A	Space for extra PID byte	17687	
	127	00 00	Empty	17688	18626
		00 00	Empty	17689	

List #	PID #	Default PID in Hex	Description	Input PID at Modbus register	Output value at Modbus register
	128	00 00	Empty	17690	18627
		00 00	Empty	17691	

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 17500-17507.

To change the predefined lists it is necessary to change the content of the input PID addresses (example below 17500). 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 17500, 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 18500 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	17500	18500
	2	00 00		17501	18501
	3	00 00		17502	18502
	4	00 00		17503	18503
	5	00 00		17504	18504
	6	00 00		17505	18505
	7	00 00		17506	18506
	8	00 00		17507	18507

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 17509. Then the RPM returned from the CCM can be read from the Modbus register 18509.

List #	PID #	Default PID in Hex	Description	Input PID at Modbus register	Output value at Modbus register
2	9	F1 13	Engine operation	17508	18508
	10	**00 40**	**Generator set engine RPM**	**17509**	**18509**
	11	F1 89	Engine power derate percentage	17510	18510
	12	F1 D0	Jacket water outlet to engine oil differential temperature	17511	18511
	13	F4 0E	Engine oil filter differential pressure	17512	18512
	14	F4 4C	Generator set relay status	17513	18513
	15	F4 4E	Actual exhaust oxygen	17514	18514
	16	00 00	Empty	17515	18515

When a list is being changed, it must be turned off and then turned on again after the setup. Refer to page 7.

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 the different gen-sets. The lists below are 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	20000	20500 [HI]
	00 00		20001	20501 [LO]
2	FC 07	Warning status	20002	20502 [HI]
	00 00		20003	20503 [LO]
3	FC 08	Shutdown status	20004	20504 [HI]
	00 00		20005	20505 [LO]
4	FC 09	Engine derate status	20006	20506 [HI]
	00 00		20007	20507 [LO]
5	FC 0F	Generator total real power	20008	20508 [HI]
	00 00		20009	20509 [LO]
6	FC 17	Generator total reactive power	20010	20510 [HI]
	00 00		20011	20511 [LO]
7	FC 1C	Generator total kW-hours	20012	20512 [HI]
	00 00		20013	20513 [LO]
8	FC 1D	Generator total kVAr-hours	20014	20514 [HI]
	00 00		20015	20515 [LO]
9	FC 1E	Generator shutdown status	20016	20516 [HI]
	00 00		20017	20517 [LO]
10	FC 1F	Generator alarm status	20018	20518 [HI]
	00 00		20019	20519 [LO]

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