Description of options

DEIF
-power in control

Option H1,
CAN open communication
Engine Controller EC-1 and EC-1M
4189340407B
SW 1.3X.X

Engine Controller EC-1

TEMP 34°C

120h

Power ○

○ Alarm

AUT

ESC
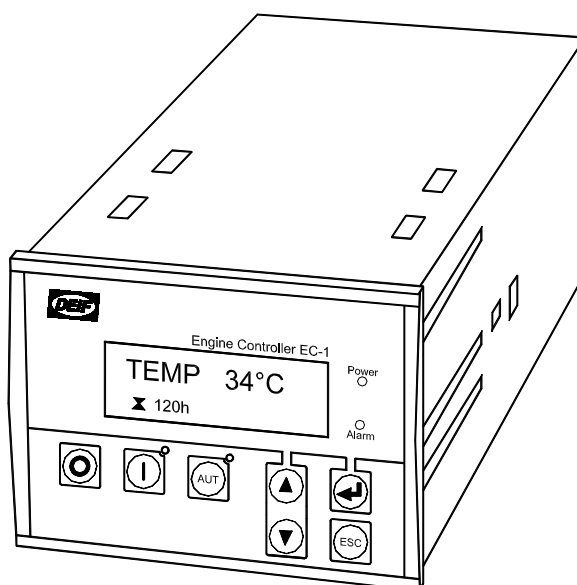
- *Description of option*

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CE

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1. Warnings and legal information

Legal information and responsibility

DEIF takes no responsibility for installation or operation of the engine set. If there is any doubt about how to install or operate the engine 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.**

Factory settings

The unit is delivered with certain factory settings. Given the fact that these settings are based on average values, they are not necessarily the correct settings for matching the individual engine. Thus precautions must be taken to check the settings before running the engine.

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 H1

Option H1 is a CAN bus based serial interface for the engine controller, EC-1/EC-1M. The CAN protocol implementation is based on the CAN open Application Layer and Communication Profile Specification CiA Draft Standard 301 Version 4.02. It is not the purpose of this protocol to describe all the functionalities of the CAN open communication. The CAN open is implemented and runs according to the CAN open standards and needs no special attention from the user.

Please use the website http://www.can-cia.com to download a detailed explanation of the CAN open description.

Hardware

The CAN terminals are placed on terminal strip 37-52.
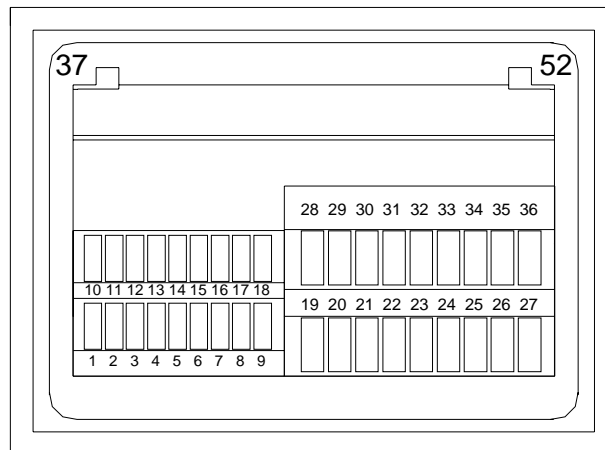
Rear view of EC-1

Slot #2	Technical data	Description
Terminal		
37	Not used	
38	Not used	
39	Not used	
40	CAN-H	CAN interface
41	Not used	
42	CAN-GND	
43	Not used	
44	CAN-L	
45	Not used	
46	Not used	
47	Not used	
48	Not used	
49	Not used	
50	Not used	
51	Not used	
52	Not used	
53	Not used	
54	Not used	
55	Not used	

Wirings
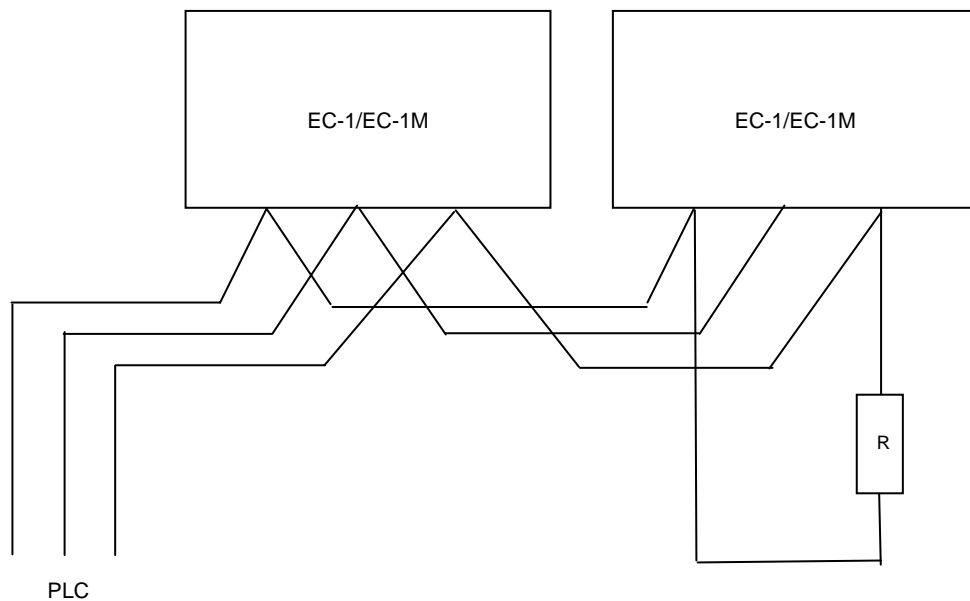
The end resistor R (~120 Ohm) is only needed, if the network is longer than 300m. Cable type: 3 x AWG 22 (0.6mm^2) Cu, <40 mΩ/m, max. 500m or equivalent.

Terminal 42 is the common CAN open port. This terminal must NEVER be connected to any point except terminal 42 in the system.

3. Functional description

Transfer types

Transfer type description

PDO transfer

Process Data Objects (PDO) provide direct access to application objects within a device, e.g. an EC-1 with option H1. The application objects for PDO transfer are the measurement values which can be seen in the table 'Application objects for PDO (page 10) and SDO transfer', (page 14).

PDOs are used to perform real-time transfers of short blocks of high priority data. Each PDO telegram must contain one COB-ID (Communication Object-Identifier) and a maximum of eight bytes of data (the application objects).

PDO telegrams are used for transfer of measurement values in this protocol (e.g. UL1-L2, UL2-L3, UL3-L1, UL1-N) from a slave device (multi-line 2 unit) to the master (PLC).

SDO transfer

Service Data Object (SDO) can be used for access with read/write attributes of all application objects (some objects can only be accessed with reading or writing attribute) implemented in the multi-line 2 regarding CAN open.

NMT transfer

Network Management (NMT) transfer is used to control the application in the slave device from the master.

Baud rate supported

Bit rates	Bus length
125 kbit/s	500 m
50 kbit/s	1000 m
20 kbit/s	2500 m
10 kbit/s	5000 m

The bit rate can be chosen using menu 4082.

> **When the bit rate is changed, the multi-line 2 must be reset (powered down) to activate the new communication speed.**

PDO transfer

PDO triggering mode

The transmission type 5 to 240 is supported in the multi-line 2 units. (Default value is 5 in the EDS file).

Each time the multi-line 2 unit has received 5 synchronisation objects (sync. telegrams with the COB-ID 0x80) from the master, the slave device is triggered to a response with all PDO telegrams using the transmission type 5 as triggering mode.

It is recommended to use the same transmit type for all the PDOs' telegrams in this protocol.

PDO static mapping

It is not possible to change the address ranges of the values used for PDO transfer. Therefore the values map in each PDO is static for application objects used for PDO transfer.

PDO configuration and allocation of COB-ID

In this application for CAN open there is room for 8 transmit PDOs, all PDOs are used for transfer of measurement values. The configuration of a PDO consists of setting the communication parameters of each PDO itself, the COB-ID and the transmission type. This protocol supports 11 bit identifiers, meaning the possibility of 2047 different COB-IDs.

Do not use COB-IDs for PDO transfer which is used for other communication processes in CAN open.

Each EC-1 unit must have a unique node-ID which is configured in the display or in the PC utility software.

COB-IDs used for PDO transfer

The tables show the default selected COB-IDs (communication object identifier) which is used for PDO transfer.

Default COB-ID, node 1

COB-ID		Number of PDO telegram
Dec.	Hex.	
385	0x181	1
641	0x281	2
897	0x381	3
1153	0x481	4
258	0x1A1	5
514	0x1C1	6
770	0x2A1	7
1026	0x2C1	8
	0x3A1	9
	0x3C1	10
	0x4A1	11
	0x4C1	12

Default COB-ID, node 2

COB-ID		Number of PDO telegram
Dec.	Hex.	
386	0x182	1
642	0x282	2
898	0x382	3
1154	0x482	4
259	0x1A2	5
515	0x1C2	6
771	0x2A2	7
1027	0x2C2	8
	0x3A2	9
	0x3C2	10
	0x4A2	11
	0x4C2	12

According to CAN open standard only PDO numbers 1 to 4 are active by default.

Example of PDO telegram

Examples of transmitting default PDO telegrams from slave device with node-ID number 1:

Field name	Example
COB-ID	0x181
U_{L1-L2}	2 bytes
F_{GEN}	2 bytes
Alarms	2 bytes
Alarms	2 bytes

Identifier allocation

In networks where the identifier allocation is to be altered by a configuration tool using SDOs (SDO transfers are used to access all objects implemented in the EC-1 unit regarding CAN open), there are some recommendations which should be taken into account. Predefined COB-ID reserved for other communication processes in CAN open than PDO transfer.

Object	Resulting identifiers (COB-ID)
NMT module control	0
Synchronisation object	128(0x80)
SDO (transmit)	1409-1535(0x581-0x5FF)
SDO (receive)	1537-1663(0x601-0x67F)
NMT error control and boot-up service	1793-1919(0x701-0x77F)

Be aware of the allocation of COB-ID for PDO transfer, because some COB-IDs are predefined for other communication processes in CAN open.

If the configuration tools cannot read the default values for the COB-ID for PDOs from the EDS file, the COB-IDs have to be allocated manually.

Additional information

It is important to be aware of some vital information that concerns CAN open features. These points must be taken into consideration when using CAN open.

1. This protocol does not support any device profile.

2. Object index 1000 and sub index 0 for device profile are implemented with the value 0x00.

3. Producer heartbeat time is supported for error control services index 0x1017 and sub index 0 default value 0.

    Identity Object index 0x1018 contains general information about the device.

Please also refer to www.can-cia.com for details.

4. Protocol tables

Application objects for PDO transfer

The availability of data is dependent on whether it is related to an option and whether the option is present. Data values not available are set to 0xFF. EIC alarms and values depend on option H5 and type of engine set.

Content	Type	
U_{L1-N}	Generator voltage. Measured in [V]	
F_{GEN}	Generator frequency. Measured in [Hz/100]	
Alarms	Bit 0	Spare
	Bit 1	Spare
	Bit 2	Spare
	Bit 3	Spare
	Bit 4	Spare
	Bit 5	4390. f/U failure
	Bit 6	Reserved
	Bit 7	1120. U-DG high step 1
	Bit 8	Reserved
	Bit 9	1130. U-DG low step 1
	Bit 10	Reserved
	Bit 11	1140. f-DG high step 1
	Bit 12	Reserved
	Bit 13	1150. f-DG low step 1
	Bit 14	Reserved
	Bit 15	Spare
Alarms	Bit 0	Spare
	Bit 1	Spare
	Bit 2	Spare
	Bit 3	Spare
	Bit 4	Spare
	Bit 5	Spare
	Bit 6	Spare
	Bit 7	Spare
	Bit 8	Spare
	Bit 9	Spare
	Bit 10	Spare
	Bit 11	Spare
	Bit 12	Spare
	Bit 13	Spare
	Bit 14	Spare
	Bit 15	Reserved

Content	Type	
Alarms	Bit 0	1350. 4-20mA input no. 1.1
	Bit 1	1360. 4-20mA input no. 1.2
	Bit 2	1370. 4-20mA input no. 2.1
	Bit 3	1380. 4-20mA input no. 2.2
	Bit 4	1390. 4-20mA input no. 3.1
	Bit 5	1400. 4-20mA input no. 3.1
	Bit 6	Spare
	Bit 7	Spare
	Bit 8	Spare
	Bit 9	Spare
	Bit 10	Spare
	Bit 11	1420. Overspeed 1 (tacho)
	Bit 12	1430. Overspeed 2 (tacho)
	Bit 13	1700. Dig. input term. 12
	Bit 14	1710. Dig. input term. 13
	Bit 15	1720. Dig. input term. 14
Alarms	Bit 0	1720. Dig. input term. 15
	Bit 1	1730. Dig. input term. 16
	Bit 2	1740. Dig. input term. 17
	Bit 3	1750. Dig. input term. 18
	Bit 4	1370. Dig. input term. 20
	Bit 5	1350. Dig. input term. 21
	Bit 6	1360. Dig. input term. 22
	Bit 7	1460. Dig. input term. 23 (Emer stop)
	Bit 8	Spare
	Bit 9	Spare
	Bit 10	Spare
	Bit 11	Spare
	Bit 12	Spare
	Bit 13	Spare
	Bit 14	Spare
	Bit 15	Spare
Alarms	Bit 0	Spare
	Bit 1	Spare
	Bit 2	Spare
	Bit 3	Spare
	Bit 4	Spare
	Bit 5	Spare
	Bit 6	1440. V. belt failure
	Bit 7	1450. Charger generator failure
	Bit 8	Spare
	Bit 9	Spare
	Bit 10	1350. Oil pressure (VDO sensor 1)
	Bit 11	1360. VDO 1.2
	Bit 12	1370. Water temperature (VDO sensor 2)
	Bit 13	1380. VDO 2.2
	Bit 14	1390. Fuel level (VDO sensor 3)
	Bit 15	1400. VDO 3.2

Content	Type	
System alarms/status	Bit 0	1880. Fuel fill fail
	Bit 1	4451. Generator breaker ON alarm
	Bit 2	4451. Generator breaker OFF alarm
	Bit 3	4451. Breaker fail
	Bit 4	4370. Gen-set start fail
	Bit 5	4410. Gen-set stop fail
	Bit 6	4220. Battery low voltage alarm
	Bit 7	4230. Battery high voltage alarm
	Bit 8	Spare
Alarm relay status	Bit 0	Relay 0
	Bit 1	Relay 1
	Bit 2	Relay 2
	Bit 3	Relay 3
	Bit 4	Relay 4
	Bit 5	Relay 5
	Bit 6	Spare
	Bit 7	Spare
	Bit 8	Spare
	Bit 9	Spare
	Bit 10	Spare
	Bit 11	Spare
	Bit 12	Spare
	Bit 13	Spare
Status	Bit 0	Preheating
	Bit 1	Starting
	Bit 2	Cooling down
	Bit 3	Extended stop
	Bit 4	Spare
	Bit 5	Spare
	Bit 6	Spare
	Bit 7	Running
	Bit 8	Breaker position OFF
	Bit 9	Breaker position ON
	Bit 10	Spare
	Number of alarms	
	Number of unacknowledged alarms	
VDO 1	Oil pressure in [bar]/10	
VDO 2	Water temp. in [^{o}C]	
VDO 3	Fuel level in [%]	
U_{SUPPLY}	Supply voltage. Measured in [V/10]	
	Analogue input no. 1 (scaled)	
	Analogue input no. 2 (scaled)	
	Analogue input no. 3 (scaled)	
Running time	Hour	
RPM	RPM	
CB$_{oper}$	Circuit beaker operations counter	

Content	Type	
EIC warnings	Bit 0	Low oil pressure
	Bit 1	High coolant temperature
	Bit 2	Charge 61
	Bit 3	EMS
	Bit 4	Stop limit exceeded
	Bit 5	EMR
	Bit 6	JDEC
	Bit 7	Intake manifold
	Bit 8	Fuel injection pump
	Bit 9	Spare
	Bit 10	Spare
	Bit 11	Spare
	Bit 12	Spare
	Bit 13	Spare
	Bit 14	Spare
	Bit 15	Spare
EIC shutdown	Bit 0	Overspeed
	Bit 1	Low oil pressure
	Bit 2	High coolant temperature
	Bit 3	EMR
	Bit 4	JDEC
	Bit 5	EMS
	Bit 6	Fuel temperature
	Bit 7	Fuel control valve
	Bit 8	ECU failure
	Bit 9	Spare
	Bit 10	Spare
	Bit 11	Spare
	Bit 12	Spare
	Bit 13	Spare
	Bit 14	Spare
	Bit 15	Spare
EIC speed	RPM	
EIC coolant temperature		
EIC oil pressure		
EIC number of actual faults		
EIC engine oil temperature		
EIC fuel temperature		
EIC boost pressure		
EIC air inlet temperature		
EIC coolant level		
EIC fuel rate		
EIC charge air pressure		
EIC charge air temperature		
EIC air inlet pressure		
EIC exhaust gas temperature		
EIC engine hours		
EIC oil filter differential pressure		
EIC battery voltage		

EDS file

The EDS file (ELECTRONIC DATA SHEETS) is used for configuration tools to read the implementation of the supported CAN open features. The EDS file contains the object dictionary and can be downloaded at www.deif.com.

5. Parameter list

The parameter setup is performed through the PC utility software (USW). In the following the parameter settings are presented in tables.

Default settings can be changed to the relevant settings.

System
4080 External comm. ID
4090 External comm. error

Settings

4080 External comm. ID

No.	Setting		Min. setting	Max. setting	Factory setting
4080	External comm. ID	Selection display	-	-	-
4081	External comm. ID	ID	1	30	1
4082	External comm. ID	Baud rate	10kbit/s	125kbit/s	125kbit/s

(i)   **The possible Baud rates are 10, 20, 50, 125kbit/s.**

4090 External comm. error

| No.	Setting		Min. setting	Max. setting	Factory setting
4090	External comm. error	Selection display	-	-	-
4091	External comm. error	Delay	1.0 s	100.0 s	10.0 s
4092	External comm. error	Relay output A	R0 (none)	R4 (relay 4)	R0 (none)
4093	External comm. error	Relay output B	R0 (none)	R4 (relay 4)	R0 (none)
4094	External comm. error	Enable	OFF	ON	OFF

Possible comm. errors

- 'Failed CAN transmit':   E.g. noise disturbances or CAN bus line not connected
- 'Failed CAN bus OFF':   E.g. noise disturbances or CAN bus line short-circuited

In order for comm. errors to work, the heartbeat must be activated.

Setting of the Comm. command input

In the example above binary input 5 (terminal 17) is used for activating/deactivating external communication. When the input is activated, a positive input signal on the digital input (terminal 17 in the above example) will set the CAN open port as priority, if the input is then deactivated (no positive voltage on terminal 17), the EC-1 is controlled from the binary inputs only.

> **If the input Ext. communication command is set to be 'not used', then the CAN open port will have priority. As a consequence, the EC-1 can no longer be controlled using the digital inputs.**

DEIF A/S reserves the right to change any of the above