



DSEControl



DEEP SEA ELECTRONICS

DSEM640 & DSEM643 Operator Manual

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DSEM640 & DSEM643 Operator Manual

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Revision History

Issue No.	Comments
1	First Issue 06/07/16
2	Corrected comments for pins on connectors B and C. Corrected Program Enable pin instructions. Added failure codes. Additional detail throughout.
3	Added DSEM643.
4	Updated to reflect changes for M640 / M643 V1.3 firmware (changes to Phase inputs), correction to the main typical wiring diagram. Device housing updated on dimensions diagram to match device housing update for Q3 2020. Corrected 'Applicable Pin' list for OUT H. Added 'silicone grease' note for M12 O-rings. Added section about Application Update by .app and .pkg file.
5	Update for M640/M643 firmware V2.0
6	Added Manual Shutdown details (previously missing) and additional Program Enable pin troubleshooting. Troubleshooting item for 'lost user login details.' More detail about Output Supply inputs. Additional instructions within Application Update section. Added DSE_CAN Guide to Technical Information section.

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1 INTRODUCTION

This document details the operation and setup requirements of the DSEM640 and DSEM643, part of the DSEControl® range of products.

The manual forms part of the product and should be kept for the entire life of the product. If the product is passed or supplied to another party, ensure that this document is passed to them for reference purposes.

This is not a *controlled document*. DSE do not automatically inform on updates. Any future updates of this document are included on the DSE website at www.deepseaelectronics.com

Observe the operating instructions. Non-observance of the instructions, operation not in accordance with use as prescribed below, wrong installation or incorrect handling seriously affects the safety of operators and machinery.

A robust metal case designed for chassis mounting houses the module. Connections are via locking plug and sockets.

DSEM640 and DSEM643 have identical functionality, with DSEM643 having a lower I/O (Input/Output) count, half that of the DSEM640. This is achieved by omitting Connector B on DSEM643. This allows cost savings to be made where the application is less demanding.

The controller is supplied with no application program. The equipment manufacturer is responsible for creating and managing the application program and installing it in the controller. This is achieved using CODESYS V3.5. Contact DSE Technical Support for further details.



DSEM640



DSEM643

1.1 CLARIFICATION OF NOTATION

Clarification of notation used within this publication.

	NOTE:	Highlights an essential element of a procedure to ensure correctness.
	CAUTION!	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
	WARNING!	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

1.2 GLOSSARY OF TERMS

Term	Description
+ve	Positive
-ve	Negative
AIN	Analogue Input
Application	The application is the program that allows the device to control the machine to which it is connected. The Application within the device is designed and provided by the manufacturer of the complete machine.
Bootloader	The Bootloader is the program within the device responsible for loading the Operating System (handling the transfer of .pkg files via DSEServiceTool PC Software or by USB memory stick). CODESYS cannot connect to the device while it's in Bootloader mode.
CAN	Control Area Network. A high-speed data transmission system used extensively within the Automotive and Off-Highway industries.
CM	CodeMeter used by CODESYS for download security. This checks for the presence of the Program Enable pin before transfer of the application from CODESYS to the device.
CODESYS (Previously stylised as CoDeSys)	Integrated Development Environment for programming controller applications according to the international industrial standard IEC 61131-3. device supports CODESYS V3.5
DIN	Digital Input
ECM	Engine Control Module. For example, the Engines own Electronic Control Unit or CAN ECU.
ECU	Electronic Control Unit. For example, the device. Engine Control Unit. For example, the Engines own Electronic Control Unit or CAN ECU.
Firmware	The Firmware of the device is the Operating System of the device that reads and executes the Application program.
Floating	Refers to a signal line with a high impedance connection (or open circuit) to a supply line.
FSD	Full Scale Deflection. For example, 0 mA to 20 mA is the Full Scale Deflection of a current sink input.
IDE	Integrated Development Environment. For example, the CODESYS V3.5 application that runs on the host PC is an IDE.
I/O	Input / Output. For example, "The I/O is taken out to an external terminal strip in the user panel".
Ixyyy	An Input, where x is the connector and yyy is the input number. For example, IC005 means Input 5 on Connector C.

Continued Overleaf...

Term	Description
Off-Highway	An industrial vehicle used primarily "off road". For example construction and farm machinery. A wider interpretation includes on road access platforms, emergency vehicles and other industrial machinery, used either on the road, or off road.
OUTL / OUTH	Digital output that switches Low (to GND) or High (to output supply) when active.
Pin	A male or female pin connection in a housing (plug or socket).
PLC	Programmable Logic Controller. Industrial computer used primarily for the automation of electromechanical machinery.
Pull-Up or Pull-Down	A resistor used to bias a signal line towards a positive (Pull-Up) or negative (Pull-Down) supply.
PWM PWMi	A digital signal is used to represent an analogue value by using Pulse Width Modulation. The mark-space ratio of a square wave changes to represent the value. Used for many control applications including proportional valves. PWM = The application specifies the duty cycle of the output. PWMi = The application specified the current target of the output. The duty cycle is adjusted automatically to maintain the current drawn from the output.
Qxyyy	An Output, where x is the connector and yyy is the output number. For example, QB022 means Output 22 on Connector B.

1.3 RELATED INFORMATION

This document refers to, and is referred by the following DSE publications which are obtained from the DSE website: www.deepseaelectronics.com or by contacting DSE technical support: support@deepseaelectronics.com.

1.3.1 TECHNICAL INFORMATION

DSE Part	Description
055-198	DSEM640 Datasheet
055-236	DSEM643 Datasheet
053-186	DSEM640 & DSEM643 Installation Instructions
057-265	DSEServiceTool PC Software Manual
057-336	DSE_CAN Usage Guide

1.3.2 ADDITIONAL INFORMATION

The following information relates to optional equipment compatible with the DSEM640 & DSEM643.

DSE Part	Description
057-261	DSEM040 Development Kit Operator Manual

1.4 SAFETY INSTRUCTIONS

1.4.1 GENERAL

- These instructions are for authorised persons according to the EMC and low-voltage directives. The device must be installed, connected, and put into operation by a qualified electrician.
- It is not permissible to open the controller or to modify or repair the controller. Modification or repairs to the wiring could result in dangerous malfunctions. Repairs to the controller must be performed by DSE. Contact your original equipment supplier in the case of malfunction.
- When the device is unpowered, ensure that no connection pins are connected to a voltage source. Thus, when the supply is switched off, the supply for the electronics, the power outputs and the external sensor supply must be switched off together.
- The controller will heat up beyond normal ambient temperature during operation. To avoid danger caused by elevated temperatures, protect against contact.
- The customer is responsible for performing risk analysis of the mobile working machine and determining the possible safety related functions. The user is responsible for the safe function of the application programs created. If necessary, they must additionally carry out an approval test by corresponding supervisory and test organisations according to the national regulations.
- All connectors must be unplugged from the electronics during electrical welding and painting operations.

1.4.2 INSTALLATION NOTES

- Follow the instructions of the connector manufacturer, specifically with respect to preventing water from entering the device. See Section entitled *Cables, Connectors, Harnesses and Spare Parts* for details of DSE Part Numbers.
- To maintain IP67 rating where connectors have unused pins, ensure the use of a suitable Blanking Insert. In the case of a completely unused connector, the plug must be inserted, fully populated with Pin Blanking Inserts. See Section entitled *Cables, Connectors, Harnesses and Spare Parts* for details.
- M12 protection plugs supplied, protected with silicone grease, must be installed in both the USB and Ethernet interfaces to ensure IP67 rating.
- The case must be wired to vehicle ground to comply with EMC guidelines. Metallic screws must be used to create an electrical connection to vehicle / machine ground.

2 SPECIFICATIONS

2.1 PROCESSOR

Description	Specification
Processor Type	Ti Hercules™ RM microcontroller 32 bit ARM cortex - R4FCPU
Speed	220 MHz

2.2 MEMORY

Description	Specification
Flash	11 MB Total
RAM	8 MB Total
FRAM (Retained Data)	512 kB

2.3 DC SUPPLY

Description	Specification
Operating Voltage (Connector A, Pin 4)	8 V to 32 V
Maximum Current (no external loads)	300 mA at 24 V
Maximum Current (ignition off)	5 mA at 24 V

2.3.1 FUSING

NOTE: Maximum total current of the device is 32 A. This includes the device current consumption plus the current supplied to the outputs. Each Output supply is rated Max 16 A. Output Supply 1 + Output Supply 2 must not exceed 16 A. Output Supply 3 + Output Supply 4 must not exceed 16 A.

Description	Specification
DC Supply (Connector A, Pin 4)	3 A
High Current Outputs supply Fuse as required by connected loads (Connector A, Pins 1, 8, 16, 23)	16 A Max for each Output Supply.

2.3.2 OUTPUT SUPPLY 1,2,3,4

▲ NOTE: Maximum total current of the device is 32 A. This includes the device current consumption plus the current supplied to the outputs. Each Output supply is rated Max 16 A. Output Supply 1 + Output Supply 2 must not exceed 16 A. Output Supply 3 + Output Supply 4 must not exceed 16 A.

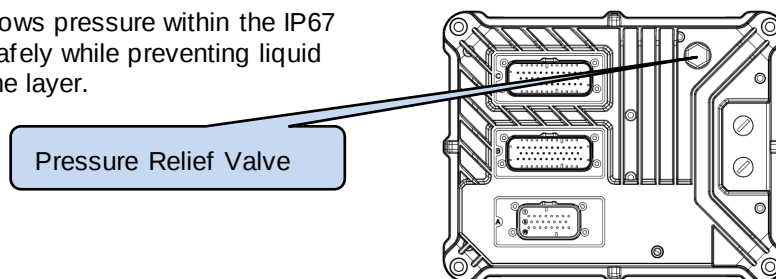
Output Supply pins are isolated from the DC Supply on A4 and are switched by the relevant outputs. Differing supplies are supported on each pin, so (for example) it is possible to have some outputs with 12 V supply, with others at 24 V supply.

Description	Specification
Output Supply 1,2,3,4	8 V to 32 V
Maximum Current for Output Supplies	▲ NOTE: Maximum total current of the device is 32 A. This includes the device current consumption plus the current supplied to the outputs. Each Output supply is rated Max 16 A. Output Supply 1 + Output Supply 2 must not exceed 16 A. Output Supply 3 + Output Supply 4 must not exceed 16 A.
	16 A Max for each Output Supply.
Output Supply 1 and 2 -ve (Pin A7) Not fitted to DSEM643	
Output Supply 1 +ve (Pin A1) Not fitted to DSEM643	Used to supply QB002 (B35), QB003 (B13), QB005 (B1), QB008 (B34), QB009 (B27), QB012 (B33), QB013 (B26), QB016 (B32), QB017 (B25), QB018 (B24)
Output Supply 2 +ve (Pin A8) Not fitted to DSEM643	Used to supply QB001 (B2), QB004 (B12), QB006 (B23), QB007 (B3), QB010 (B4), QB011 (B10), QB014 (B5), QB015 (B11)
Output Supply 3 and 4 -ve (Pin A9)	
Output Supply 3	Used to supply QC002 (C35), QC008 (C34), QC009 (C27), QC012 (C33), QC013 (C26), QC016 (C32), QC017 (C25), QC018 (C24)
Output Supply 4	Used to supply QC001 (C2), QC003 (C13), QC004 (C12), QC005 (C1), QC006 (C23), QC007 (C3), QC010 (C4), QC011 (C10), QC014 (C5), QC015 (C11)

2.4 ENVIRONMENTAL

Description	Specification
Operating Temperature at sea level	-40 °C to +85 °C (-40 °F to 185 °F)
Storage Temperature at sea level	-40 °C to +85 °C (-40 °F to 185 °F)
Degrees of Protection Provided by Enclosure (with all mating connectors fitted)	IP67 (NEMA 6)

The pressure relief valve allows pressure within the IP67 sealed device to equalise safely while preventing liquid ingress due to the membrane layer.



2.5 INPUTS

2.5.1.1 IGNITION

Ignition is used to energise / deenergise the device. The pin must be switched from the same supply as ECU.

Description	Specification
Ignition. Same supply as ECU (Connector A, Pin 4)	Connector A, Pin 3
Input Voltage for OFF	0 V
Input Voltage for ON	4 V DC to 32 V DC

2.5.1.2 PROGRAM ENABLE

NOTE: Ensure to remove the *Program Enable* Pin once you have finished. Powering up with *Program Enable* active results in the device entering *Bootloader* mode, hence the application is not active.

Description	Specification
Program Enable	Connector A, Pin 6
Program Enable pin pull-down resistance	33 kΩ
Minimum voltage for active (Program Enable)	6 V
Maximum voltage for inactive	2 V

Program Enable pin has two functions as listed below.

- To configure (program) the device or activate *Debug Mode* via CODESYS V3:
 - Power down the device.
 - Disconnect *Program Enable* pin.
 - Apply DC power to the device.
 - Wait a few seconds.
 - Connect *Program Enable* pin to battery positive.
 - Program the device (i.e., using CODESYS V3).

2. To use the *DSEServiceTool* software to update firmware or download the application program to the device:
 - Power down the device.
 - Connect *Program Enable* pin to battery positive.
 - Apply DC power to the device.
 - Use *Service Tool* software as desired.

2.5.2 DIGITAL INPUTS

2.5.2.1 DIGITAL



NOTE: Connector B is not fitted to DSEM643.



NOTE: Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 6, 9, 14, 15, 16, 22, 28, 31
Minimum voltage for High Level	6 V
Maximum voltage for Low Level	2 V
Internal Pull Up Resistance (when configured)	2.2 k Ω to internal 12 V reference
Internal Pull Down Resistance (when configured)	13 k Ω to internal 0 V reference
Impedance of input when set to <i>Float</i>	30 k Ω

2.5.2.2 FREQUENCY



NOTE: Connector B is not fitted to DSEM643.



NOTE: Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 6, 9, 14, 15, 16, 22, 28, 31
Frequency Range	5 Hz to 30 kHz
Resolution	100 Hz at Maximum Frequency
Accuracy	400 Hz at Maximum Frequency
Minimum voltage for High Level (Mark)	6 V
Maximum voltage for Low Level (Space)	2 V

2.5.2.3 PHASE

 **NOTE:** Connector B is not fitted to DSEM643.

 **NOTE:** From M640 / M640 V1.3 onwards, each phase measurement requires the two inputs be 'neighbouring' as detailed below.

 **NOTE:** Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 6, 9, 14, 15, 16, 22, 28, 31
Frequency Range	5 Hz to 30 kHz
Resolution	1°
Accuracy	1°
Minimum voltage for High Level (Mark)	6 V
Maximum voltage for Low Level (Space)	2 V

Phase measurement functionality requires two inputs. The phase measured is the phase between them.

From M640 / M640 V1.3 onwards, each phase measurement requires two 'neighbouring' inputs as detailed below:

DSEM640

Input	IB009	IB010	IB011	IB012	IB013	IB014	IB015	IB016
Input Pin	B6	B14	B15	B16	B28	B9	B22	B31
Reference	IB010	IB011	IB012	IB013	IB014	IB015	IB016	IB009
Reference Pin	B14	B15	B16	B28	B9	B22	B31	B6

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Input	IC009	IC010	IC011	IC012	IC013	IC014	IC015	IC016
Input Pin	C6	C14	C15	C16	C28	C9	C22	C31
Reference	IC010	IC011	IC012	IC013	IC014	IC015	IC016	IC009
Reference Pin	C14	C15	C16	C28	C9	C22	C31	C6

2.5.2.4 PULSE COUNTER



NOTE: Connector B is not fitted to DSEM643.



NOTE: For *directional* encoders, use an Encoder input type for the A signal and Frequency input type for the B signal.



NOTE: Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 6, 9, 14, 15, 16, 22, 28, 31
Frequency Range	5 Hz to 30 kHz
Counter Range	2^{24} (16777215)
Direction	Up / Down
Resolution	1 count

2.5.2.5 ENCODER

 **NOTE:** Connector B is not fitted to DSEM643.

 **NOTE:** For *non-directional* encoders, use a Pulse Counter input type.

 **NOTE:** From M640 / M640 V1.3 onwards, each phase measurement requires the two inputs be 'neighbouring' as detailed below.

 **NOTE:** Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 6, 9, 14, 15, 16, 22, 28, 31
Frequency Range	5 Hz to 30 kHz
Counter Range	2 ²⁴ (16777215)
Direction	Up / Down
Resolution	1 count

Encoder measurement functionality requires two inputs. The phase between them is monitored to know the direction of encoder movement.

Input Pin must be configured as *Encoder* (for the A input), with *Reference Pin* being configured as *Frequency* (for the B input).

From M640 / M640 V1.3 onwards, each phase measurement requires two 'neighbouring' inputs as detailed below:

DSEM640

Input	IB009	IB010	IB011	IB012	IB013	IB014	IB015	IB016
Input Pin	B6	B14	B15	B16	B28	B9	B22	B31
Reference	IB010	IB011	IB012	IB013	IB014	IB015	IB016	IB009
Reference Pin	B14	B15	B16	B28	B9	B22	B31	B6

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Input	IC009	IC010	IC011	IC012	IC013	IC014	IC015	IC016
Input Pin	C6	C14	C15	C16	C28	C9	C22	C31
Reference	IC010	IC011	IC012	IC013	IC014	IC015	IC016	IC009
Reference Pin	C14	C15	C16	C28	C9	C22	C31	C6

2.5.3 ANALOGUE INPUTS

2.5.3.1 VOLTAGE



NOTE: Connector B is not fitted to DSEM643.



NOTE: Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Where the device supplying the input voltage is supplied itself by M64x ECU Supply or M64x Vref Supply, consider using a *Ratiometric* input type.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 7, 8, 17, 18, 19, 20, 29, 30
Configurable Ranges	0 V to 5 V 0 V to 10 V 0 V to 32 V
Input Resistance	30 kΩ
Sampling Rate	1 kHz

Voltage Measurement resolution and accuracy

Configured Range	Resolution (12 bits)	Accuracy (±1%) FSD
0 V to 5 V	0.001 V	±0.05 V
0 V to 10 V	0.01 V	±0.1 V
0 V to 32 V	0.3 V	±0.32 V

2.5.3.2 CURRENT



NOTE: Connector B is not fitted to DSEM643.



NOTE: Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 7, 8, 17, 18, 19, 20, 29, 30
Configurable Ranges	0 mA to 20 mA 4 mA to 20 mA
Input Type	Current sink only
Input Sink Resistance	100 Ω
Sampling Rate	1 kHz
Resolution (12 bits)	0.005 mA
Accuracy (± 1 % Full Scale Deflection)	0.2 mA

2.5.3.3 RESISTIVE



NOTE: Connector B is not fitted to DSEM643.



NOTE: Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 7, 8, 17, 18, 19, 20, 29, 30
Measurement Range	0 Ω to 3400 Ω
Measurement source voltage	12 V
Measurement source current	1 mA
Sampling Rate	1 kHz
Resolution (12 bits)	0.78 Ω
Accuracy (± 1 % Full Scale Deflection)	32 Ω

2.5.3.4 RATIOMETRIC



NOTE: Connector B is not fitted to DSEM643.



NOTE: Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Ratiometric inputs consider the supply voltage as reference when measuring. Therefore, they are not affected by rise and fall as the supply changes. Select this input type when the voltage being measured is supplied by, and is affected by, either the M64x ECU Supply or the M64x Vref supply.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 7, 8, 17, 18, 19, 20, 29, 30
Measurement voltage reference	Supply (Pin 4)
Measurement	Ratio of input Pin to Supply (Pin 4)
Measurement source current	1 mA
Accuracy (± 1 % Full Scale Deflection)	0.36 V (based upon maximum supply voltage of 36 V)

2.6 OUTPUTS

 **NOTE:** Maximum total current of the device is 32 A. This includes the device current consumption plus the current supplied to the outputs. Each Output supply is rated Max 16 A.

 **NOTE:** Also see section Output Supply 1,2,3,4 elsewhere in this document.

2.6.1 NEGATIVE SWITCHING

 **NOTE:** Connector B is not fitted to DSEM643.

Description	Specification
2 A Switching Current Applicable Inputs (Connector B and C)	Pins 1, 12, 13, 23, 24
4 A Switching Current Applicable Inputs (Connector B and C)	Pins 12, 13, 25
Maximum voltage for output ON	2 V
Maximum current for output OFF	10 mA at 24 V output supply

2.6.2 POSITIVE SWITCHING

 **NOTE:** Connector B is not fitted to DSEM643.

Description	Specification
2 A Switching Current Applicable Inputs (Connector B and C)	Pins 1, 2, 3, 5, 11, 12, 13, 23, 24, 26, 32, 34, 35
4 A Switching Current Applicable Inputs (Connector B and C)	Pins 2, 4, 10, 12, 13, 25, 27, 33, 35
Minimum voltage for output ON	Output supply -2 V
Maximum current for output OFF	10 mA at 24 V output supply

2.6.3 PWM

 **NOTE:** Connector B is not fitted to DSEM643.

 **NOTE:** When configuring or *plugging* PWM outputs, V2 onwards has an additional selection of *PWM Accurate*, providing ten times greater PWM duty cycle resolution.

 **NOTE:** Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

Description	Specification
Applicable Inputs (Connector B and C)	Pins 1, 2, 3, 12, 13, 23, 34, 35
Peak Current Rating (output ceases if rating is exceeded)	5 A
Frequency Range	20 Hz to 250 Hz
Frequency Resolution	0.1 Hz
Frequency Dither (Configurable)	0 Hz to 25 Hz
Duty Cycle Range	0 % to 100 %
Duty Cycle Resolution (<i>PWM</i> output type)	1 %
Duty Cycle Resolution (<i>PWM Accurate</i> output type) V2 onwards.	1 %
Accuracy	±1 % Full Scale Deflection
Dither Amplitude (Configurable)	0 % to 10 %
Minimum Load Impedance	3 Ω at 12 V 6 Ω at 24 V

2.6.3.1 PWMI CURRENT RESOLUTION

 **NOTE:** Consult *CODESYS | Library Manager | DSE Standard Library* for additional online help relating to input / output settings.

PWMI automatically adjusts duty cycle to maintain a given current draw from the output. Configurable PID settings (within the user application code) are used to adjust the gain and stability of the control.

Configured Range	Current Resolution
0 A to 2 A	1 mA
0 A to 4 A	2 mA

2.7 COMMUNICATIONS

2.7.1 CAN

 **NOTE:** CAN connections are NOT internally terminated. A complete CAN network must have 120 Ω terminators at each end of the network.

 **NOTE:** Screened 120 Ω impedance cable specified for use with CAN must be used for the CAN links.
DSE stock and supply Belden cable 9841 which is a high quality 120 Ω impedance cable suitable for CAN use (DSE part number 016-030).

Description	Specification
Number of CAN interfaces	4
Supported Protocols	J1939 CAN open Raw CAN CODESYS (Application upload/download)
Supported Baud Rates	50 kbit/s, 120 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s

2.7.2 ETHERNET

NOTE: When fitted with the supplied 'blanking plug' and integral O-ring, the Ethernet socket is sealed against the environment to IP67 (NEMA 6). Ensure suitable protection is provided when removing this plug and connecting an Ethernet cable. A suitable O-ring is available from DSE, part number 011-137.

NOTE: For details of *Web Settings* pages, see section entitled *Inbuilt Web Settings* elsewhere in this document.

Description	Specification
Number of Ethernet ports	1
Supported data rates	10 Mbits / 100 Mbits, Full Duplex
Supported Protocols	MODBUS TCP Server CODESYS 3.5 Inbuilt <i>Web Settings</i> Pages. Other protocols possible by using coding (CODESYS syssock library is available to assist)
MAC Address	Device MAC address is shown in the <i>Web Settings</i> pages.
Factory Settings	IP Mode: Static IP Address: 192.168.1.100 Subnet Mask: 255.255.255.0 Gateway: 192.168.1.1 DNS Server: 192.168.1.1 Hostname: M640 (or M643) With factory settings, Inbuilt <i>Web Settings</i> Pages accessible at http://192.168.1.100:8080

M12 'D' Coded – 4 Pin Female	Pin	Description
	1	Tx+
	2	RC+
	3	TX-
	4	RC-

2.7.3 USB

Allows a pkg (package) file to be applied to the device. Package (pkg) files contain either device bootloader/firmware or device application updates. The USB device cannot be used to store application data. For alternative option, see section entitled *Programmatic File Access* elsewhere in this document.

NOTE: When fitted with the supplied 'blanking plug' and integral O'ring, the USB socket is sealed against the environment to IP67 (NEMA 6). Ensure suitable protection is provided when removing this plug and connecting a USB cable. A suitable O'ring is available from DSE, part number 011-137.

Description	Specification
Number of Ethernet Ports	1
USB Version	2
Supported Speeds	Full Speed (12 Mbit/s)
Device Class	08 (Mass Storage)
Filing System	FAT32

M12 'B' Coded – 5 Pin Female	Pin	Description
	1	5 V
	2	Data-
	3	Data+
	4	0 V
	5	Shield

2.8 APPLICABLE STANDARDS

Category	Description	Standard
CE marking (Industrial)	Electromagnetic compatibility (EMC) noise immunity Electromagnetic compatibility (EMC) emission standard	EN 61000-6-2 EN 61000-6-4
CE marking (Off-Highway)	Electromagnetic compatibility (EMC)	EN ISO 13766-1:2008
E11	EMC requirements for vehicles Noise immunity with 100 V/m	UN/ECE-R10.05 ISO 11452-2
Electrical tests	Pulse 1, severity level: III; function state C Pulse 2a, severity level: III; function state A Pulse 2b, severity level: III; function state C Pulse 3a, severity level: III; function state A Pulse 3b, severity level: III; function state A Pulse 4, severity level: III; function state A Pulse 5a, severity level: III; function state C	ISO 7637-2 (2004)
Climatic tests	Damp heat, cyclic upper temperature 55 °C Damp heat, steady state test temperature 40 °C / 93% RH Test duration: 21 days Salt spray test severity level 3 (vehicle)	EN 60068-2-30 EN 60068-2-78 EN 60068-2-52
Mechanical tests	Test VII; vibration, random mounting location: vehicle body. Vibration, sinusoidal 10...500 Hz; 0.73 mm / 10 g: 10 cycles / axis. bumps 30 g / 6 ms; 24,000 shocks	ISO 16750-3 EN 60068-2-6 ISO 16750-3

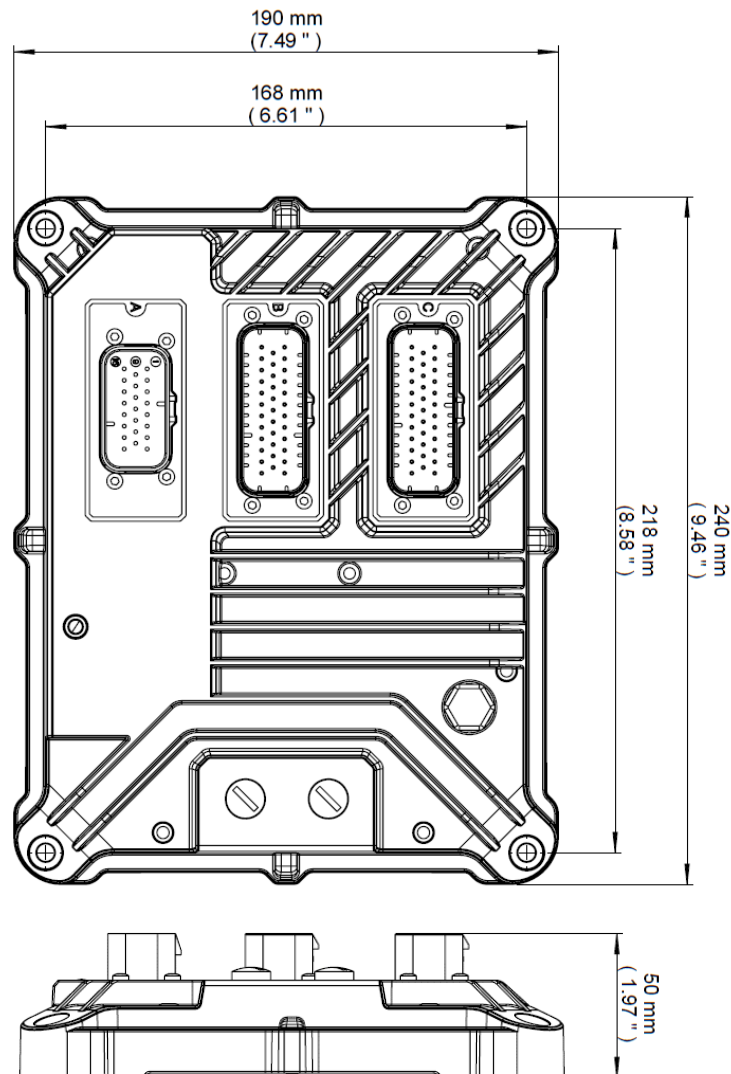
3 INSTALLATION

3.1 DIMENSIONS AND MOUNTING

3.1.1 DIMENSIONS

Description	Specification
Overall Dimensions (Height X Width X Depth)	240 mm X 190 mm X 49 mm (9.45 " X 7.48 " X 1.46 ")
Mounting Holes	Suitable for M6 bolts (1/4" holes)
Mounting Hole Centres	218 mm X 169 mm (8.58 " X 6.65 ")
Mounting Bolt Material Recommendation	Steel or Stainless Steel
Mounting Bolt Tightening Torque	8 Nm $\pm$ 2 Nm
Overall Weight	1.58 kg

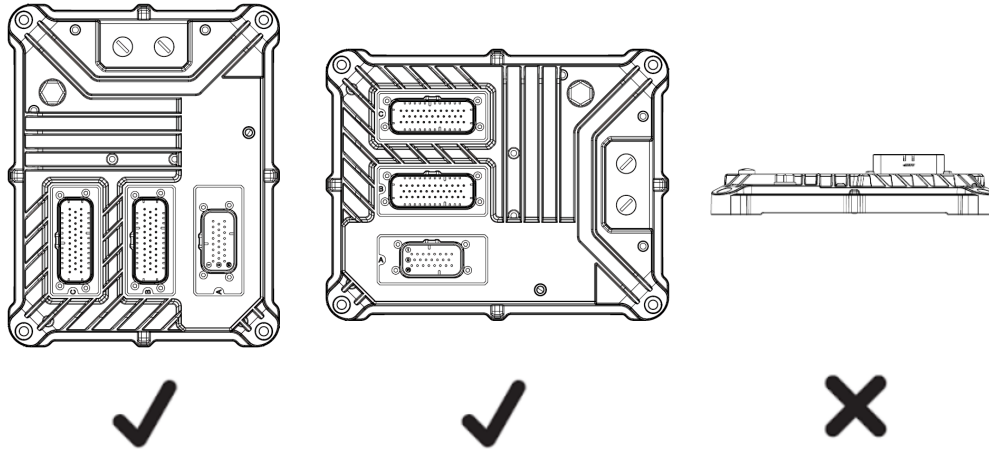
NOTE: Connector B (centre connector) is not fitted to DSEM643.



3.1.2 MOUNTING

3.1.2.1 ORIENTATION

Install the controller in such a way to allow any condensation that may form to flow out.

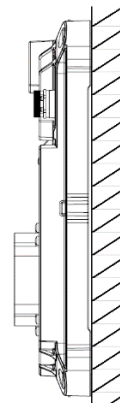


3.1.2.2 SURFACE

The controller must be mounted on a flat surface.

Use compensating elements if there is no flat mounting surface available.

For steel surfaces, ensure that it is protected against corrosion.



3.1.2.3 FIXING

4 x M6 Screws (one in each corner of the controller)

Screw material: steel or stainless steel

Tightening torque: 8 Nm $\pm$ 2 Nm

3.1.2.4 GROUNDING

To ensure the protection of the device against electrical interference and the safe function of the device, the housing must be connected to the ground of the vehicle / machine.

3.2 FUSING

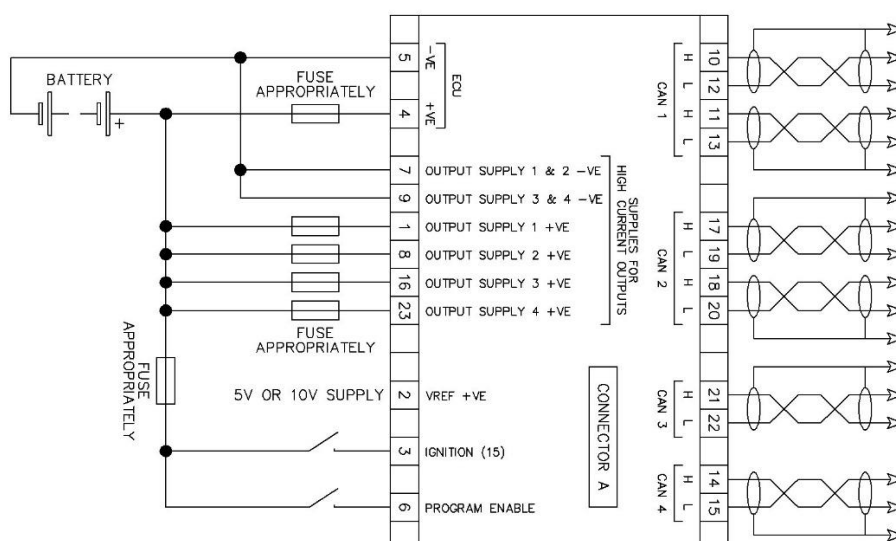
The individual electric circuits must be fused to protect the complete system. Select appropriate fuses to protect the outputs being supplied.

NOTE: Output Supplies must be connected (even if the outputs are not used in the project) to ensure *Output Supply Under Voltage* alarms are not raised by the device.

NOTE: Maximum total current of the device is 32 A. This includes the device current consumption plus the current supplied to the outputs. Each Output supply is rated Max 16 A. Output Supply 1 + Output Supply 2 must not exceed 16 A. Output Supply 3 + Output Supply 4 must not exceed 16 A.

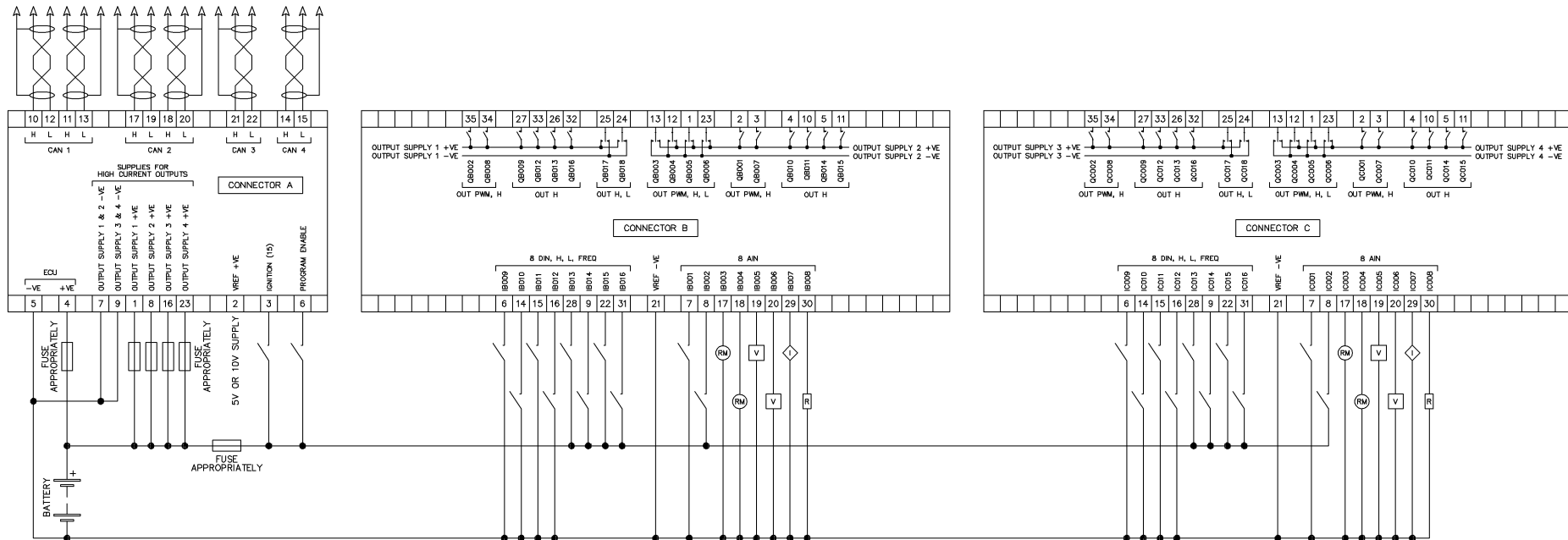
NOTE: Connector B is not fitted to DSEM643.

Pin	Description	Comments	Recommended Fuse Size
1	Output Supply 1 Not fitted to DSEM643	Supplies Outputs QB002 (B35), QB003 (B13), QB005 (B1), QB008 (B34), QB009 (B27), QB012 (B33), QB013 (B26), QB016 (B32), QB017 (B25), QB018 (B24)	16 A Max
2	VREF Output	Provides auxiliary supply output (application configurable as OFF / 5 V / 10 V)	100 mA Max
3	Ignition (15)	Supplied by a switch connected to Pin A4 (ECU+) of the same ECU device.	1 A Max
4	ECU Supply	Supplies device ECU	3 A Max
8	Output Supply 2 Not fitted to DSEM643	Supplies Outputs QB001 (B2), QB004 (B12), QB006 (B23), QB007 (B3), QB010 (B4), QB011 (B10), QB014 (B5), QB015 (B11)	16 A Max
16	Output Supply 3	Supplies Outputs QC002 (C35), QC008 (C34), QC009 (C27), QC012 (C33), QC013 (C26), QC016 (C32), QC017 (C25), QC018 (C24)	16 A Max
23	Output Supply 4	Supplies Outputs QC001 (C2), QC003 (C13), QC004 (C12), QC005 (C1), QC006 (C23), QC007 (C3), QC010 (C4), QC011 (C10), QC014 (C5), QC015 (C11)	16 A Max



3.3 TYPICAL CONNECTION DIAGRAM

NOTE: Connector B is not fitted to DSEM643. *Output Supply 1 & 2 (Connector A, Pins 7 & 9) are not fitted to DSEM643.*

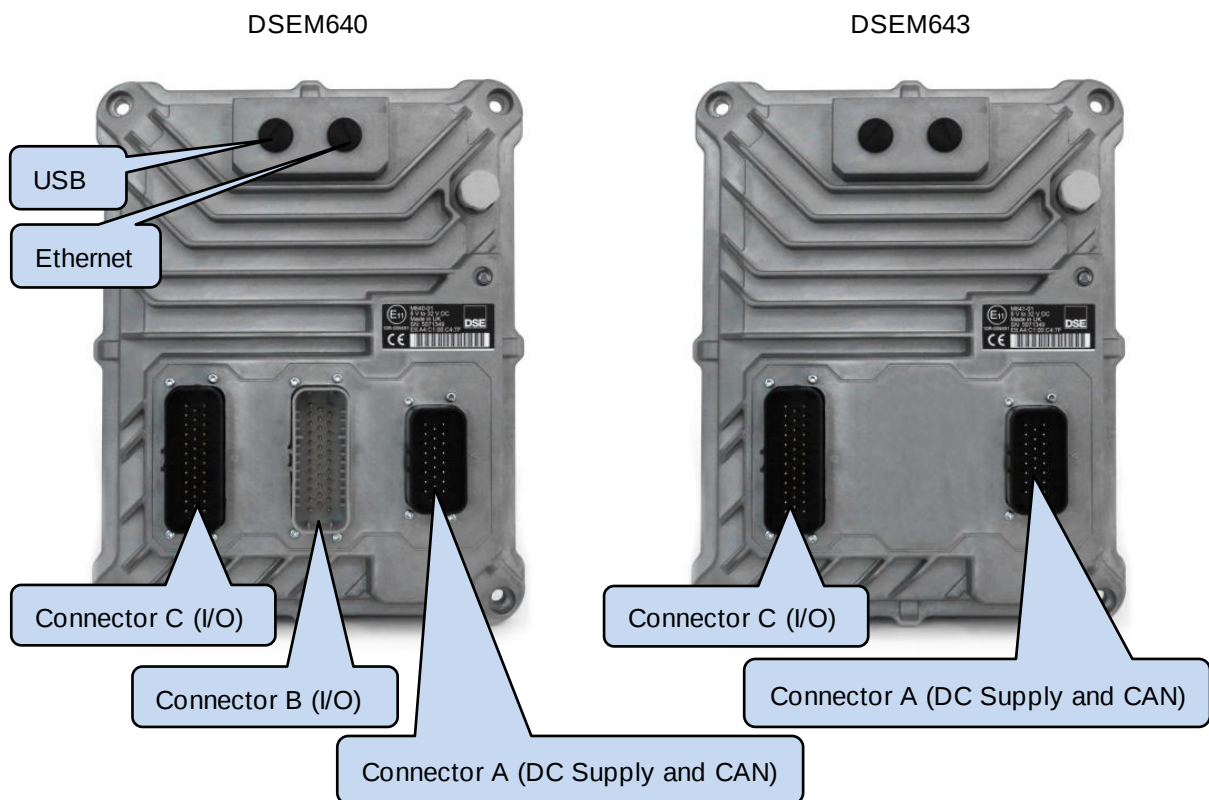


3.4 USER CONNECTIONS

NOTE: If a prewired connection cable is used, remove the cores with unused signal inputs and outputs. Unused cores, in particular *core loops*, lead to interference coupling that can influence the connected controller.

NOTE: When fitted with the supplied 'blanking plug' and integral O'ring, the Ethernet and USB sockets are sealed against the environment to IP67 (NEMA 6). Ensure suitable protection is provided when removing these plugs and connecting a cable. A suitable O'ring is available from DSE, part number 011-137.

NOTE: Connector B is not fitted to DSEM643.



3.4.1 CONNECTOR A (DC SUPPLY AND CAN)



NOTE: For details of fuse requirements, refer to section entitled *Fusing* elsewhere in this document.



NOTE: Maximum total current of the device is 32 A. This includes the device current consumption plus the current supplied to the outputs. Each Output supply is rated Max 16 A. Output Supply 1 + Output Supply 2 must not exceed 16 A. Output Supply 3 + Output Supply 4 must not exceed 16 A.



NOTE: Screened 120 Ω impedance cable specified for use with CAN must be used for the CAN links.
DSE stock and supply Belden cable 9841 which is a high quality 120 Ω impedance cable suitable for CAN use (DSE part number 016-030).



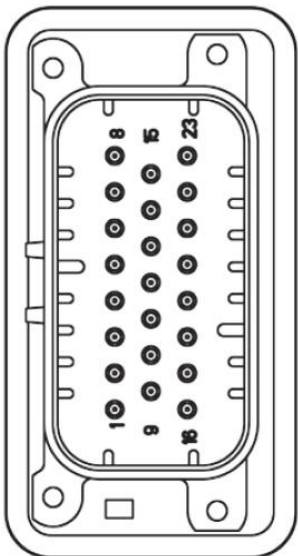
NOTE: CAN connections are NOT internally terminated. A complete CAN network must have 120 Ω terminators at each end of the network.



NOTE: Output Supplies must be connected (even if the outputs are not used in the project) to ensure *Output Supply Under Voltage* alarms are not raised by the device.

Connections listed overleaf.

NOTE: Connector B is not fitted to DSEM643. Output Supply 3 and Output Supply 4 are used to provide power to DSEM643 outputs on Connector C.

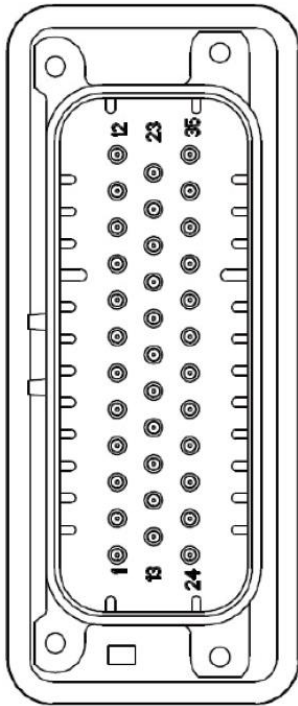
Connector A	Pin	Description	Comments
	1	Output Supply 1 +ve Not fitted to DSEM643	Used to supply QB002 (B35), QB003 (B13), QB005 (B1), QB008 (B34), QB009 (B27), QB012 (B33), QB013 (B26), QB016 (B32), QB017 (B25), QB018 (B24)
	2	Vref +ve	Max 100 mA output. Application programmable with options for Off, 5 V, 10 V.
	3	Ignition +ve (15)	Supplied by a switch connected to Pin A4 (ECU+) of the same ECU device.
	4	ECU Supply +ve	DC Supply for the device ECU
	5	ECU Supply -ve	DC Supply for the device ECU
	6	Program Enable	Connect to +ve to enable
	7	Output Supply 1 & 2 -ve Not fitted to DSEM643	
	8	Output Supply 2 +ve Not fitted to DSEM643	Used to supply QB001 (B2), QB004 (B12), QB006 (B23), QB007 (B3), QB010 (B4), QB011 (B10), QB014 (B5), QB015 (B11)
	9	Output Supply 3 & 4 -ve	
	10	CAN1 H	Internally connected
	11	CAN1 H	
	12	CAN1 L	Internally connected
	13	CAN1 L	
	14	CAN4 H	
	15	CAN4 L	
	16	Output Supply 3 +ve	Used to supply QC002 (C35), QC008 (C34), QC009 (C27), QC012 (C33), QC013 (C26), QC016 (C32), QC017 (C25), QC018 (C24)
	17	CAN2 H	Internally connected
	18	CAN2 H	
	19	CAN2 L	Internally connected
	20	CAN2 L	
	21	CAN3 H	
	22	CAN3 L	
	23	Output Supply 4 +ve	Used to supply QC001 (C2), QC003 (C13), QC004 (C12), QC005 (C1), QC006 (C23), QC007 (C3), QC010 (C4), QC011 (C10), QC014 (C5), QC015 (C11)

3.4.2 CONNECTOR B (I/O)



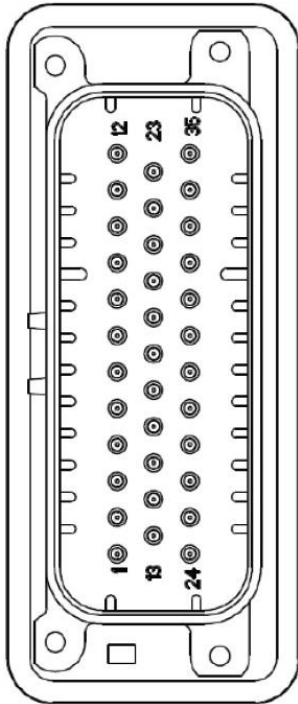
NOTE: Connector B is not fitted to DSEM643.

Terminology	Meaning
QBxxx	Output
IBxxx	Input
H	Output, High when active.
L	Output, Low when active.
PWM	Pulse Width Modulation (voltage or current)
DIN	Digital Input configurable to accept signals as positive digital, negative digital or frequency sensing.
AIN	Input configurable to accept signals as positive digital, negative digital, 0 V to 5 V, 0 V to 10 V, 0 V to 32 V, 0 mA to 20 mA, 4 mA to 20 mA, ratiometric or resistive.
Supply	Designates the 'Output Supply' on Connector A, used to supply the Output

Connector B	Pin	Description	Comments	Supply
	1	QB005	OUT H, L, PWM (2 A).	1 (A1)
	2	QB001	OUT H, PWM (2 A / 4 A)	2 (A8)
	3	QB007	OUT H, PWM (2 A)	2 (A8)
	4	QB010	OUT H (4 A)	2 (A8)
	5	QB014	OUT H (2 A)	2 (A8)
	6	IB009	DIN	
	7	IB001	AIN	
	8	IB002	AIN	
	9	IB014	DIN	
	10	QB011	OUT H (4 A)	2 (A8)
	11	QB015	OUT H (2 A)	2 (A8)
	12	QB004	OUT H, L, PWM (2 A / 4 A)	2 (A8)
	13	QB003	OUT H, L, PWM (2 A / 4 A)	1 (A1)
	14	IB010	DIN	
	15	IB011	DIN	
	16	IB012	DIN	
	17	IB003	AIN	
	18	IB004	AIN	
	19	IB005	AIN	
	20	IB006	AIN	
	21	Vref -ve	Negative for Vref (A2).	
	22	IB015	DIN	
	23	QB006	OUT H, L, PWM (2A)	2 (A8)
	24	QB018	OUT H, L (2A)	1 (A1)
	25	QB017	OUT H, L (4A)	1 (A1)
	26	QB013	OUT H (2A)	1 (A1)
	27	QB009	OUT H (4A)	1 (A1)
	28	IB013	DIN	
	29	IB007	AIN	
	30	IB008	AIN	
	31	IB016	DIN	
	32	QB016	OUT H (2A)	1 (A1)
	33	QB012	OUT H (4A)	1 (A1)
	34	QB008	OUT H, PWM (2 A)	1 (A1)
	35	QB002	OUT H, PWM (2 A / 4 A)	1 (A1)

3.4.3 CONNECTOR C (I/O)

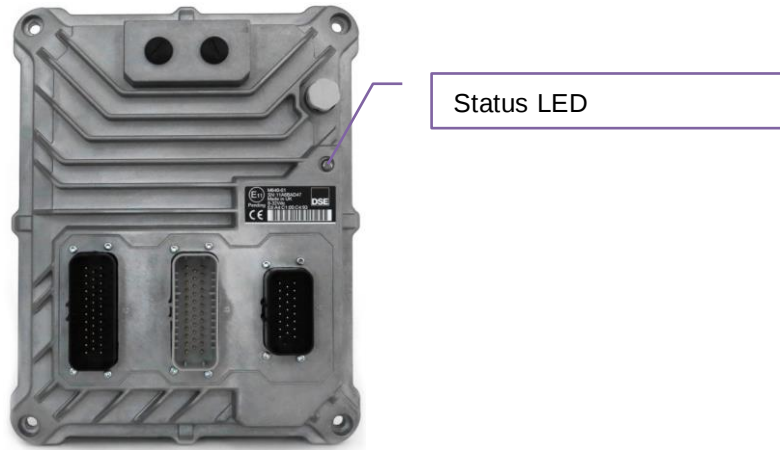
Terminology	Meaning
QCxxx	Output
ICxxx	Input
H	Output, High when active.
L	Output, Low when active.
PWM	Pulse Width Modulation (voltage or current)
DIN	Digital Input configurable to accept signals as positive digital, negative digital or frequency sensing.
AIN	Input configurable to accept signals as positive digital, negative digital, 0 V to 5 V, 0 V to 10 V, 0 V to 32 V, 0 mA to 20 mA, 4 mA to 20 mA, ratiometric or resistive.
FREQ	Input used for Frequency Measurement
Supply	Designates the 'Output Supply' on Connector A, used to supply the Output

Connector C	Pin	Description	Comments	Supply
	1	QC005	OUT H, L, PWM (2 A).	4 (A23)
	2	QC001	OUT H, PWM (2 A / 4 A)	4 (A23)
	3	QC007	OUT H, PWM (2 A)	4 (A23)
	4	QC010	OUT H (4 A)	4 (A23)
	5	QC014	OUT H (2 A)	4 (A23)
	6	IC009	DIN	
	7	IC001	AIN	
	8	IC002	AIN	
	9	IC014	DIN	
	10	QC011	OUT H (4 A)	4 (A23)
	11	QC015	OUT H (2 A)	4 (A23)
	12	QC004	OUT H, L, PWM (2 A / 4 A)	4 (A23)
	13	QC003	OUT H, L, PWM (2 A / 4 A)	4 (A23)
	14	IC010	DIN	
	15	IC011	DIN	
	16	IC012	DIN	
	17	IC003	AIN	
	18	IC004	AIN	
	19	IC005	AIN	
	20	IC006	AIN	
	21	Vref -ve	Negative for Vref (A2).	
	22	IC015	DIN	
	23	QC006	OUT H, L, PWM (2A)	4 (A23)
	24	QC018	OUT H, L (2A)	3 (A16)
	25	QC017	OUT H, L (4A)	3 (A16)
	26	QC013	OUT H (2A)	3 (A16)
	27	QC009	OUT H (4A)	3 (A16)
	28	IC013	DIN	
	29	IC007	AIN	
	30	IC008	AIN	
	31	IC016	DIN	
	32	QC016	OUT H (2A)	3 (A16)
	33	QC012	OUT H (4A)	3 (A16)
	34	QC008	OUT H, PWM (2 A)	3 (A16)
	35	QC002	OUT H, PWM (2 A / 4 A)	3 (A16)

4 INDICATIONS

NOTE: Connector B is not fitted to DSEM643.

One Multi Colour LED is provided to give indication of the device operating status.



The system LED is used to indicate operating status.

Description	Specification
LED Type	Multicolour by application programming. System faults override the application configured colour (see below). For all other colours, consult the equipment OEM.

Colour	Operation	Description	State
Off	N/A	N/A	Powered down
Green	Steady	Unit powered up Application program loaded Not running	Ignition ON
	1 Hz flash	Unit powered up Application program loaded Running	Ignition ON
	5 Hz flash	Unit powered up No application program loaded.	Ignition ON
Amber	Static	Application exception Bootloader functioning normally Firmware present Program Pin enabled	Bootloader
	1 Hz flash	Firmware update in progress Reading downloaded image.	Bootloader
	5 Hz flash	Bootloader functioning normally No firmware present	Bootloader
Red	Static	Fatal system / hardware fault	Fault Condition
	1 Hz flash	Unit running with a fault, see CODESYS error flags or DSEServiceTool.	Fault Condition

5 USE WITH CODESYS

 **NOTE:** Adding the application file to the device is also possible using DSEServiceTool PC Software or USB memory stick. For further details, refer to DSE Publication 057-256 *DSEServiceTool PC Software Manual* and the section entitled *Application Update* elsewhere in this document.

 **NOTE:** DSEM640 / M643 V1 supports CODESYS version 3.5.7.0. Ensure Compiler version, Visualisation version and the versions of any 3S libraries used in the project are no later than version 3.5.7.0. Contact support@deepseaelectronics.com if assistance is required.

 **NOTE:** DSEM640 / M643 V2 / V3 supports CODESYS version 3.5.12.0. Ensure Compiler version, Visualisation version and the versions of any 3S libraries used in the project are no later than version 3.5.12.0. Contact support@deepseaelectronics.com if assistance is required.

DSEM640 / DSEM643 communicates with, and is programmed by, the CODESYS V3.5 Integrated Development Environment (IDE).

Connection to CODESYS is available by Ethernet (recommended) or by CAN.

5.1 SETTING UP CODESYS TO COMMUNICATE BY CAN

 **NOTE:** CAN transfer is slower than Ethernet and intended for specialist applications. It is recommended to use Ethernet transfer if possible.

 **NOTE:** Users wishing to connect by Ethernet can skip this section and jump to the section entitled *Connecting to CODESYS* elsewhere in this document.

 **NOTE:** DSE Stock and supply PCAN-USB IPEH-002021 from Peak Systems (<https://www.peak-system.com>). DSE Part number 016-179. Contact sales@deepseaelectronics.com.

Users wishing to connect by Ethernet can skip this section and jump to the section entitled *Connecting to CODESYS* elsewhere in this document.

5.1.1 INSTALL THE PCAN DRIVER

To connect the device to a PC by CAN, a CAN interface is required as detailed above.

Before proceeding you must install the PCAN Driver supplied with the PCAN Interface, or downloaded from <https://www.peak-system.com/>

5.1.2 SETUP THE CODESYS GATEWAY

CODESYS Gateway requires configuration to add CAN support.

DSE provide the necessary configuration within *Gateway.cfg*, that is available at www.deepseaelectronics.com. This file must be downloaded and used to replace the existing file already in use on the PC where CODESYS is installed.

The location of the file varies depending upon your PC setup. Where only one version CODESYS IDE is installed, this is within the *GatewayPLC* folder of that installation. For PCs that have multiple CODESYS IDE versions installed, use the below method to locate the file.

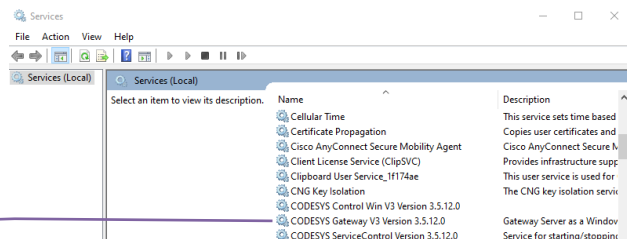
5.1.2.1 LOCATING WHERE TO STORE THE GATEWAY CONFIGURATION FILE

- In Windows, use search to locate and open the Windows Services application.



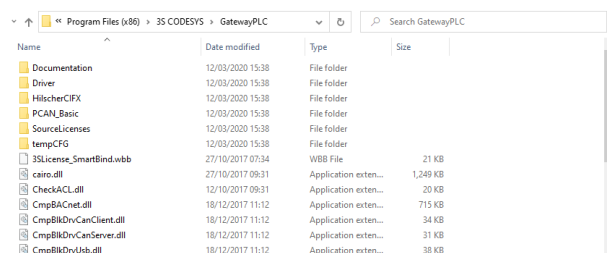
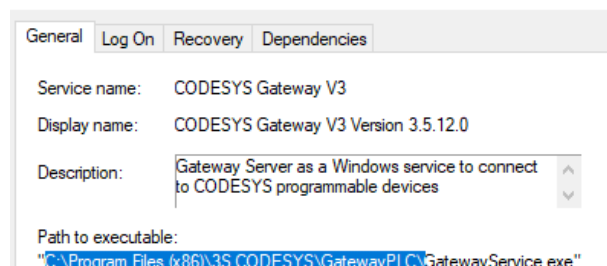
- Click Name (to sort by Name) and then scroll down to locate CODESYS Gateway. The version number shown differs depending upon the last version of CODESYS you installed on the PC

CODESYS Gateway



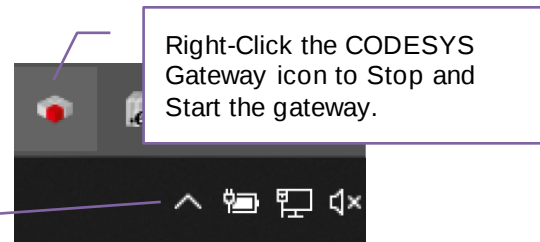
- Right-Click the CODESYS Gateway and select *Properties*.
- Path to executable* shows the location of the GatewayService File.
- Use the mouse to select only the path.
- Ensure to omit the leading “ and omit the trailing *GatewayService.exe*
- Right-Click the selection and select *Copy* (or press *CTRL-C*).
- Open *Windows File Explorer* and *Paste* the path just copied.
- This opens *File Explorer* showing the contents.
- Copy the new *Gateway.cfg* file into this folder, overwriting the old one. If you prefer you can take a backup of the old one should you wish to revert to it in future.

CODESYS Gateway V3 Version 3.5.12.0 Properties (Local Computer)



- The Gateway must now be stopped and restarted. You can either do this from within *Services*, or you can follow the instructions detailed.

Click the UP arrow at the bottom right of Windows™ to access the system tray icons.



CAN Gateway setup is complete you can proceed *to Connect to CODESYS* as detailed in the following section.

5.2 CONNECTING TO CODESYS

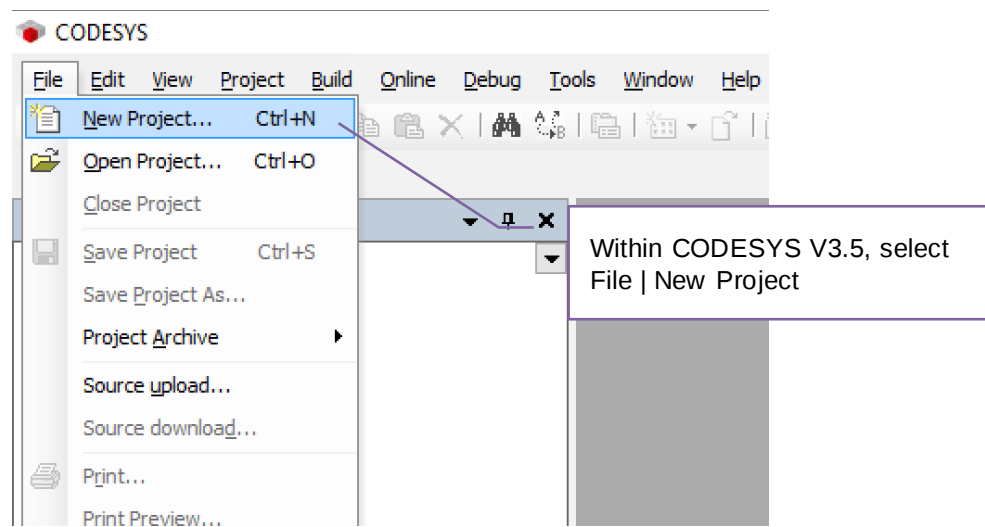
5.2.1 PROGRAM PIN

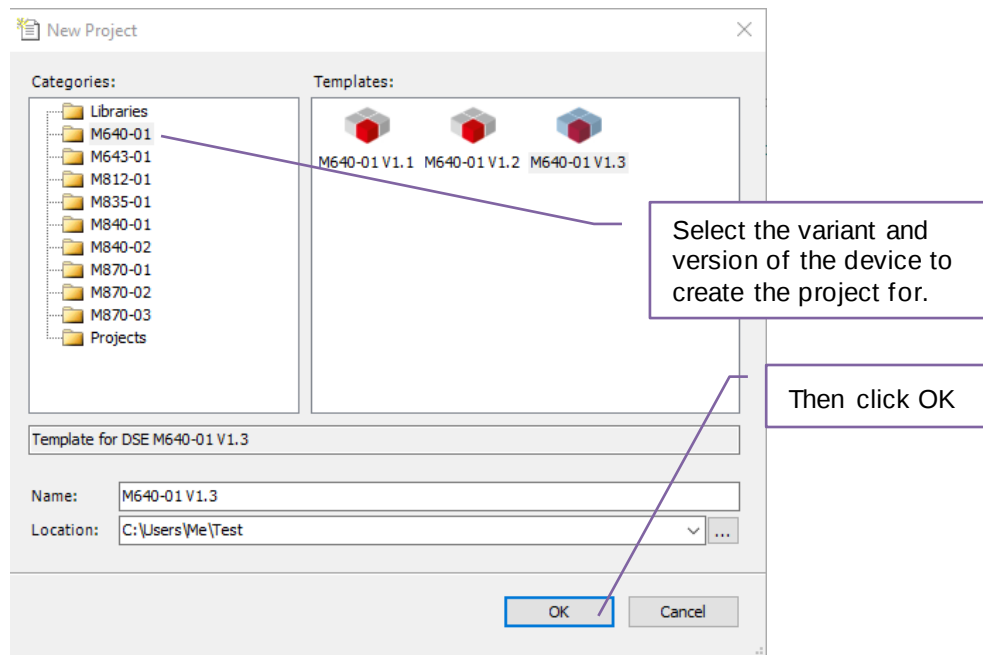
To configure (program) the device via CODESYS V3 or activate *Debug Mode*, the *Program Pin* must be enabled as follows:

- Power down the device.
- Disconnect Program Enable pin.
- Apply DC power to the device.
- Wait a few seconds.
- Connect *Program Enable* (Connector A, Pin 6) to battery positive.

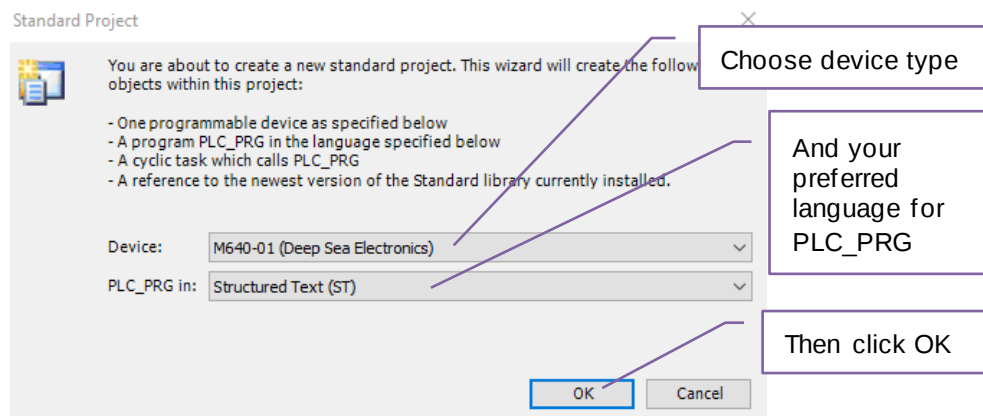
5.2.2 START NEW PROJECT

To begin, start a new project as shown.





If you did not select a template from the previous dialogue, now select the model type:



5.2.3 CONNECT BY AUTOMATIC SCAN

NOTE: A device in *System Settings* or *Bootloader* mode cannot be found in the *Scan* and cannot connect to CODESYS.

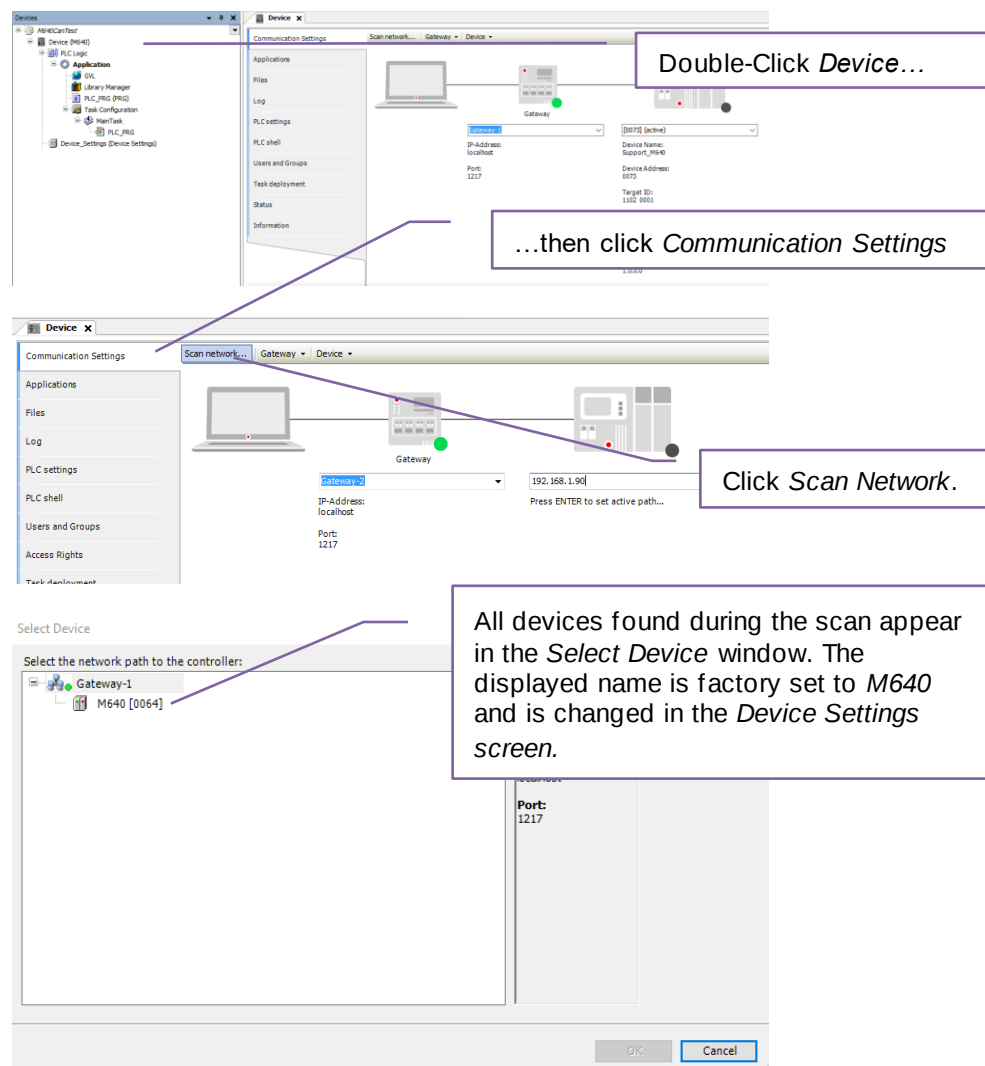
NOTE: For Ethernet connection, the *Scan* requires the device to be on the same subnet as the PC. If this is not possible, locate the IP address of the device and connect as detailed in the section entitled *Ethernet TCP* elsewhere in this document.

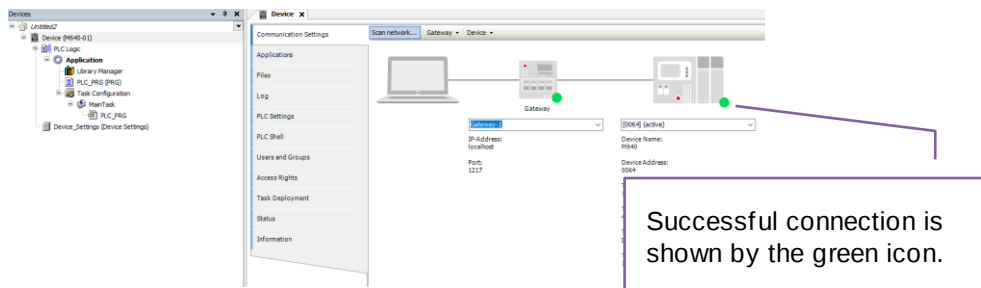
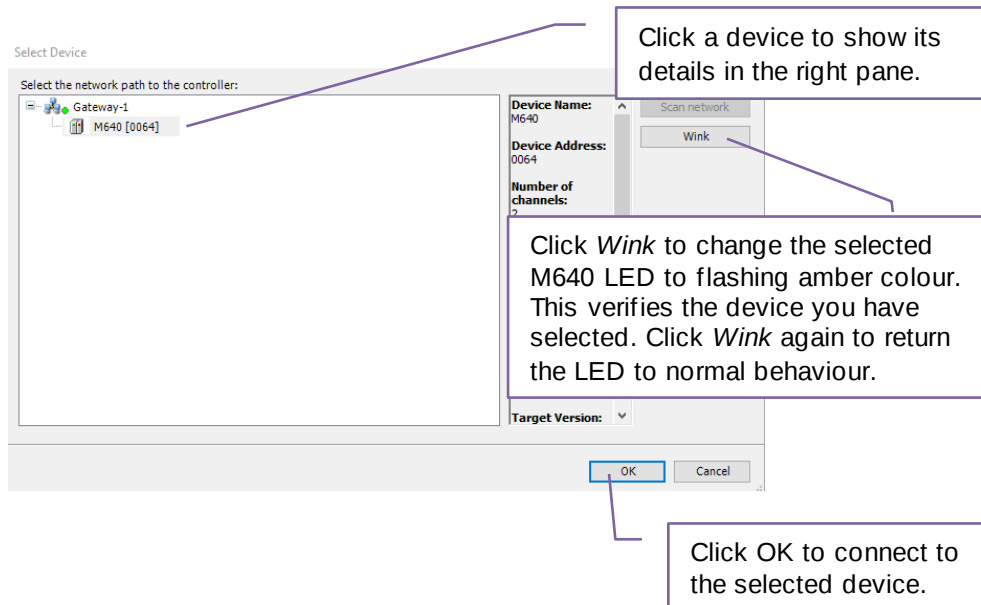
NOTE: If the IP address of the device is known, connection may also be achieved manually as detailed in the section entitled *Ethernet TCP* elsewhere in this document.

NOTE: To connect by CAN ensure the port connected is configured as the “Configure” port in the Web Settings Pages. See section entitled *Inbuilt Web Settings* elsewhere in this document.

This method of connection is suitable only for devices in the same subnet as the PC or for connection by CAN.

Select *Device | Communication Settings* in the CODESYS V3.5 IDE.





5.2.4 CONNECT BY IP ADDRESS



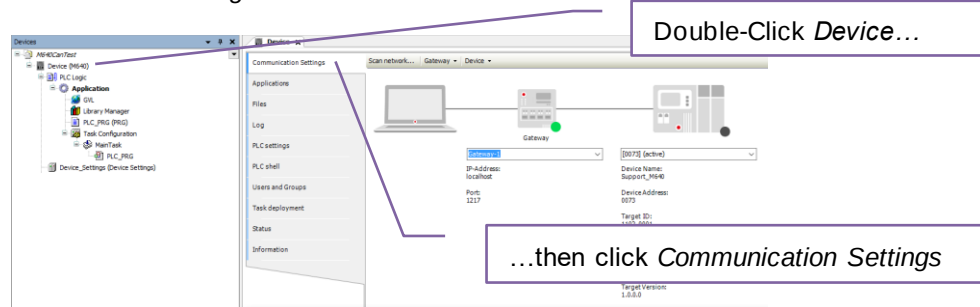
NOTE: A device in *Bootloader* mode cannot connect to CODESYS.



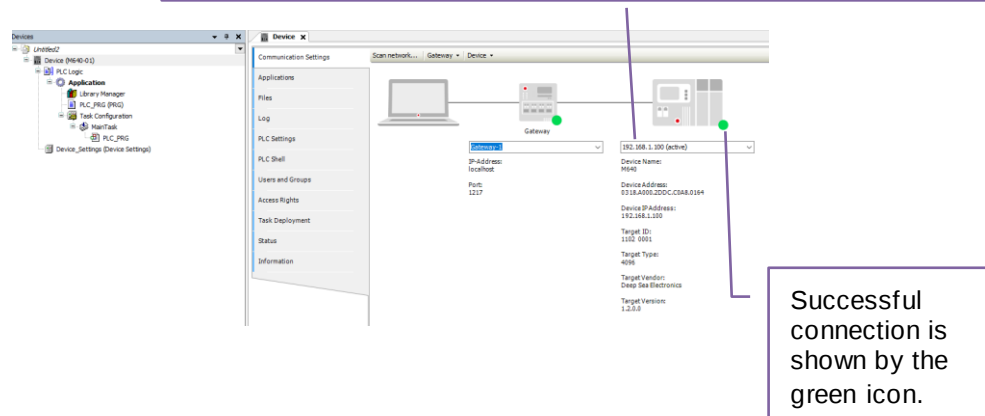
NOTE: If the IP address of the device is not known, see the section entitled *Connect by Automatic Scan* elsewhere in this document.

This method of connection is particularly suited for devices on other subnets or networks, providing the PC has a routable connection to the device.

Select *Device | Communication Settings* in the CODESYS V3.5 IDE.



Where the IP address of the device is known, this is entered directly into the address bar. Press *Enter* to make the connection.



5.2.5 CONNECT BY CAN CONNECTION

NOTE: Ensure previous subsections *Install the PCAN Driver* and *Setup the CODESYS Gateway* have been followed before attempting *CAN Connection*.

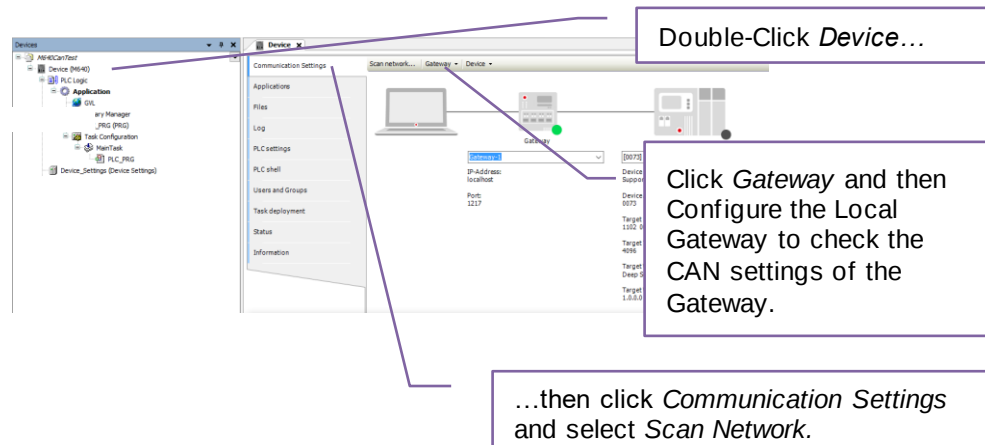
NOTE: DSE Stock and supply PCAN-USB IPEH-002021 from Peak Systems (<https://www.peak-system.com>). DSE Part number 016-179. Contact sales@deepseaelectronics.com.

NOTE: Ensure the Gateway is set to operate the CAN port at the same rate that the DSEM640 / DSEM643 is set to. Factory Setting is 250 kbit/s though this may have been changed by the OEM or system programmer.

NOTE: Ensure CODESYS Gateway is running. For details, see section entitled *Stopping and Starting the Gateway* elsewhere in this manual.

NOTE: Connection by CAN is slower than Ethernet. CODESYS Debug may not be practical due to the slower connection.

Select *Device | Communication Settings* in the CODESYS V3.5 IDE:

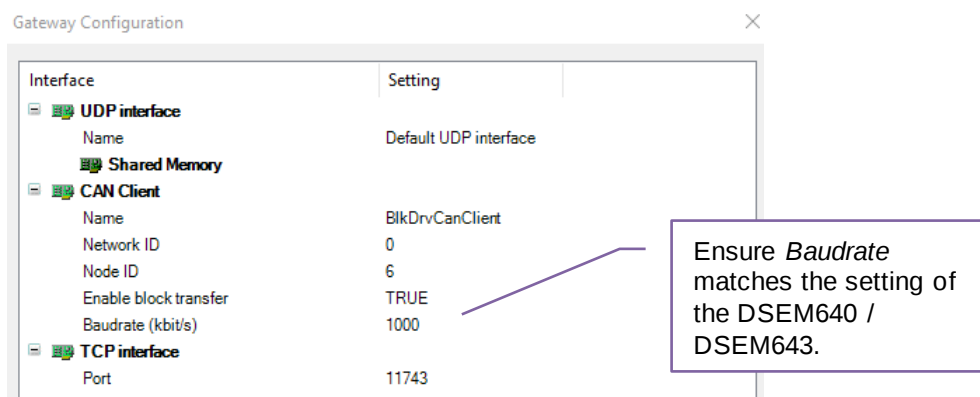


5.2.6 CONFIGURE THE LOCAL GATEWAY

NOTE: If *CAN Client* is not visible within the *Gateway Configuration* then CODESYS is not correctly setup for use with the CAN device. Ensure the latest *DSE CODESYS PACKAGE* is installed. For additional support, contact support@deepseaelectronics.com.

NOTE: Where the baud rate of the device is not known, try all available options. Where no connection is made, use DSEServicetool PC Software to set the device back to factory settings (250 kbit/s). See DSE Publication 057-265 *DSEServicetool PC Software Manual* for further details.

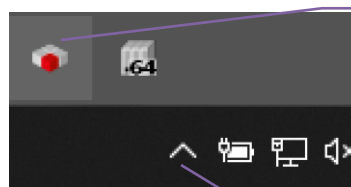
NOTE: After changing *Gateway Configuration* settings, the gateway must be stopped and restarted before changes take effect.



5.2.6.1 STOPPING AND STARTING THE GATEWAY

NOTE: After changing *Gateway Configuration* settings, the gateway must be stopped and restarted before changes take effect.

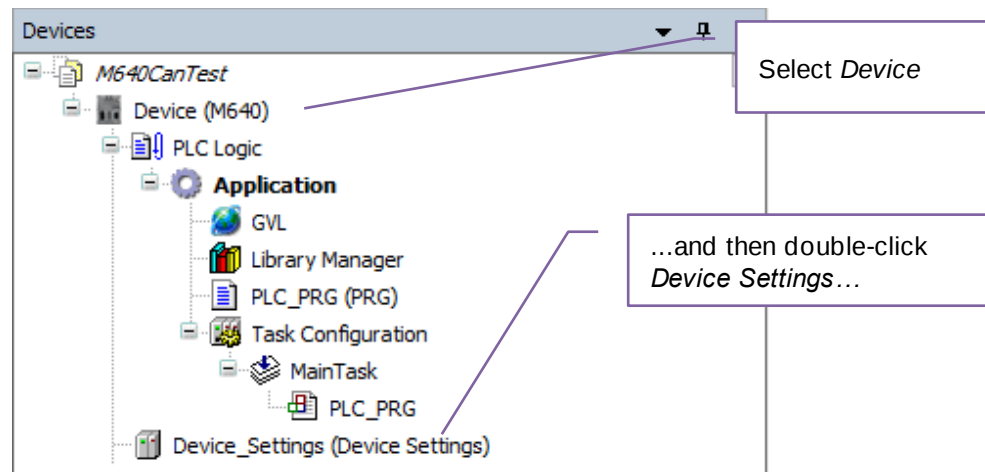
NOTE: Remember to start the gateway again if you previously stopped it to enable CAN connection to DSEServicetool. For details of DSEServicetool PC Software see DSE Publication 057-265 *DSEServicetool PC Software Manual*.



Right-Click the CODESYS Gateway icon to Stop and Start the gateway.

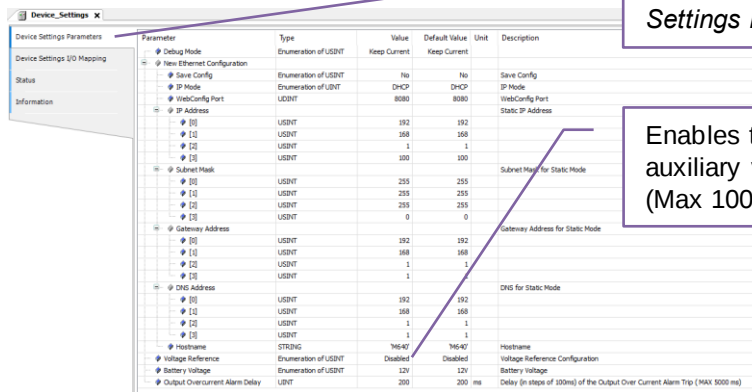
Click the UP arrow at the bottom right of Windows™ to access the system tray icons.

5.3 CONFIGURE SETTINGS AND MONITOR THE DEVICE



See the following subsections for details of the Device Settings pages.

5.3.1 DEVICE SETTINGS PARAMETERS



Parameter	Type	Value	Default Value	Unit	Description
Debug Mode	Enumeration of USINT	Keep Current	Keep Current		
New Ethernet Configuration	Enumeration of USINT	No	No		Save Config
Save Config	Enumeration of USINT	DHCP	DHCP		IP Mode
IP Mode	Enumeration of USINT	8080	8080		WebConfig Port
WebConfig Port	USINT				Static IP Address
IP Address	USINT	192	192		
[0]	USINT	168	168		
[2]	USINT	1	1		
[3]	USINT	100	100		
Subnet Mask	USINT	255	255		Subnet Mask for Static Mode
[0]	USINT	255	255		
[2]	USINT	255	255		
[3]	USINT	0	0		
Gateway Address	USINT	192	192		Gateway Address for Static Mode
[0]	USINT	168	168		
[2]	USINT	1	1		
[3]	USINT	1	1		
DNS Address	USINT	192	192		DNS for Static Mode
[0]	USINT	168	168		
[2]	USINT	1	1		
[3]	USINT	1	1		
Hostname	STRING	16447	16447		Hostname
Voltage Reference	Enumeration of USINT	Disabled	Disabled		Voltage Reference Configuration
Battery Voltage	Enumeration of USINT	12V	12V		Battery Voltage
Output Overcurrent Alarm Delay	USINT	200	200	ms	Delay (in steps of 100ms) of the Output Over Current Alarm Trip (MAX 5000 ms)

...and then select *Device Settings Parameters*...

Enables the VREF auxiliary voltage output (Max 100 mA)

Parameter	Description
Debug Mode	NOTE: After debugging is completed, ensure to disable <i>Debug Mode</i>. Energising the device with <i>Debug Mode</i> enable when CODESYS is not connected, results in the application NOT running. <i>Debug Mode</i> is switchable by activating the <i>Program Enable</i> pin when the device is powered. However, keeping the pin active during a power cycle places the device into <i>Bootloader</i> mode. During debugging of a project, repeated enabling and disabling of the <i>Program Enable</i> pin can become tiresome. An alternative is to use the <i>Device Settings</i> to enable and disable <i>Debug Mode</i>. True: Program Enable mode is automatically entered at device power up. Program Enable pin is not required, device can connect to CODESYS. False: Program Enable mode is automatically disabled at device power up. Program Enable pin must be activated if the device is to connect to CODESYS. Keep Current: Program Enable mode follows the current operation of the device.
Manual Shutdown	For further details, see section entitled <i>Manual Shutdown</i> elsewhere in this document. True: Removal of Ignition pin does not directly begin device shutdown. Application code is required to initiate shutdown. False: Removal of Ignition pin immediately initiates device shutdown.

Parameter	Description
Save Config	True: Configured network settings are applied each time the device powers up. This overrides any other setting (ie Settings made in the Web Settings pages). False: User network settings (for example in Web Settings pages) are maintained through power off.
Voltage Reference	Configuration of the VREF output (max 100 mA). Disabled: The output is off. 5 V: The output is enabled at 5 V 10 V: The output is enabled at 10 V

5.3.2 MANUAL SHUTDOWN

 **NOTE:** Enable *Manual Shutdown* in *Device Settings*.

 **NOTE:** Calling *DSE.SystemShutdown* when *Ignition* pin remains active, results in DSEM64x shutting down and restarting (ie similar to a power cycle).

Intended for use to allow an application to stop motors, return valves to known position etc prior to the device shutting down. The application monitors the Ignition pin, executes custom code when removed, then calls *DSE.SystemShutdown* to initiate the shutdown process.

Manual Shutdown parameter is controlled by either mapping a BOOL variable within *Device Settings I/O Mapping*:

 Application.PLC_PRG.bIgnitionSwitch	 Ignition Switch	%IX126.0	BIT	Ignition Switch
---	---	----------	-----	-----------------

or by utilising the function:

```
DSE.SystemSetManualShutdown(TRUE); or DSE.SystemSetManualShutdown(FALSE);
```

When *Manual Shutdown* is set to *TRUE*, removal of the *Ignition* pin does not begin the shutdown process. Instead, the application can monitor the *Ignition* pin, performing a graceful machine shutdown, before programmatically instructing DSEM64x to shutdown using the function:

```
DSE.SystemShutdown();
```

Ignition pin may be monitored either by mapping Ignition Switch within the *Device Settings I/O Mapping* page, or by using:

```
DSE.SystemGetIgnition(Ignition => bIgnitionState);
```

Where *bIgnitionState* is a BOOL variable used to store the state of the system *Ignition* pin.

To restart the application, reapply *Ignition* pin.

5.3.3 DEVICE SETTINGS I/O MAPPING

This page is used to monitor the device, and if required, to map the monitored values to program variables.

Device Settings Parameters

Device Settings I/O Mapping

Status

Information

Find

Filter Show all

Variable	Mapping	Channel	Address	Type
		Error Code	%IW0	Enumeration of UINT
		Device Temperature	%ID1	REAL
		Battery Voltage	%ID2	DINT
		Supply Voltage 1	%ID3	DINT
		Supply Voltage 2	%ID4	DINT
		Supply Voltage 3	%ID5	DINT
		Supply Voltage 4	%ID6	DINT
		Ignition Switch	%IX28.0	BIT
		Program Enable	%IX28.1	BIT
		Voltage Reference	%ID8	DINT

Error Code is a bit field, detailed in the section entitled DSEM840 CODESYS Error Codes elsewhere in this document.

5.4 ADD INPUTS AND OUTPUTS TO THE PROJECT

If the input and/or output devices are not already included in the project file:

Devices

M640CanTest

Device (M640)

PLC Logic

Application

GVL

Library Manager

PLC_PRG (PRG)

Task Configuration

MainTask

PLC_PRG

Device_Settings (Device Setti

Cut

Copy

Paste

Delete

Properties...

Add Object

Add Folder...

Add Device...

Update Device...

Edit Object

Edit Object With...

Edit IO mapping

Import mappings from CSV...

Export mappings to CSV...

Online Config Mode...

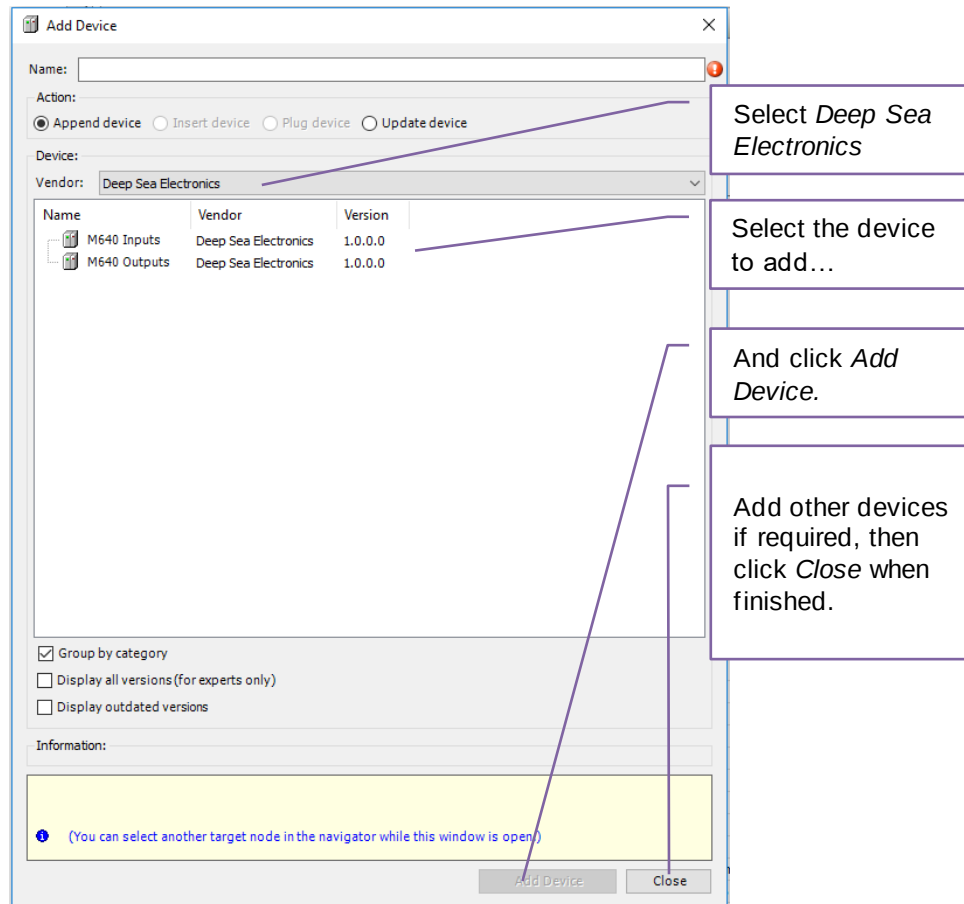
Reset origin device [Device]

Simulation

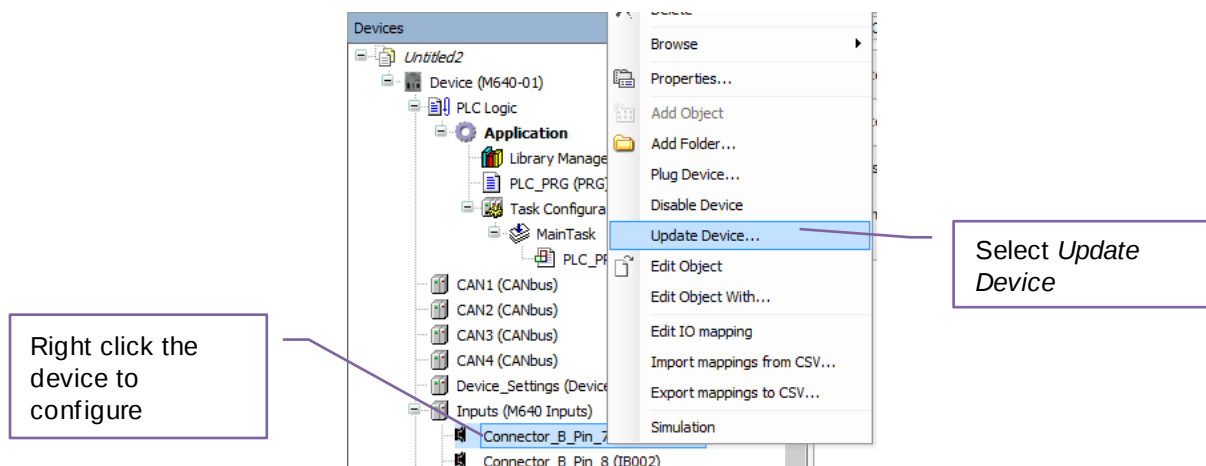
Device Configuration

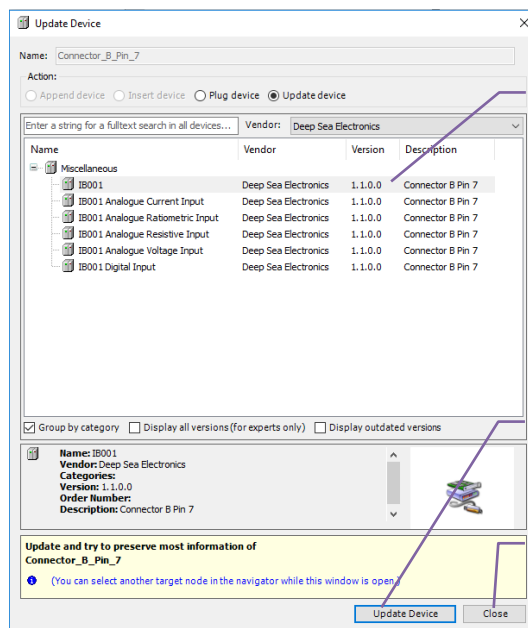
Right-Click Device...

And select Add Device.



To configure the inputs / outputs, and select how they are to be used:





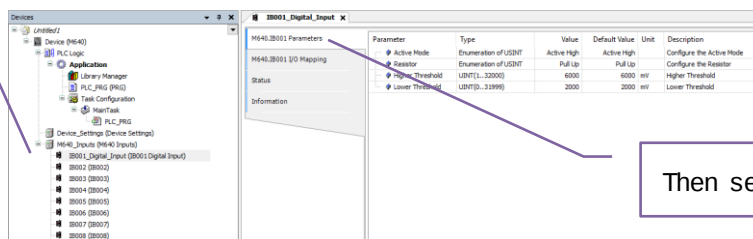
Select the required configuration for the Input / Output (available choices depend upon which Input / Output is selected. See section entitled *User Connections* elsewhere in this document for details).

And click *Update Device*.

Select and configure other Inputs / Outputs if required, then click *Close* when finished.

5.4.1 DIGITAL INPUT PARAMETER CONFIGURATION

Double click the device to configure



Then select *Parameters*

Parameter	Description
Active Mode	Active High: The input connects to the positive supply rail when activated. Active Low: The input connects to the negative supply rail when activated.
Resistor	Float: The input is floating when no connection is made. Commonly used with PNP (Sourcing) type switched sensors. Pull Up: An internal pull up resistor biases the input to the positive supply rail when no connection is made. Commonly used with NPN (Sinking) type switched sensors and volt-free contacts. Pull Down: An internal pull down resistor biases the input to the negative supply rail when no connection is made. Commonly used with volt-free contacts.
Higher Threshold	For <i>Active High</i> inputs, the inputs is detected as being active when above this threshold with respect to the negative supply rail.
Lower Threshold	For <i>Active Low</i> inputs, the inputs is detected as being active when below this threshold with respect to the negative supply rail.

5.5 CAN

NOTE: DSEM640 / DSEM643 has four CAN ports. They are referred to within CODESYS as *Network0*, *Network1*, *Network2*, and *Network 3*. With DSE_CAN library the enum *DSE_CAN.eCANList.CAN1*, *DSE_CAN.eCANList.CAN2*, *DSE_CAN.eCANList.CAN3* and *DSE_CAN.eCANList.CAN4* can be used.

NOTE: To program the device using CAN, see section entitled *Cables, Connectors, Harnesses and Spare Parts* for details of a suitable PC USB CAN interface.

NOTE: DSE_CAN compiled library, supplied as part of the DSE CODESYS Package is available from www.deepseaelectronics.com.

DSEM640 / DSEM643 CAN interface Network0 (CAN1) may be used to configure the device (using CODESYS). All four ports are able to connect to external CAN devices such as engine ECUs and DSEM240 (Input/Output expansion).

CAN Protocol	Options
SAE J1939	- CODESYS J1939 (see section entitled <i>CODESYS J1939</i>) - DSE_CAN compiled library
Raw CAN (custom protocols)	DSE_CAN compiled library
CANopen	CODESYS CANopen Manager is supported by DSEM640 / DSEM643. The Slave Device eds file is imported into CODESYS within <i>Tools Device Repository</i> .
Other CAN protocols	Contact support@deepseaelectronics.com

5.5.1 DSE_CAN

NOTE: DSE_CAN Guide (DSE Part 057-336) is available from support@deepseaelectronics.com, along with example application code.

NOTE: DSEM640 / DSEM643 has four CAN ports. They are referred to within CODESYS as *Network0*, *Network1*, *Network2*, and *Network 3*. With DSE_CAN library the enum *DSE_CAN.eCANList.CAN1*, *DSE_CAN.eCANList.CAN2*, *DSE_CAN.eCANList.CAN3* and *DSE_CAN.eCANList.CAN4* can be used.

DSE_CAN compiled library, supplied as part of the *DSE CODESYS Package* available from www.deepseaelectronics.com allows standard CAN messages to be sent and received. This may be used (with customer application code) to interface with J1939, custom protocols and other CAN protocols as required.

While CODESYS Library Manager includes help for the libraries, for additional information, contact support@deepseaelectronics.com.

5.5.2 CODESYS J1939

NOTE: DSEM640 / DSEM643 has four CAN ports. They are referred to within CODESYS as *Network0*, *Network1*, *Network2*, and *Network 3*. With DSE_CAN library the enum *DSE_CAN.eCANList.CAN1*, *DSE_CAN.eCANList.CAN2*, *DSE_CAN.eCANList.CAN3* and *DSE_CAN.eCANList.CAN4* can be used.

NOTE: CODESYS CAN devices are not required within the project unless attaching a J1939 CAN Manager to it.

CODESYS J1939 is a complete J1939 implementation for sending and receiving J1939 CAN messages. Conversion to/from actual values and CAN data is automatic (when enabled).

First add the CAN device to the project:

Right-Click *Device*, select *Add Device*....

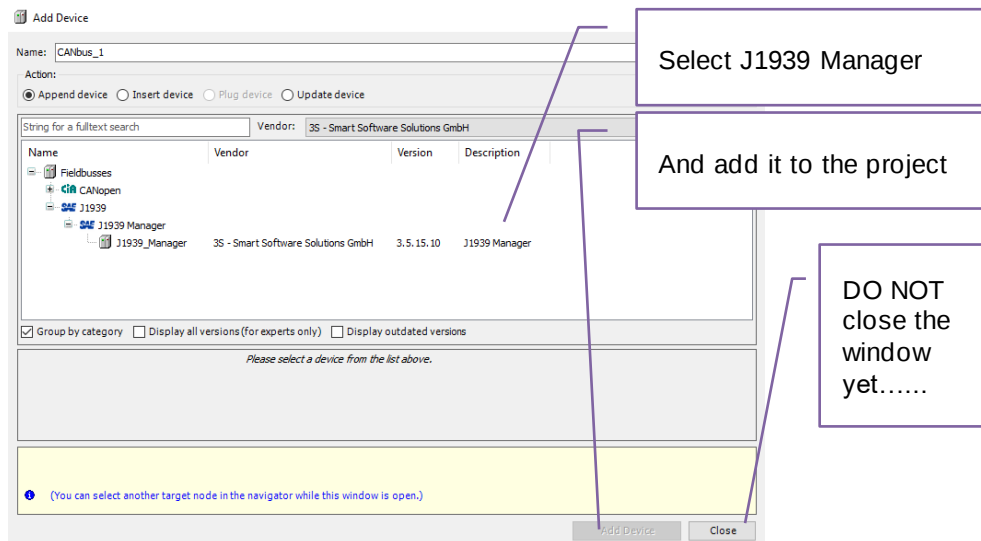
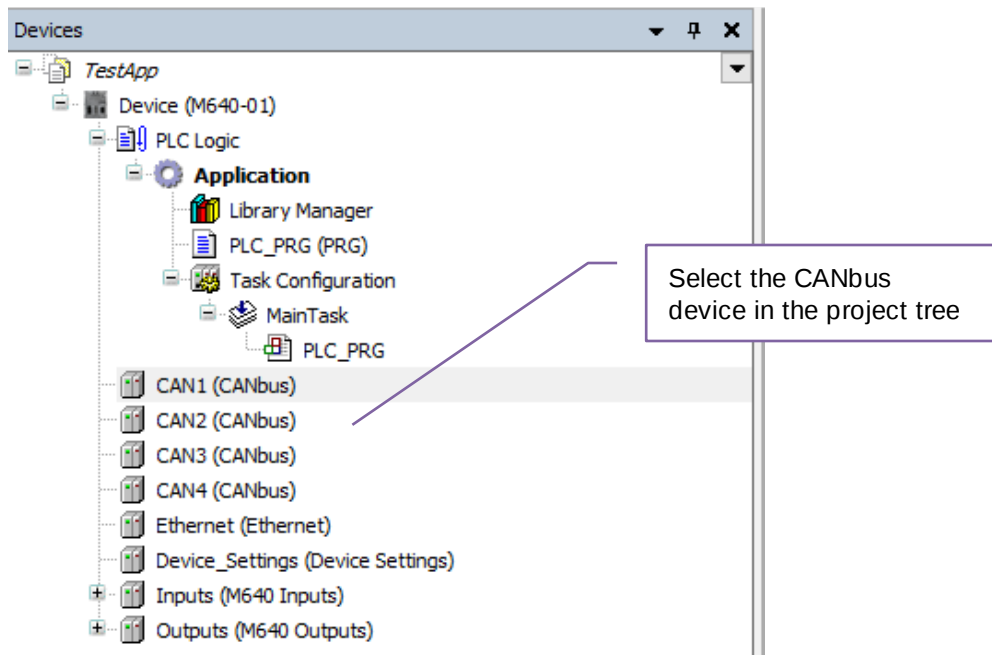
Select 3S – Smart Software Solutions GmbH

Select *CANbus*

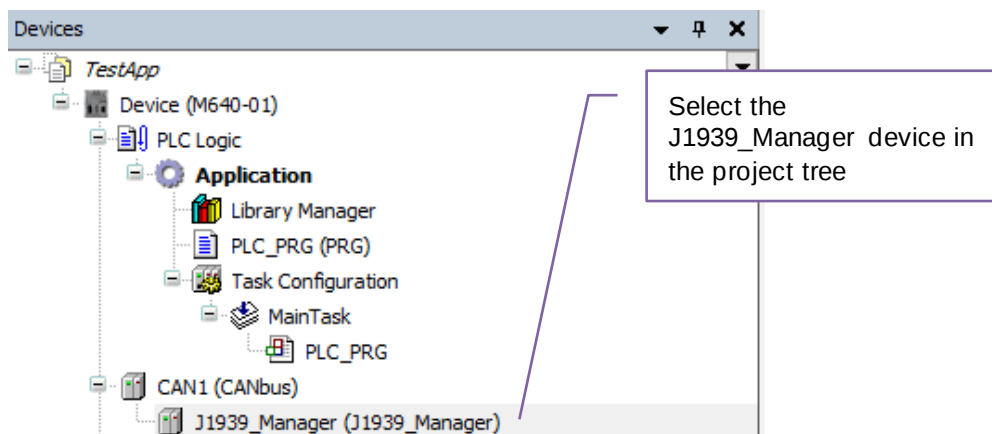
Add CAN to the project.

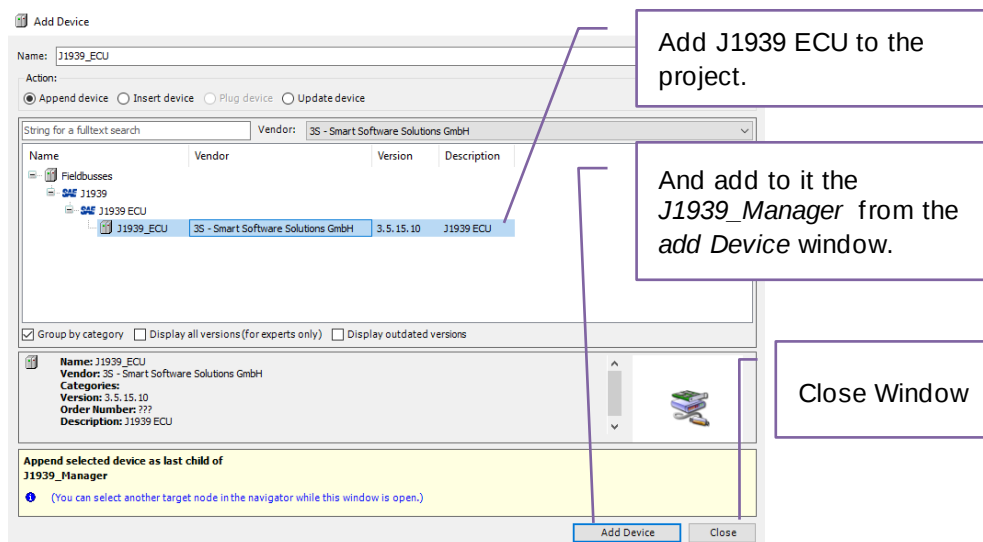
DO NOT close the window yet.....

Keep the *Add Device* window open.

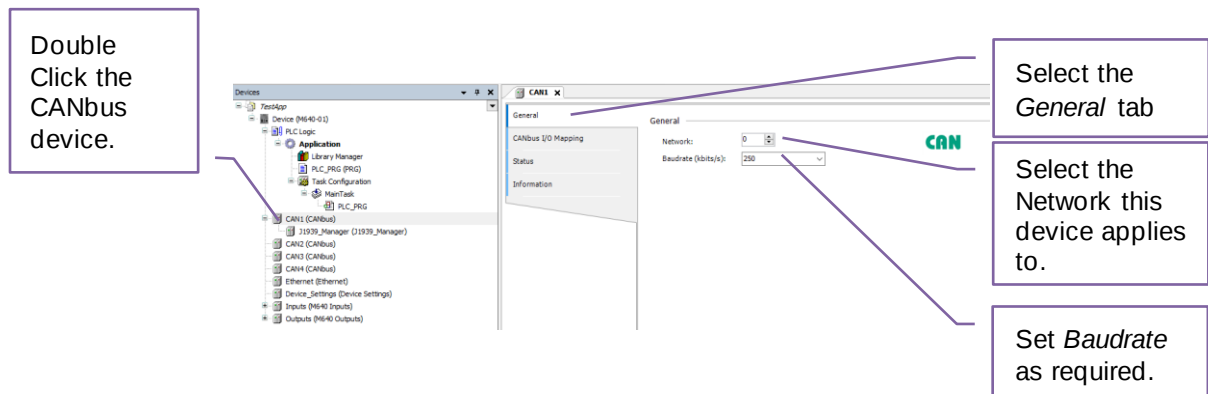


Keep the *Add Device* window open.

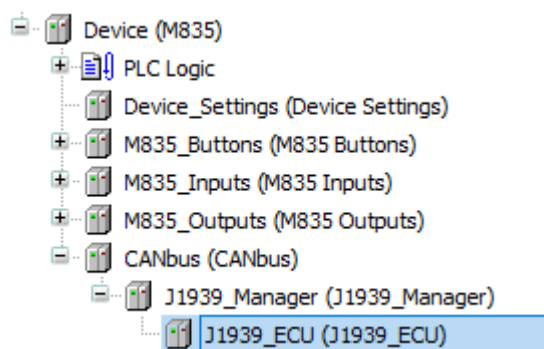




NOTE: DSEM640 / DSEM643 has four CAN ports. Repeat the above procedure to add more CAN devices as required.



The project is now able to communicate with one J1939 ECU. Other devices may be added as required to allow communication with other J1939 ECUs on the same CAN.



For further information, please contact support@deepseaelectronics.com.

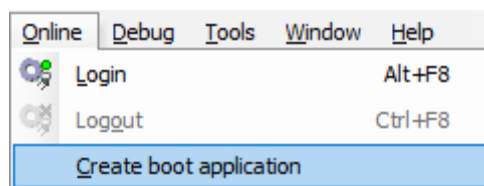
5.6 APPLICATION UPDATE

While a live CODESYS connection to the device by Ethernet is the most common method to load the application, alternatives exist as detailed below. Both options require the creation of a 'Boot Application' and the use of *DSEServicetool PC Software*. First, we must connect by Ethernet to a device to create the .pkg file.

5.6.1 CREATION OF THE BOOT APPLICATION

 **NOTE:** For further details using DSEServicetool PC Software see DSE publication 057-265 *DSE Servicetool PC Software Manual*.

Within CODESYS select *Online | Create boot application*



Browse to select the location to store the files. It is convenient to put the file (application.app) into an empty folder.

You can now use DSEServicetool PC software to transfer the boot application to the device or use *command line* to convert the file to pkg format making the file suitable for USB transfer to the device and maintaining support with DSEServicetool PC Software.

5.6.2 CREATION OF THE PKG FILE

5.6.2.1 BASIC

Within DSEServicetool PC Software scan for and select the DSEM640 device, then select the file *Application.app* and transfer it to the DSEM640.

The process of transfer creates *Application.pkg* and stores it along with the *Application.app* file.

With the .pkg file now created, this can be used to update other devices by USB if required.

5.6.2.2 ADVANCED

Open a command prompt in Windows and navigate to the installation folder of DSEServicetool PC Software (default is "C:\Program Files (x86)\Deep Sea Electronics plc\DSEServicetool\") and execute the command:

```
m640Convert.bat <Path_to_my_BootApplication_file>
```

example:

```
C:\Program Files (x86)\Deep Sea Electronics plc\DSEServicetool>m640convert.bat Application.app
```

The pkg file is now created and can be transferred to the device using USB stick or DSEServicetool PC Software.

5.6.3 APPLICATION UPDATE USING USB



NOTE: For further details of *Program Enable* (Pin A6), refer to section entitled *Program Enable* elsewhere in this document.



NOTE: A *.pkg* (package) file of the application must be pre-prepared as described in the section entitled *Creation of the Boot Application* and *Creation of the pkg file* elsewhere in this document.



NOTE: The *.pkg* file is a compressed folder, containing all associated files.

- Store the *.pkg* file on a USB memory stick. Rename the file to be “update.pkg”.
- Remove DC power from DSEM640.
- Insert USB to the DSEM640
- Connect *Program Enable* pin (A6) to battery positive.
- Apply DC power to the device.
- A solid amber LED shows that the device has entered bootloader mode.
- Connect the memory stick to the device USB connection using the M12 to USB-A adaptor.
- After approximately 20 seconds, the LED flashes amber (2Hz) while the update file is read.
- Once read, the update file is uncompressed. The LED flashes amber at a slower rate (1 Hz) during this process. The time this occurs depends upon the size of the update file (approximately 100 seconds for a 1.25 MB file).
- After decompressing, the LED lights solid amber for approximately four seconds while the firmware update is applied to the memory, then illuminates green for a short time.
- When update is complete, the LED extinguishes.
- Remove DC Supply from the device.
- Remove the USB memory stick.
- Remove *Program Enable* pin (A6).
- The update is complete.

5.7 PROGRAMMATIC FILE ACCESS

As there is no File System within DSEM64x, it is not possible to open/create/write to files on the device or on an external USB memory stick.

The solution is to store the data in a Persistent Variables object for viewing from within CODESYS if required. Where it is desired to view the data ‘offline’, it must be transferred to another device via CAN or custom ethernet code.

For applications where a display device is present, one alternative is for that device to store the information, passing the information to it using CAN. Contact support@deepseaelectronics.com to discuss your requirements.

6 INBUILT WEB SETTINGS



NOTE: For updated settings to take effect, power cycle the device after updating settings.

DSEM640 and DSEM643 include an internal settings page, accessible using a PC browser. For access, the device IP address must be known. Where the settings are not known, the device must be returned to factory settings. For details, see section entitled Troubleshooting elsewhere in this document.

Description	Specification
Factory Settings	IP Mode: Static IP Address: 192.168.1.100 Subnet Mask: 255.255.255.0 Gateway: 192.168.1.1 DNS Server: 192.168.1.1 Hostname: M640 (or M643) With factory settings, Inbuilt <i>Web Settings</i> Pages accessible at http://192.168.1.100:8080

DSE M640, rev: 1, UID: 0x1fa6bad4c

STATUS

Bootloader	v2.0.1, M64xBootrom, May 19 2021 09:24:53	?
Firmware	v2.0.1, M640Firmware, May 17 2021 12:25:40	?
IEC Application		?
Model	M640, rev: 1, UID: 0x1fa6bad4c	?
IP Mode	STATIC IP	?
IP Address	192.168.1.100	?
Subnet Mask	255.255.255.0	?
Gateway	192.168.1.1	?
DNS Server	192.168.1.1	?
Hostname	M640_Manufacturing	?
MAC Address	e8:a4:c1:00:c4:98	?
Current State	Power On	?
IEC Application Run State	Application Missing	?

Factory Setting is 192.168.1.100:808

Hover the mouse over the ? symbols to see a short help description of the item.

6.1 STATUS

Provides information about the connected device including version number and currently active network details.

Bootloader, *Firmware*, and *Model* are useful to identify the device hardware and firmware platform.

The firmware version capable of being run on a particular device depends on the hardware platform. This is identified by looking to the status report of the Model as shown below

Model Text	Hardware Platform	Compatible Firmware Versions	Bootloader
'M640', "or 'M643'	Rev 1	V1.0.0 to V1.3.0	V1.x
'M640 rev:1' or 'M643 rev:1'	Rev 1	V1.0.0 to V1.3.0	V1.x
'M640 2' or 'M643 2'	Rev 2	V1.3.3, V2.x, V3.x	V1.x, V2.x, V3.x
'M640 Rev 3' or 'M630 Rev 3'	Rev 3	V3.x	V3.x

6.2 CONFIGURATION

Allows changes to the settings.

6.2.1 IP CONFIG

**NOTE:** Ethernet settings applied in the *Web Settings* pages may be superseded by application settings. Consult the equipment OEM for further information.

Status

Configuration

Trace

Reboot

Factory Reset

IP Config | LAN Config | IEC App

DHCP Enabled

IP Address

192.168.1.100

Subnet Mask

255.255.255.0

Gateway IP

192.168.1.1

DNS IP

192.168.1.1

Host Name

M940_Manufacturi

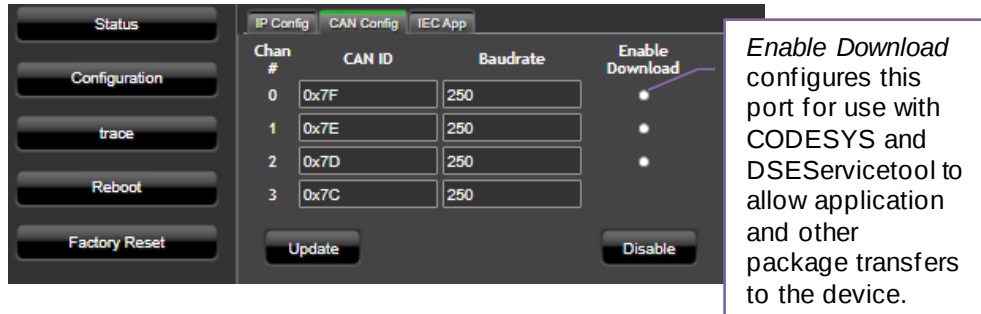
HTTP Port

8080

Update

6.2.2 CAN CONFIG

NOTE: CAN settings applied in the *Web Settings* pages may be superseded by application settings. Consult the equipment OEM for further information.



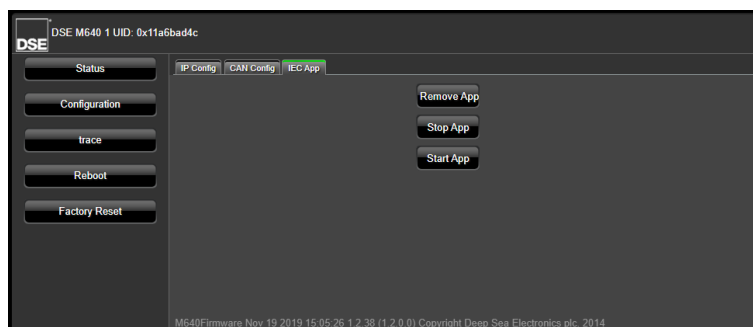
Enable Download configures this port for use with CODESYS and DSEServiceTool to allow application and other package transfers to the device.

6.2.3 IEC APP

NOTE: Removing the application renders the device inoperable until a new application is written to the device. This operation must be carried out only by, or in conjunction with, the equipment OEM.

NOTE: Stopping the application renders the device inoperable until it is subsequently Started. This operation must be carried out only by, or in conjunction with, the equipment OEM.

Allows the current application on the device to be started, stopped, and removed.



6.2.4 TRACE

This section is no longer supported and has no functionality.

6.2.5 REBOOT



NOTE: Ethernet settings applied in the *Web Settings* pages may be superseded by application settings. Consult the equipment OEM for further information.



NOTE: CAN settings applied in the *Web Settings* pages may be superseded by application settings. Consult the equipment OEM for further information.

Click *Reboot* to restart the device, with saved changes being applied.

6.2.6 FACTORY RESET



NOTE: After resetting the device to factory settings, the application code must be reapplied to the device. If you are not the system programmer, contact your Original Equipment Supplier before proceeding.

Click *Factory Reset* and confirm the operation, to set the device to Factory Settings.

7 DSEM640 & DSEM643 CODESYS ERROR CODES

The device returns error codes to CODESYS when appropriate. Individual bits are set within the returned value to indicate one or more error conditions. This can be mapped to a variable if required and is available to view within CODESYS under the *Device Settings I/O Mapping* as shown below.

Device Settings Parameters		The bus is not running. The shown values might not be up-to-date						
Device Settings I/O Mapping		Error Code is a bit field, detailed below.						
Status	Channels	Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value
Information				Error Code	%IW18	UINT	120	
				Device Temperature	%ID10	REAL	18.2	°C
				Battery Voltage	%IW22	UINT	15024	mV
				Supply Voltage 1	%IW23	INT	247	mV
				Supply Voltage 2	%IW24	INT	274	mV
				Supply Voltage 3	%IW25	INT	185	mV
				Supply Voltage 4	%IW26	INT	301	mV
				Ignition Switch	%IX54.0	BIT	TRUE	
				Program Enable	%IX54.1	BIT	TRUE	
				Voltage Reference	%IW28	INT	-1217	mV
								Description
								Error Code: Check Manual for more information
								Value of the Device Temperature
								Battery Voltage
								Supply Voltage 1
								Supply Voltage 2
								Supply Voltage 3
								Supply Voltage 4
								Ignition Switch
								Program Enable
								Voltage Reference

Examples:

A Device error value of 120 (01111000 in binary) indicates that all four *Output Supplies* are *Under Voltage*.

A Device error value of 2 (00000010 in binary) indicates *Over Temperature*.

7.1 DEVICE

To clear these errors, first correct the issue, then either power cycle the device, or apply the command `DSE.SystemClearError`.

MSB	Bit						LSB
8	7	6	5	4	3	2	1
Output Reference Outside Limits	Under Voltage Output Supply 4	Under Voltage Output Supply 3	Under Voltage Output Supply 2	Under Voltage Output Supply 1	Under Voltage Supply	Over Temperature	Error

7.2 ANALOGUE INPUTS

To clear these errors, first correct the issue, then either power cycle the device, or apply the command `DSE.InputClearError`.

Input Configuration	MSB	Bit						LSB
	8	7	6	5	4	3	2	1
Digital	Invalid Parameter	Reserved	Reserved	Invalid Threshold	Reserved	Reserved	Reserved	Error
Voltage	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Range	Inverted Input (<10 mV)	Error
Current	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Range	Wire Break (<4 mA)	Error
Resistance	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Range	Reserved	Error
Ratiometric	Invalid Parameter	Reserved	Invalid Reference	Reserved	Reserved	Over Range	Reserved	Error

7.3 DIGITAL INPUTS

To clear these errors, first correct the issue, then either power cycle the device, or apply the command DSE.InputClearError.

Input Configuration	Bit							
	MSB 8	7	6	5	4	3	2	LSB 1
Digital	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Error
Frequency	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Freq Over Range	Reserved	Error
Phase	Invalid Parameter	Reserved	Invalid Phase Reference	Reserved	Reserved	Freq Over Range	Invalid Phase Reading	Error
Counter	Invalid Parameter	Reserved	Invalid Phase Reference	Invalid Direction	Reserved	Reserved	Reserved	Error
Encoder	Invalid Parameter	Reserved	Invalid Phase Reference	Reserved	Reserved	Reserved	Reserved	Error

7.4 DIGITAL OUTPUTS

To clear these errors, first correct the issue, then either power cycle the device, or apply the command DSE.OutputClearError.

Output Configuration	Bit							
	MSB 8	7	6	5	4	3	2	LSB 1
Digital	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Current	Wire Break (Config)	Error
PWM	Invalid Parameter	Reserved	Reserved	Invalid Duty Cycle	Invalid Frequency	Over Current	Wire Break (Config)	Error
PWMi	Invalid Parameter	Invalid Dither	Invalid Current Target	Reserved	Invalid Frequency	Over Current	Wire Break (Config)	Error

8 CABLES, CONNECTORS, HARNESSES AND SPARE PARTS

Description	DSE Part	Manufacturer Part	Manufacturer
DSEM640 Connector Kit (Set of 3)	007-035	770680-1 776164-4 776164-1	TE Connectivity
DSEM643 Connector Kit (Set of 2)	007-1020	770680-1 776164-1	TE Connectivity
Connector Pin Crimp	N/A	770854-1	TE Connectivity
DSEM640 Connector Harness Kit (Set of 3)	007-036	N/A	DSE
DSEM643 Connector Harness Kit (Set of 2)	016-174	N/A	DSE
M12 to Ethernet Cable	016-160	VS-M12MS-IP20-93R-L1/2	Phoenix
M12 to USB Cable	016-161	N/A	DSE
M12 Sealing O-Ring	011-137	N/A	DSE
Belden 9841	016-030	9841	Belden
Pin Blank Inserts (Seals unused connector pins)	N/A	114017	TE Connectivity

8.1 DSEM640 CONNECTOR HARNESS KIT (007-036)

DSE Part 007-036 consists of three cables as listed below. Connectors are fitted at one end, with cable marking to identify the wires at the other end.

	Connector A	Connector B	Connector C
Assembly Ident	007-036 (a)	007-036 (b)	007-036 (c)
AMP Connector	770680-1	776164-4	776164-1
No of Connections	23	35	35
Wire size	0.5 mm ² (AWG 20)	0.5 mm ² (AWG 20)	0.5 mm ² (AWG 20)
Wire Colour	Black	Black	Black
Wire Idents	1 to 23	1 to 35	1 to 35
Pin Crimp Part No	770854-1	770854-1	770854-1
Cable Length	1200 mm (47 ")	1200 mm (47 ")	1200 mm (47 ")

8.2 DSEM643 CONNECTOR HARNESS KIT (016-174)

DSE Part 016-174 consists of two cables as listed below. Connectors are fitted at one end, with cable marking to identify the wires at the other end.

	Connector A	Connector C
Assembly Ident	007-036 (a)	007-036 (c)
AMP Connector	770680-1	776164-1
No of Connections	23	35
Wire size	0.5 mm ² (AWG 20)	0.5 mm ² (AWG 20)
Wire Colour	Black	Black
Wire Idents	1 to 23	1 to 35
Pin Crimp Part No	770854-1	770854-1
Cable Length	1200 mm (47 ")	1200 mm (47 ")

9 FIRMWARE UPDATE

 **NOTE:** For details how to view the hardware revision and firmware versions compatible with the device, see section entitled *Inbuilt Web Settings | Status* elsewhere in this manual.

 **NOTE:** DSEM64x-003-01 supports firmware V3+ (it cannot be downgraded to V1/V2)

 **NOTE:** To update from V1.x to V2.0 contact support@deepseaelectronics.com

 **NOTE:** When updating from V1.2 to V1.3 you may need to review input assignments as it's mandated that Phase/Encoder inputs utilise adjacent input IDs.

 **NOTE:** A firmware update ERASES THE APPLICATION code.

 **NOTE:** Firmware update is also possible using DSEServiceTool PC Software. Refer to section entitled *DSEServiceTool PC Software* elsewhere in this document.

Firmware update files are obtained from www.deepseaelectronics.com and are applied as follows:

- Rename the firmware package to be "update.pkg" and place in the root folder on a **clean** (blank) USB memory stick.
- Remove DC Supply from the device.
- Apply Program Enable pin.
- Apply DC Supply to the device. A solid amber LED shows that the device has entered bootloader mode.
- Connect the memory stick to the device USB connection using the M12 to USB-A adaptor.
- After approximately 20 seconds, the LED flashes amber (2Hz) while the update file is read.
- Once read, the update file is uncompressed. The LED flashes amber at a slower rate (1 Hz) during this process. The time this occurs depends upon the size of the update file (approximately 100 seconds for a 1.25 MB file).
- After decompressing, the LED lights solid amber for approximately four seconds while the firmware update is applied to the memory.
- When update is complete, the LED extinguishes.
- Remove DC Supply from the device.
- Remove the USB memory stick.
- The update is complete.

10 BOOTLOADER UPDATE



NOTE: Bootloader Update must not be performed on a working machine. Contact OEM for advice updating the bootloader.



NOTE: Bootloader update must be performed using DSEServiceTool PC Software and Ethernet connection.

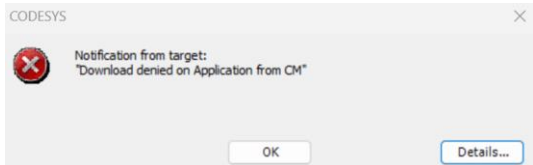
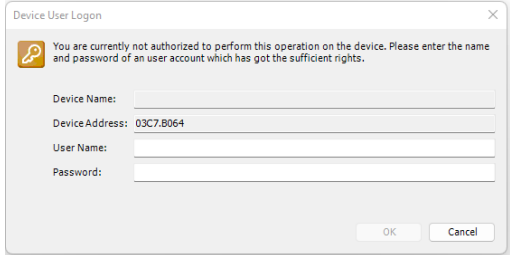


NOTE: Device must not be powered off until the Bootloader Update has completed.

11 TROUBLESHOOTING

The below are suggestions answering frequently questions about the device.

11.1 CONNECTION

Symptom	Suggestion
Cannot transfer application from CODESYS. Error "Download denied on Application from CM" is given. 	Program Enable pin is not active. Power up device with Program Enable not active to allow the device to start normally (not in bootloader mode). A few seconds later energise Program Enable pin to allow the device to be programmed. Remember to remove this pin before the device is next rebooted / power cycled
Static yellow LED on device, unable to connect to CODESYS.	This means the device is in bootloader mode. Remove Program Enable pin and remove/reapply DC power to start the device in 'normal' mode. CODESYS cannot connect to the device when in bootloader mode.
Unable to connect by CODESYS as the connection settings are unknown.	 NOTE: After resetting the device to factory settings, the application code must be reapplied. If you are not the system programmer, contact your Original Equipment Supplier before proceeding. Obtain M64x_erase application from DSE. This can be applied by USB or direct device to PC connection and resets the device to factory settings (192.168.1.100) enabling connection to be made.
Unable to connect by CODESYS as the Device User Login details are not known: 	 NOTE: After resetting the device to factory settings, the application code must be reapplied to the device. If you are not the system programmer, contact your Original Equipment Supplier before proceeding. There is no 'backdoor password' so the only options are to either obtain the login details from the person that set them or to erase the device to factory settings. To do this contact support@deepseaelectronics.com

11.2 PERSISTENT VARIABLES, DATA LOGGING ETC

Symptom	Suggestion
How do I use Persistent Variables?	 NOTE: Changing the structure of the PersistentVariables objects causes the memory area to be cleared when the application is sent to the device. This results in the loss of existing Persistent Variables data. Add a Persistent Variables object to the project. Right Click <i>Application</i> and select <i>Add Object Persistent Variables</i>. Variables placed here are stored continuously and persist through a power off.
How can I implement a data log?	As M64x has no filesystem, it is not possible to write a datafile to the device memory, or to USB. There are two alternatives: 1) If the application includes DSEM840, DSEM870 or DSEM812 display, allow the display device to write the data log file to USB or internal memory. 2) Keeping the maximum data size within the bounds of the M64x FRAM, use a PersistentVariables array.

11.3 INPUTS AND OUTPUTS

Symptom	Suggestion
How can I connect an RTD or Thermocouple temperature sensor?	- DSEM64x Resistive Inputs are accurate to 1 % of full measurement scale (3400 Ω). This makes RTDs unsuitable for direction connection to DSEM64x. Suggested alternatives are temperature sensors with a 0 V to 5 V, 0 V to 10 V, or 4 mA to 20 mA output across the range of temperatures to be measured. Alternatively, sensors with CAN support are suitable.

12 MAINTENANCE AND WARRANTY

The controller is *Fit and Forget*. As such, there are no user serviceable parts within the controller. In the case of malfunction, you should contact your original equipment manufacturer (OEM).

DSE Provides limited warranty to the equipment purchaser at the point of sale. For full details of any applicable warranty, refer to the original equipment supplier (OEM).

13 DISPOSAL

13.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

If you use electrical and electronic equipment you must store, collect, treat, recycle, and dispose of WEEE separately from your other waste



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