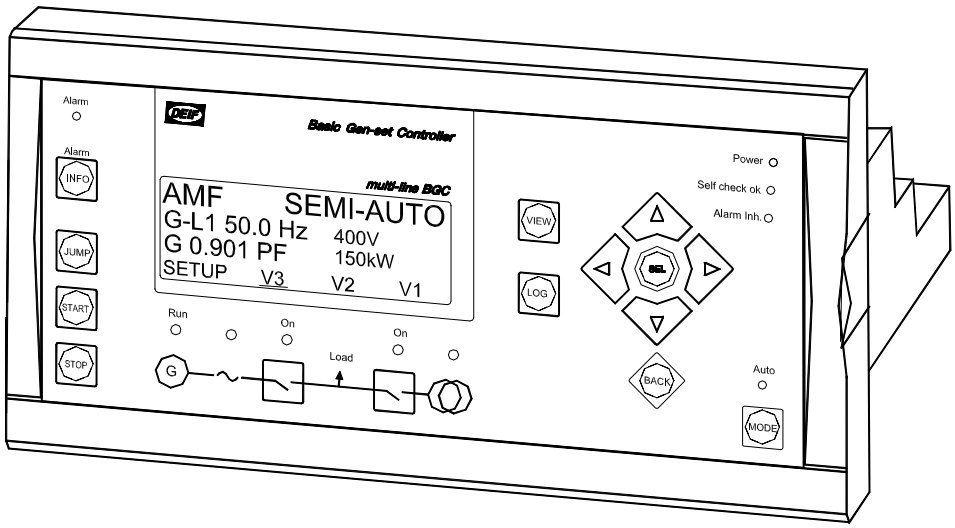
DEIF A/S

Description of options

Option H6
Cummins GCS communication
Basic Gen-set Controller

4189340378A
SW version 2.1X.X



- *Description of option*
- *Functional description*
- *Parameter list*
- *Modbus communication*

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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

Option H6

Option H6 is a hardware option. Therefore, a separate PCB is installed in slot #2 or slot #3 in addition to the standard hardware.

Function	ANSI no.
Serial engine communication	-

Terminal description

Engine side modbus connections

The PCB for the ECM communication module is placed in slot #2 or slot #3. The actual slot number is indicated on the unit label.

Term.		Function	Description
47	55	DATA + (A)	Modbus RTU, RS485 option H6, Cummins Engine Interface Communication
48	56	GND	
49	57	DATA - (B)	
50	58	Not used	
51	59	DATA + (A)	
52	60	Not used	
53	61	DATA - (B)	
54	62	Not used	

Slot #2 used:
Terminals 47 and 51 are internally connected.
Terminals 49 and 53 are internally connected.
Slot #3 used:
Terminals 55 and 59 are internally connected.
Terminals 57 and 61 are internally connected.

External modbus connections

The PCB for the modbus card is placed in slot #2 or slot #3, if the unit is equipped with option H2 (modbus option).

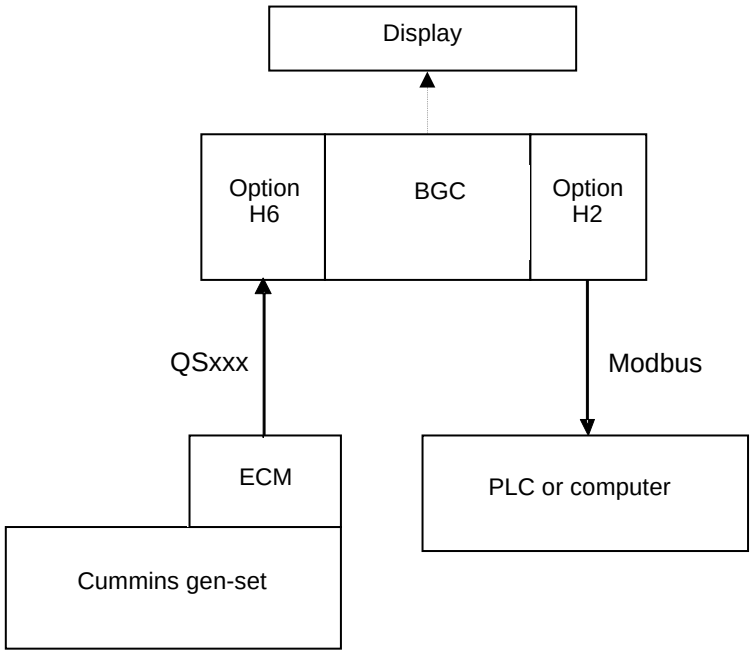
Term.		Function	Description
47	55	DATA + (A)	Modbus RTU, RS485
48	56	GND	
49	57	DATA - (B)	
50	58	Not used	
51	59	DATA + (A)	
52	60	Not used	
53	61	DATA - (B)	
54	62	Not used	

Slot #2 used:
Terminals 47 and 51 are internally connected.
Terminals 49 and 53 are internally connected.
Slot #3 used:
Terminals 55 and 59 are internally connected.
Terminals 57 and 61 are internally connected.

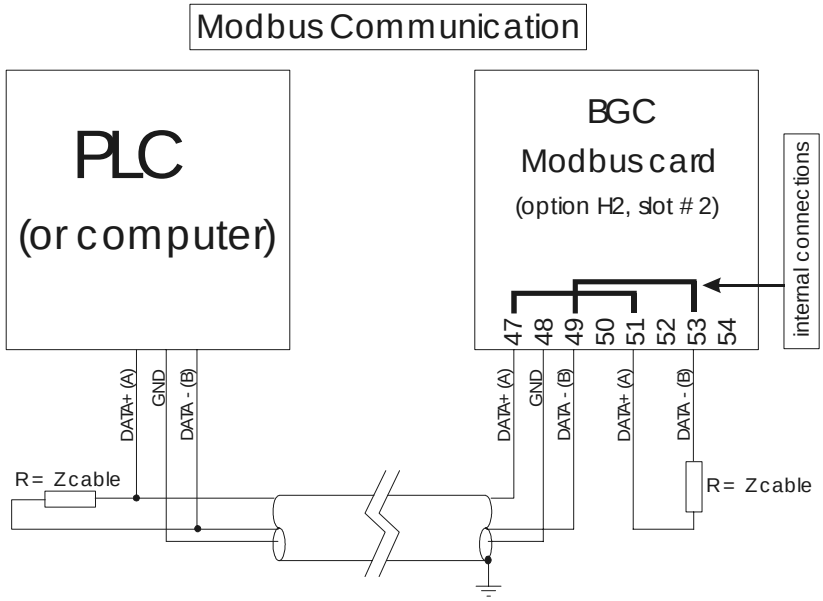
Only modbus communication can be used to transmit data to the PLC. Profibus cannot be used.

Wirings

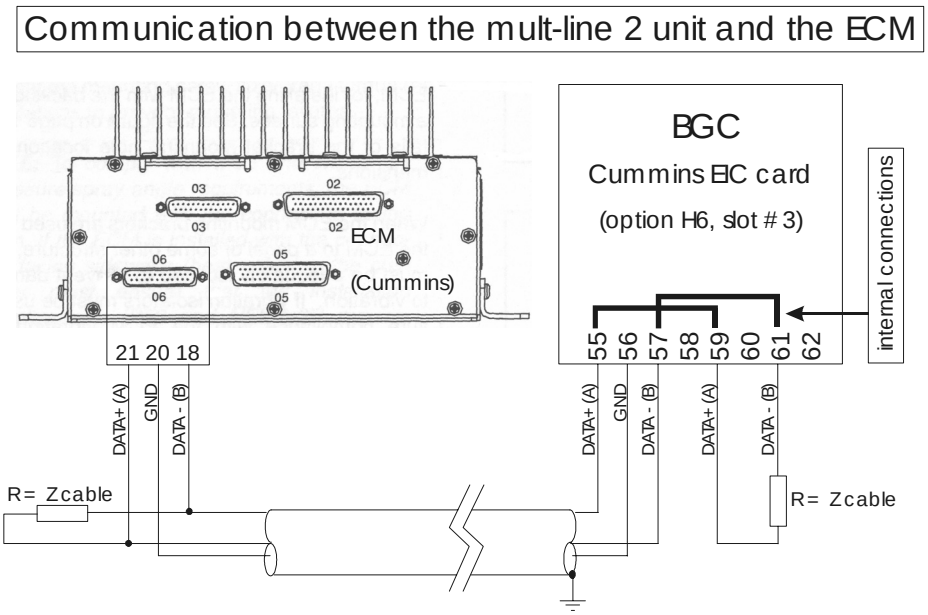
Principle diagram



Connection diagram



(earth to be connected at one end only)



(earth to be connected at one end only)

3. Functional description

This communication option extracts information from the Electronic Control Module (ECM) of a Cummins engine equipped with such a module. The values can be used as display values, alarms/shutdown alarms and values to be transmitted through modbus.

Engine type

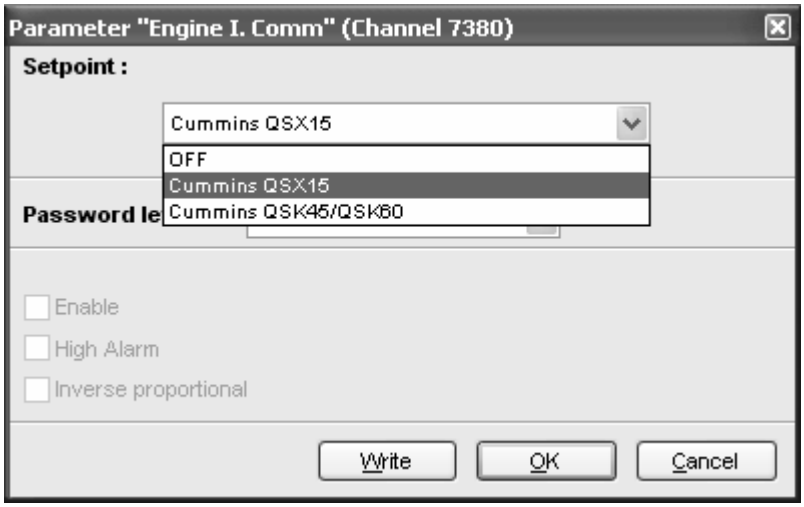
The Cummins Engine Interface Communication (EIC) supports two protocols depending on the Generator drive Control System.

It is possible to read data from the engine types QSX15, QSK45 and QSK60. The specific engine type can be set up through the display or through the PC utility software.

Engine type selection

The proper communication is selected through the PC utility software in the dialog box shown below. It can also be selected in the display (menu 7380).

If OFF is selected it means that no communication is selected.



Communication system

The Cummins protocol is based on a modbus system where the BGC is the master unit. The baud rate is fixed by Cummins at 9600 baud. The Cummins GCS (Generator drive Control System) has a fixed slave address (i.e. ID) at 01. The baud rate and ID cannot be changed via the BGC.

Please refer to the Cummins user manuals for more information about the technical descriptions and details of Cummins protocols.

Alarm

A number of alarms can be configured in the BGC. Please refer to the Designer's Reference Handbook for information about the configuration.

The following items can be configured to an alarm:

Menu number	Alarm	Comment
4150	Communication error	
4160	EIC shutdown	Corresponds to the Cummins bit data 'Common shutdown lamp/driver command'
4170	Overspeed	Actual RPM
4180/4190	Coolant temperature (2 levels)	Actual temperature
4200/4210	Oil pressure (2 levels)	Actual pressure
4340	EIC warning	Corresponds to the Cummins bit data 'Common warning lamp/driver command'

In connection with a relay output activated by the alarm, please notice that the number of configurable relay outputs is option dependent.

Displayed values

Please refer to the Designer's Reference Handbook for information about menu structure.

Object selection

The table shows which values can be displayed in the view menu (V1, V2 and V3).

The view lines can be configured with the available values:

Object	Cummins QSX15	Cummins QSK45/QSK60
EIC Engine speed	Available	Available
EIC Engine coolant temperature	Available	Available
EIC Engine oil pressure	Available	Available
EIC Engine oil temperature	Available	Not available
EIC Fuel temperature	Not available	Available
EIC Air inlet temperature	Available	Available
EIC Fuel rate	Available	Available
EIC Air inlet pressure	Available	Available
EIC Fuel delivery pressure	Available	Available
EIC Coolant pressure	Not available	Available
EIC Blowby flow	Not available	Available
EIC Fuel rail pressure	Not available	Available
EIC Timing rail pressure	Not available	Available
EIC Aftercooler water inlet temp.	Not available	Available

Menu 4140 (EIC unit) affects the value indicated on the display. It does not affect the data which can be read by the modbus communication (option H2).

The display values corresponding to the engine communication have a description beginning with 'EIC'.

Error messages

The following error messages can occur:

Engine I. = Engine interface
N.A. = Not available

Message	Description
Engine I. value N.A.	The value is not available for the present engine type
Value selected error	The value cannot be read due to sensor error, sub-system or module error
'N.A.'	The available value changes to N.A. due to communication error

Modbus communication

If the modbus option (H2) is installed in the BGC, then the data can be transmitted to a PLC or a computer.

Please refer to the option H2 documentation for more information about standard external modbus communication to an external PLC (or computer).

Please refer to chapter 5 on page 13 for specific address areas.

4. Parameter list

Please see the Designer's Reference Handbook for information about the structure of the parameter descriptions.

Engine communication settings

4330 Engine communications

No.	Setting		Min. setting	Max. setting	Factory setting
4331	Engine i. comm.	Type	OFF		OFF
				Cummins QSX15	
				Cummins QSK45/QSK60	

4140 EIC unit

No.	Setting		Min. setting	Max. setting	Factory setting
4141	EIC unit	Unit	Bar/Celsius	Psi/Fahrenheit	Bar/Celsius

4150 EI communication error

No.	Setting		Min. setting	Max. setting	Factory setting
4151	EI comm. error	Delay	0.0 s	100.0 s	0.0 s
4152	EI comm. error	Relay output A	R0 (none)	R0 (none)	R0 (none)
4153	EI comm. error	Relay output B	R0 (none)	R0 (none)	R0 (none)
4154	EI comm. error	Enable	OFF	ON	OFF
4155	EI comm. error	Fail class	Warning (2)	Shutdown (5)	Warning (2)

4340 EIC warning

No.	Setting		Min. setting	Second setting	Max./third setting	Factory setting
4341	EIC warning	Delay	0.0 s		100.0 s	0.0 s
4342	EIC warning	Relay output A	R0 (none)		R0 (none)	R0 (none)
4343	EIC warning	Relay output B	R0 (none)		R0 (none)	R0 (none)
4344	EIC warning	Enable	OFF	ON	RUN	OFF
4345	EIC warning	Fail class	Alarm (1)		Shutdown (5)	Warning (2)

Corresponds to the Cummins bit data 'Common Warning Lamp/Relay Driver Command'.

4160 EIC shutdown

No.	Setting		Min. setting	Second setting	Max./third setting	Factory setting
4161	EIC shutdown	Delay	0.0 s		100.0 s	0.0 s
4162	EIC shutdown	Relay output A	R0 (none)		R0 (none)	R0 (none)
4163	EIC shutdown	Relay output B	R0 (none)		R0 (none)	R0 (none)
4164	EIC shutdown	Enable	OFF	ON	RUN	OFF
4165	EIC shutdown	Fail class	Alarm (1)		Shutdown (5)	Warning (2)

Corresponds to the Cummins bit data 'Common Shutdown Lamp/Relay Driver Command'.

4170 EIC overspeed

No.	Setting		Min. setting	Second setting	Max./third setting	Factory setting
4171	EIC overspeed	Set point	0 RPM		2000 RPM	1600 RPM
4172	EIC overspeed	Delay	0.0 s		100.0 s	2.0 s
4173	EIC overspeed	Relay output A	R0 (none)		R0 (none)	R0 (none)
4174	EIC overspeed	Relay output B	R0 (none)		R0 (none)	R0 (none)
4175	EIC overspeed	Enable	OFF	ON	RUN	OFF
4176	EIC overspeed	Fail class	Alarm (1)		Shutdown (5)	Warning (2)

4180 EIC cooling water temperature 1

No.	Setting		Min. setting	Second setting	Max./third setting	Factory setting
4181	EIC cool w. t. 1	Set point	-40 deg.		210 deg.	100 deg.
4182	EIC cool w. t. 1	Delay	0.0 s		100.0 s	5.0 s
4183	EIC cool w. t. 1	Relay output A	R0 (none)		R0 (none)	R0 (none)
4184	EIC cool w. t. 1	Relay output B	R0 (none)		R0 (none)	R0 (none)
4185	EIC cool w. t. 1	Enable	OFF	ON	RUN	OFF

4190 EIC cooling water temperature 2

No.	Setting		Min. setting	Second setting	Max./third setting	Factory setting
4191	EIC cool w. t. 2	Set point	-40 deg.		210 deg.	110 deg.
4192	EIC cool w. t. 2	Delay	0.0 s		100.0 s	5.0 s
4193	EIC cool w. t. 2	Relay output A	R0 (none)		R0 (none)	R0 (none)
4194	EIC cool w. t. 2	Relay output B	R0 (none)		R0 (none)	R0 (none)
4195	EIC cool w. t. 2	Enable	OFF	ON	RUN	OFF
4196	EIC cool w. t. 2	Fail class	Alarm (1)		Shutdown (5)	Warning (2)

4200 EIC oil pressure 1

No.	Setting		Min. setting	Second setting	Max./third setting	Factory setting
4201	EIC oil press. 1	Set point	0.0 bar		10.0 bar	2.0 bar
4202	EIC oil press. 1	Delay	0.0 s		100.0 s	5.0 s
4203	EIC oil press. 1	Relay output A	R0 (none)		R0 (none)	R0 (none)
4204	EIC oil press. 1	Relay output B	R0 (none)		R0 (none)	R0 (none)
4205	EIC oil press. 1	Enable	OFF	ON	RUN	OFF
4206	EIC oil press. 1	Fail class	Alarm (1)		Shutdown (5)	Warning (2)

4210 EIC oil pressure 2

No.	Setting		Min. setting	Second setting	Max./third setting	Factory setting
4211	EIC oil press. 2	Set point	0.0 bar		10.0 bar	1.0 bar
4212	EIC oil press. 2	Delay	0.0 s		100.0 s	5.0 s
4213	EIC oil press. 2	Relay output A	R0 (none)		R0 (none)	R0 (none)
4214	EIC oil press. 2	Relay output B	R0 (none)		R0 (none)	R0 (none)
4215	EIC oil press. 2	Enable	OFF	ON	RUN	OFF
4216	EIC oil press. 2	Fail class	Alarm (1)		Shutdown (5)	Warning (2)

5. Modbus communication

This chapter offers additional information on option H2. Please refer to the Cummins user manuals for more information about the Cummins protocol's technical description and details of each communication value.

A. Cummins QSX15 protocol

Data table (bytes, read only registers, function code 03h)

Object	Protocol address (base 0)	No. of bytes	Refresh time (s)
Engine speed	42000	2	0.5
Coolant temperature	42001	2	0.5
Oil pressure	42002	2	0.5
Battery voltage	42003	2	0.5
Frequency adjust pot.	42004	2	0.5
Droop adjust pot.	42005	2	2.0
Ambient air absolute pressure	42006	2	2.0
Engine running time	42007	4	2.0
ECM on time	42009	4	2.0
Base frequency	42011	2	2.0
Base speed	42012	2	2.0
Final speed reference	42013	2	2.0
Estimated torque	42014	2	2.0
±0.2V speed bias	42015	2	2.0
±2.5V speed bias	42016	2	2.0
Fuel consumption rate	42017	2	2.0
Cumulative fuel consumption	42018	4	2.0
Governor gain adjust pot.	42020	2	2.0
Active warning fault events list_fault code	42032	32	5.0
Active shutdown fault events list_fault code	42048	32	5.0
Intake manifold absolute pressure	42512	2	2.0
Intake manifold temperature	42513	2	2.0
Fuel outlet absolute pressure	42514	2	2.0
Oil temperature	42515	2	2.0

Data table (bits, read only, function code 01h)

Object	Protocol address (base 0)	No. of bits	Refresh time (s)
Idle/rate switch state	22000	1	2.0
Run/stop switch state	22001	1	2.0
Remote emergency stop input	22002	1	2.0
Coolant level switch state	22003	1	2.0
Common shutdown lamp/relay driver command	22004	1	2.0
Common warning lamp/relay driver command	22005	1	2.0
Fuel shut-off valve driver state	22006	1	2.0
Operator interface mode	22007	4	2.0

B. Cummins QSK45 or QSK60 protocol

Data table (bytes, read only registers, function code 03h)

Object	Protocol address (base 0)	No. of bytes	Refresh time (s)
Engine speed	42000	2	0.5
Coolant temperature	42001	2	0.5
Oil pressure	42002	2	0.5
Battery voltage	42003	2	0.5
Frequency adjust pot.	42004	2	0.5
Droop adjust pot.	42005	2	2.0
Ambient air absolute pressure	42006	2	2.0
Engine running time	42007	4	2.0
ECM on time	42009	4	2.0
Base frequency	42011	2	2.0
Base speed	42012	2	2.0
Final speed reference	42013	2	2.0
Estimated torque	42014	2	2.0
±0.2V speed bias	42015	2	2.0
±2.5V speed bias	42016	2	2.0
Fuel consumption rate	42017	2	2.0
Cumulative fuel consumption	42018	4	2.0
Governor gain adjust pot.	42020	2	2.0
Active warning fault events list_fault code	42032	32	5.0
Active shutdown fault events list_fault code	42048	32	5.0
Blowby flow	42528	2	2.0
Intake manifold absolute pressure	42529	2	2.0
Intake manifold temperature	42530	2	2.0
Coolant absolute pressure	42531	2	2.0
Fuel pump absolute pressure	42532	2	2.0
Fuel rail absolute pressure	42533	2	2.0
Fuel inlet temperature	42534	2	2.0
Timing rail absolute pressure	42535	2	2.0
Aftercooler water inlet temperature	42536	2	2.0

Data table (bits, read only, function code 01h)

Object	Protocol address (base 0)	No. of bits	Refresh time (s)
Idle/rate switch state	22000	1	2.0
Run/stop switch state	22001	1	2.0
Remote emergency stop input	22002	1	2.0
Coolant level switch state	22003	1	2.0
Common shutdown lamp/relay driver command	22004	1	2.0
Common warning lamp/relay driver command	22005	1	2.0
Fuel shut-off valve driver state	22006	1	2.0
Operator interface mode	22007	4	2.0