DEEP SEA ELECTRONICS PLC

DSEM840 Operator Manual

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DSEM840 Operator Manual

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Revision History

Issue No.	Comments
1	Initial release of document
2	Added Manual Shutdown feature.
3	Added M840-02

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1 INTRODUCTION

This document details the operation and setup requirements of the DSEM840 Mobile Controller and Display, 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.deepseaplc.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.

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 or C programming. Contact DSE Technical Support for further details.

DSEM840-02 offers increased performance over the original DSEM840-01 while maintaining identical mechanical and connection details. Differences are detailed in the section entitled *Specifications* elsewhere in this document.



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
Application	The application is the program that allows the DSEM840 to control the machine it is connected to. The Application within the DSEM840 is designed and provided by the manufacturer of the complete machine.
Bootloader	The Bootloader is the program within the DSEM840 responsible for loading the Operating System.
CAN	Control Area Network. A high-speed data transmission system used extensively within the Automotive and Off-Highway industries.
CODESYS (Previously stylised as CoDeSys)	Integrated Development Environment for programming controller applications according to the international industrial standard IEC 61131-3. DSEM840 supports CODESYS V3.5
DSEServicetool	DSE Software used to load packages to the DSE M Series devices.
ECU	Electronic Control Unit. For example the DSEM840 device.
Firmware	The Firmware of the DSEM840 is the Operating System of the DSEM840 that reads and executes the Application program.
FSD	Full Scale Deflection. For example 0 mA to 20 mA is the Full Scale Deflection of a current sink input.
I/O	Input / Output. For example “The I/O is taken out to an external terminal strip in the user panel”.
IDE	Integrated Development Environment. For example the CODESYS V3.5 application that runs on the host PC is an IDE.
Ixyyy	An Input, where x is the connector and yyy is the input number. For example IA003 means Input 3 on Connector A.
PLC	Programmable Logic Controller. Industrial computer used primarily for the automation of electromechanical machinery.
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= Voltage control. PWMi = Current control.
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.
Pin	A male or female pin connection in a housing (plug or socket).
Qxyyy	An Output, where x is the connector and yyy is the output number. For example QA002 means Output 2 on Connector C.

1.3 RELATED INFORMATION

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

1.3.1 TECHNICAL INFORMATION

DSE Part	Description
055-222	DSEM840 Datasheet
053-188	DSEM840 Installation Instructions
057-265	DSEServicetool Software Manual
057-270	DSEM240 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 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 a connector is completely unused, ensure the use of a suitable blanking insert as recommended by the connector manufacturer.

- To maintain IP67 rating where connectors have unused pins, ensure the use of a suitable blanking insert as recommended by the connector manufacturer.

- M12 protection plugs (supplied) must be installed in both the USB and Ethernet interfaces to ensure IP67 rating when the connectors are not in use. Where IP protection is required when the interfaces are in use, suitable O-rings must be fitted. Silicon Grease to protect the O-rings is recommended.

2 SPECIFICATIONS

Specification tables below cover both DSEM840-02 and the original DSEM840-01. Where not listed, the specification covers both device versions.

2.1 PROCESSOR

Description	DSEM840-01	DSEM840-02
Processor Type	NXP LPC4357 dual core M4 & M0	STM32H745 dual core M7 & M4
Speed	200 MHz	M7 @ 400 MHz M4 @ 200 MHz

2.2 MEMORY

Description	DSEM840-01	DSEM840-02
Flash	16 MB Total	32 MB Total 20 MB Available to CODESYS
RAM	32 MB Total	64 MB Total 48 MB Available to CODESYS
Retained Data	N/A	8 kB, Data Written to Non-Volatile memory at 1 Hz rate
System Event Log	N/A	2 MB Configurable on/off

2.3 DC SUPPLY

Description	Specification
Operating Voltage (Pin A7)	8 V to 32 V Operation to 5 V for 500 ms providing supply was 5 V previously. Protection to 55 V for 200 ms
Maximum Current (Full Backlight, no External Loads)	<1000 mA at 24 V
Maximum Current (Full Backlight & Heater, no External Loads)	<1500 mA at 24 V
Maximum Current (After Controlled Shutdown With Ignition off)	<0.1 mA at 24 V

2.3.1 FUSING

Description	Specification
DC Supply (Pin A7) Supplies DSEM840 and High Current Outputs Fuse as Required by Output Loads (Pins A2, A3, A4, A5)	3 A Min (to supply DSEM840) 10 A Max
Ignition (15) (Pin A13)	1 A Max

2.3.2 IGNITION (PIN A13)

NOTE: Ignition (Pin A13) must be utilised correctly to enable / disable the application program. This ensures that *Persistent Variables* (e.g. *logs* and other changed parameters) and other files are saved correctly.
Incorrect device shutdown while using the file system may result in loss of Application Program.

NOTE: Should it be required to perform a programmatic shutdown some time after removal of *Ignition*, see section entitled *Manual Shutdown* elsewhere in this document.

Pin A7 is used to give a constant DC supply to the DSEM840, with the Ignition pin being used to energise and de-energise the ECU. Typically, this pin is controlled by an external ignition switch.
To stop the application, de-energise the Ignition pin. This allows the DSEM840 to store any changed parameters and logs before closing.

Description	Specification
Ignition Pin Active	>5 V

2.4 ENVIRONMENTAL

Description	Specification
Operating Temperature	-30 ºC to +65 ºC (-22 ºF to 149 ºF)
Storage Temperature	-40 ºC to +80 ºC (-40 ºF to 176 ºF)
Degrees of Protection Provided by Enclosure (With All Mating Connectors Fitted)	IP67 (NEMA 6)

2.5 USER INTERFACE

2.5.1 CONTROLS

Description	Specification
Push Buttons	14

2.5.2 DISPLAY

Description	Specification
Size (Across Diagonal)	109 mm (4.3”)
Size (W x H)	WQVGA (480 x 272)
Aspect Ratio	16:9
Type	Optically Bonded TFT
Lifetime	> 30,000 hours
Colour	24 bit
Splash Screen Image Type	Uncompressed Bitmap Image (BMP) 24 bit Colour 480 x 272 Spaces are not permitted within the image filename.

2.5.3 LED

The system LED is used to indicate operating status.

Description	Specification
LED Type	Tricolour (Red, Amber, Green) (see below)

Colour	Operation	State	Meaning
Off	N/A	Off	Device not powered
Green	Static	Application Stopped.	Unit powered up, Application program loaded but not running
	1Hz flash	Application Running.	Unit powered up, Application program loaded and running
	5Hz flash	No Application.	Unit powered up, but no Application program loaded
Amber	Static	Bootloader Mode	Bootloader functioning normally, firmware present
		Firmware Start-up	Firmware is at Start-up.
		Application Exception	Unit Stopped due a serious fault.
	1Hz flash	Decrypting Image	Bootloader is decrypting the downloaded image
	5Hz flash	Reading Image from USB	Bootloader is reading an image from the USB
Red	Static	Fatal Error	Fatal system / hardware fault – LED may be driven directly by microcontroller error pin or firmware is in fault condition state.
	1Hz flash	Faulty Application Running	Unit running with a serious fault, see CODESYS error flags or Web Tool

2.6 REAL TIME CLOCK

Description	Specification
Retention Type	Standard RTC.
Retention Time (Approx.)	5 years

2.7 INPUTS

2.7.1 DIGITAL INPUTS

2.7.1.1 DIGITAL

Description	Specification
Applicable Pins	Pins A10, A11, A16, A17
Minimum Voltage For High Level	Configurable
Maximum Voltage For Low Level	Configurable
Active Mode	Configurable
Whetting Current	Min 1.6 mA

2.7.1.2 FREQUENCY

Description	Specification
Applicable Pins	Pins A10, A11, A16, A17
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)	DSEM840-01: >4 V DSEM840-02: >2.4 V
Maximum Voltage For Low Level (Space)	DSEM840-01: <0.5 V DSM840-02: <0.9 V

2.7.2 ANALOGUE INPUTS

Description	Specification
Applicable Pins	Pins A10, A11, A16, A17
Reference Voltage Pins	A6
Reference Voltage	Programmable 0 V / 5 V / 10 V ±500 mV

2.7.2.1 VOLTAGE

Description	Specification
Applicable Pins	Pins A10, A11, A16, A17
Configurable Ranges	0 V to 5 V 0 V to 10 V 0 V to 32 V
Input Resistance	>=7.5 kΩ
Sampling Rate	500 Hz
Resolution	DSEM840-01: 10 bits DSEM840-02: 12 bits
Accuracy	± 1 % FSD

2.7.2.2 CURRENT

Description	Specification
Applicable Pins	Pins A10, A11, A16, A17
Configurable Ranges	0 mA to 20 mA 4 mA to 20 mA
Input Type	Current sink only
Input Sink Resistance	DSEM840-01: 100 Ω ± 1% DSEM840-02: 150 Ω ± 1%
Sampling Rate	500 Hz
Resolution	DSEM840-01: 10 bits DSEM840-02: 12 bits
Accuracy	± 1 % FSD

2.7.2.3 RESISTIVE

Description	Specification
Applicable Pins	Pins A10, A11, A16, A17
Measurement Range	0 Ω to 3400 Ω
Measurement Source Current	1 mA
Sampling Rate	500 Hz
Resolution	DSEM840-01: 10 bits DSEM840-02: 12 bits
Accuracy (± 1 % Full Scale Deflection)	± 1 % FSD

2.7.2.4 RATIOMETRIC

Description	Specification
Applicable Pins	Pins A10, A11, A16, A17
Measurement Voltage Reference	Configurable (Supply / VREF)
Measurement Type	Ratio of input Pin to Reference
Resolution	DSEM840-01: 10 bits DSEM840-02: 12 bits
Accuracy	± 1 % FSD

2.8 OUTPUTS

2.8.1 NEGATIVE SWITCHING

Description	Specification
Applicable Pins	Pins A2, A3, A4, A5
Maximum Current	1 A selectable
Digital Output Active Low ‘ON’ State Maximum Voltage at Rated Current	< 100 mV
Digital Output Active Low ‘OFF’ State Leakage Current	<5 µA at 24 V output supply

2.8.2 POSITIVE SWITCHING

Description	Specification
Applicable Pins	Pins A2, A3, A4, A5
Maximum Current	1 A selectable
Digital Output Active Low ‘ON’ State Maximum Voltage at Rated Current	<100 mV
High Side Digital Output Active Low ‘OFF’ State Leakage Current	<10 µA at 24 V output supply
Low Side Digital Output Active Low ‘OFF’ State Leakage Current	<2 mA at 24 V output supply

2.8.3 VREF

Configurable output voltage suitable for supply external circuits such as input sensors.

Description	Specification
Applicable Pins	Pin A6
Voltage	Configurable (Disabled, 5 V, 10 V)
Accuracy Under Load	1 %
Maximum Source Current	100 mA
OFF State Leakage Current	< 100 µA

2.9 COMMUNICATIONS

2.9.1 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	2
Supported Protocols	J1939 CAN open Raw CAN
Supported Baud Rates	50 kbit/s, 100 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s

2.9.2 ETHERNET

Description	Specification
Number Of Ethernet Ports	1
Supported Data Rates	10 Mbit/s / 100 Mbit/s, Duplex
Supported Protocols	MODBUS TCP CODESYS 3.5

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

2.9.3 USB

Description	Specification
Number of USB Ports	1
USB Version	2
Supported Speeds	Full Speed (12 Mbit/s)
Device Class	08 (Mass Storage)
Max Size	64 GB
Filing System	VFAT or FAT32

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

2.10 CAMERA INPUTS

Description	Specification
Number of Camera Inputs	1
Connection Pins	A12 (signal), A18 (gnd).
Interface Type	Analogue (Composite) Video for PAL / NTSC

2.11 APPLICABLE STANDARDS

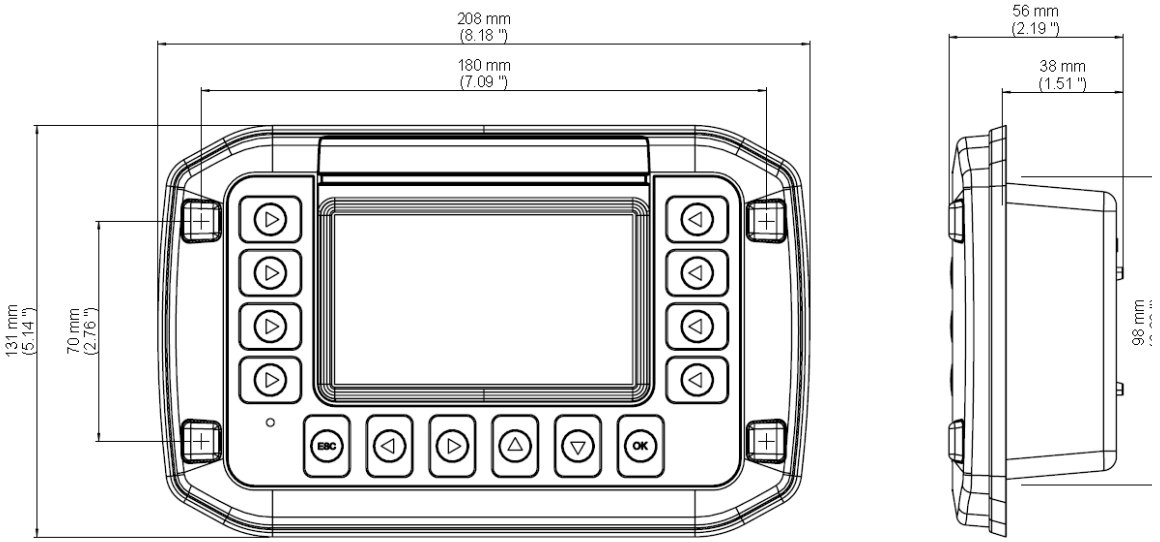
Category	Description	Standard
CE marking	Electromagnetic compatibility (EMC) noise immunity Electromagnetic compatibility (EMC) emission standard Safety of information technology equipment, general requirements	EN 61000-6-2 EN 61000-6-4
E11 PENDING	EMC requirements for vehicles Noise immunity with 100 V/m	UN/ECE-R10.05 ISO 11452-2
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
Load Dump (Not Applicable to DSEM840-01)	151 V (Ri 1 Ω) 202 V (Ri 8 Ω)	ISO 16750-2

3 INSTALLATION

3.1 DIMENSIONS AND MOUNTING

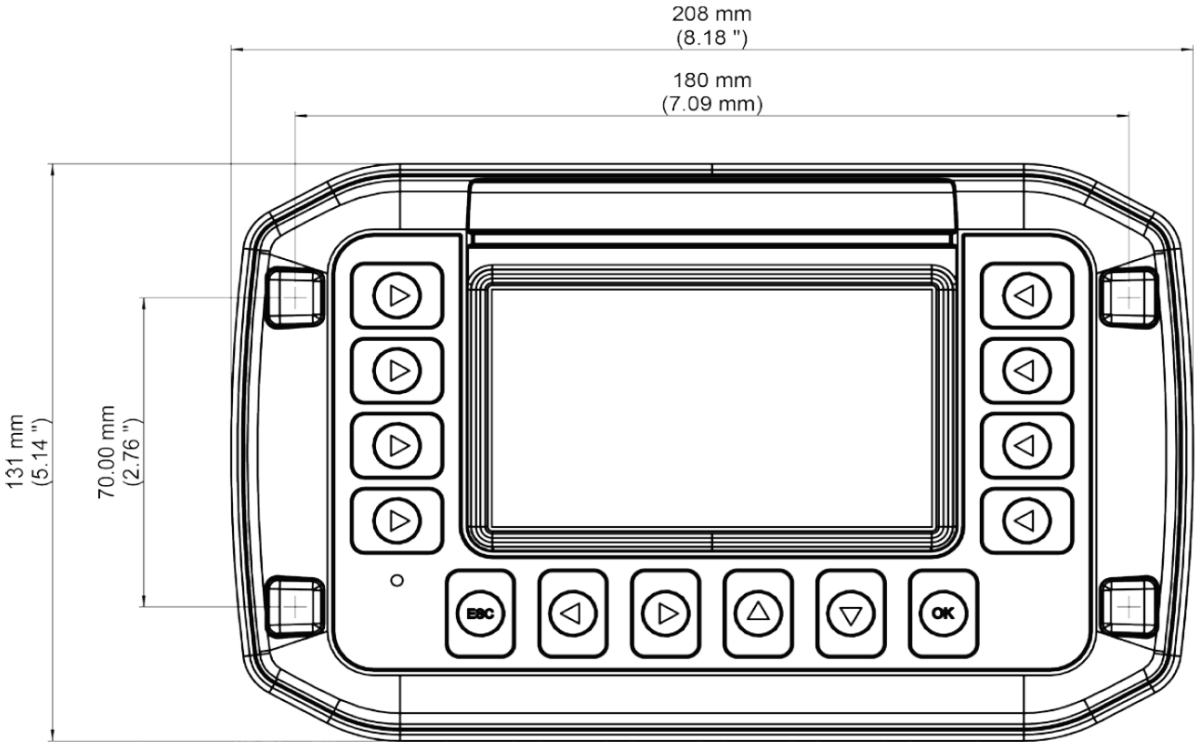
3.1.1 DIMENSIONS

Description	Specification
Overall Dimensions (Height x Width x Depth)	208 mm x 131 mm x 56 mm (8.18 ” x 5.14 ” x 2.19 ”)
Mounting Type	4 x mounting bolts or RAM mount.
Overall Weight	<1 kg (2.2 lb)



3.1.2 FASCIA MOUNTING

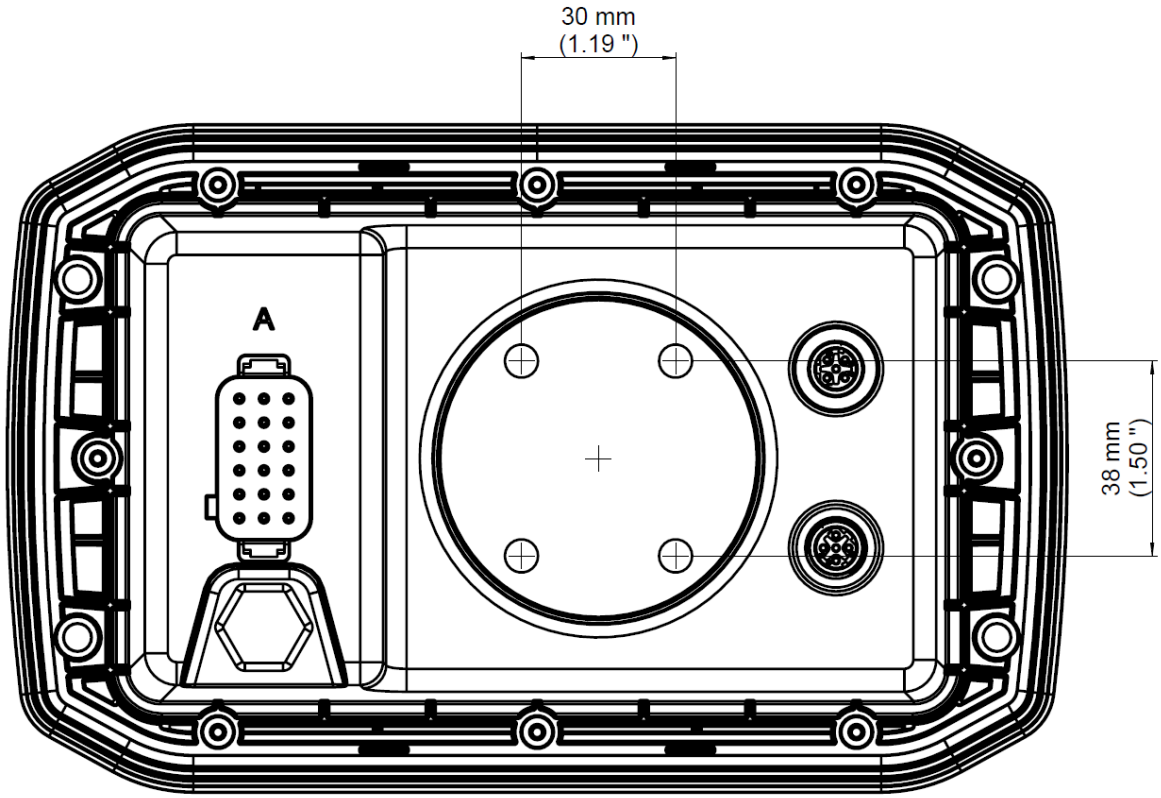
Description	Specification
Fascia Mounting Holes	Suitable for M5 bolts (0.3 “ holes)
Fascia Mounting Hole Centres	180 mm x 70 mm (7.09 “ x 2.76 “) See Diagram Below
Panel Cut-Out	163 mm x 98 mm (6.42 “ x 3.86 “)
Fascia Mounting Bolt Material Recommendation	Steel or Stainless Steel bolts fitted with M5 bonded seal washers (also known as Dowty washers).
Fascia Mounting Bolt Tightening Torque to prevent distortion of the sealing gasket and subsequent seal failure / mechanical damage to the controller.	1.2 Nm Maximum (0.89 ft. lb Maximum)



3.1.3 RAM MOUNTING

DSE840 has four holes on the rear face, suitable for fitting of a RAM type mount. The spacing for the mounting holes is detailed in the image below.

Description	Specification
RAM Mounting Holes	Suitable for M5 bolts (0.3 “ holes)
RAM Mounting Hole Centres	30 mm x 38 mm (1.19 “ x 1.50 “)
RAM Mounting Bolt Material Recommendation	Steel or Stainless Steel
RAM Mounting Bolt Tightening Torque	4 Nm Maximum (2.95 ft. lb Maximum)

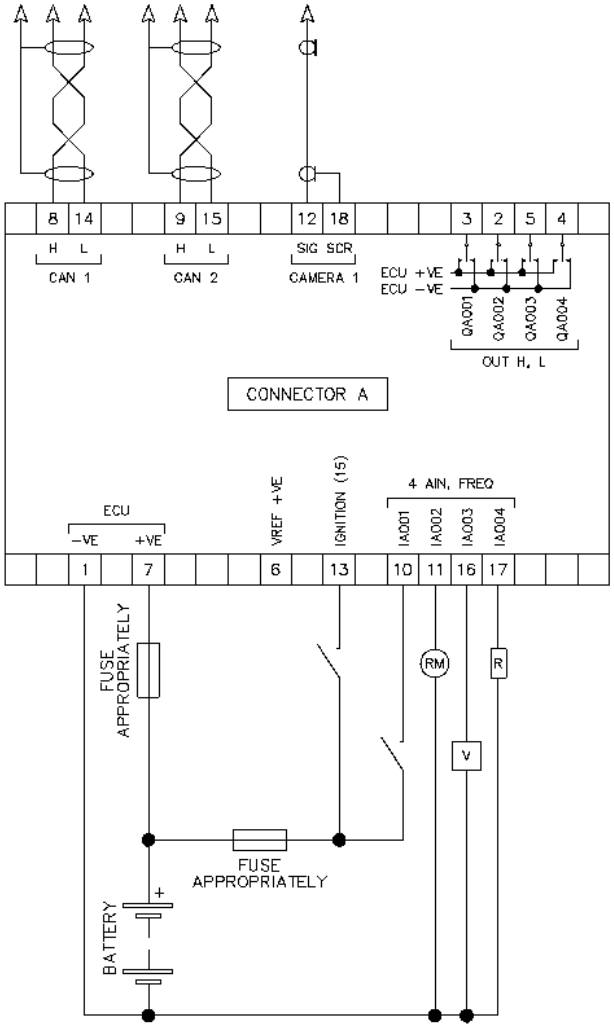


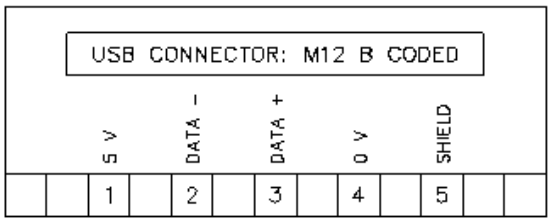
3.2 FUSING

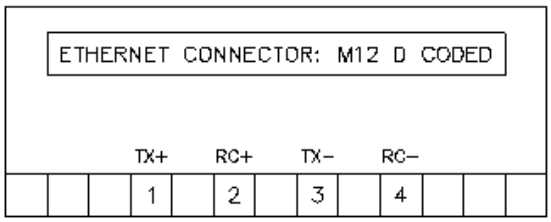
The individual electric circuits must be protected in order to protect the whole system. Select appropriate fuses to protect the outputs being supplied.

Pin	Description	Comments	Recommended Fuse Size
A7	ECU Supply	Supplies DSEM840 CPU and Outputs	3 A to 10 A Max
A13	Ignition (15)		1 A Max

3.3 TYPICAL CONNECTION DIAGRAM



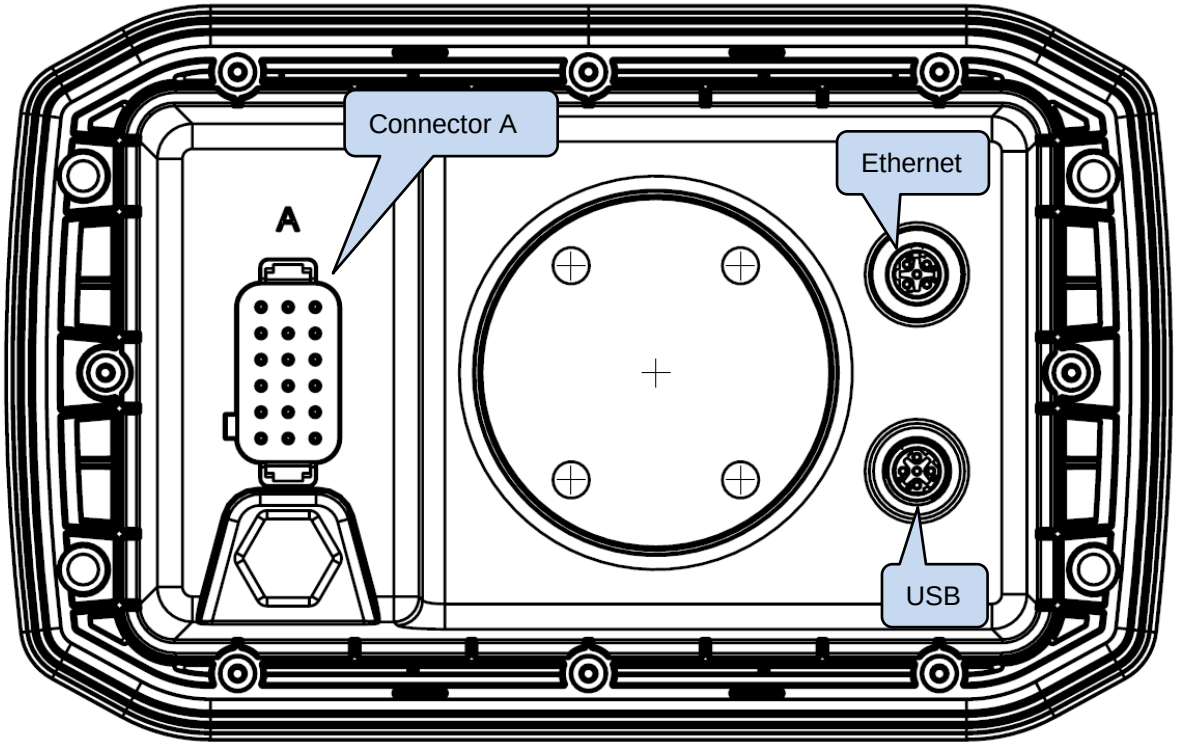




3.4 USER CONNECTIONS

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: USB and Ethernet connectors are coded differently. Do not try to force a connector into the wrong socket.



3.4.1 CONNECTOR A

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

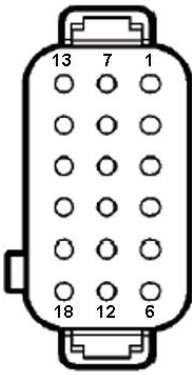
NOTE: Ignition (Pin A13) must be utilised correctly to enable / disable the application program. This ensures that logs and other changed parameters are stored when the Ignition is switched off.

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: Connect Camera using a single core conductor with screen (shield).

Terminology	Meaning
QA00x	Output
IA00x	Input
H	Output, High when active.
L	Output, Low when active.
AIN, FREQ	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 and frequency measuring

Connector A	Pin	Description	Comments
(A Coded)  	1	ECU Supply -ve	DC Supply negative for the DSEM840
	2	QA001	OUT H,L
	3	QA002	OUT H,L
	4	QA003	OUT H,L
	5	QA004	OUT H,L
	6	VREF +	VREF output for AIN
	7	ECU Supply +ve	DC Supply positive for the DSEM840
	8	CAN1 H	
	9	CAN2 H	
	10	IA001	AIN, FREQ
	11	IA002	AIN, FREQ
	12	Camera Signal	Analogue (Composite) video
	13	Ignition +ve (15)	Energises the ECU.
	14	CAN1 L	
	15	CAN2 L	
	16	IA003	AIN, FREQ
	17	IA004	AIN, FREQ
	18	Camera GND	Screen/GND for Camera

4 OPERATION

4.1 SYSTEM PAGES

The System Information and System Settings pages are accessed by pressing and holding any two of the fascia buttons during the power up (application of Ignition input with DC power supplied) of the DSEM840. Wait until *Entering Setup…* is displayed before releasing the buttons.

4.1.1 NAVIGATION

Within the System Pages, the following icons appear a adjacent to the buttons to indicate their function.

Icon	Function	Description
ESC	Return	Return to a previous page.
◄►▲▼	Navigate	Navigate through the available selections.
OK	OK / Accept	Accept/Edit the current selection, Save the value being edited.

4.1.1.1 PAGE SELECTION

Use the ◄ / ► buttons to move through the pages. Press **OK** to select the page. Press **ESC** to exit the editor and return to the main application.



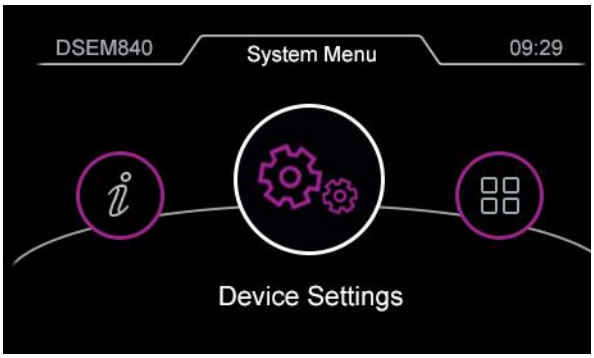
4.1.1.2 OPTION SELECTION AND EDITING

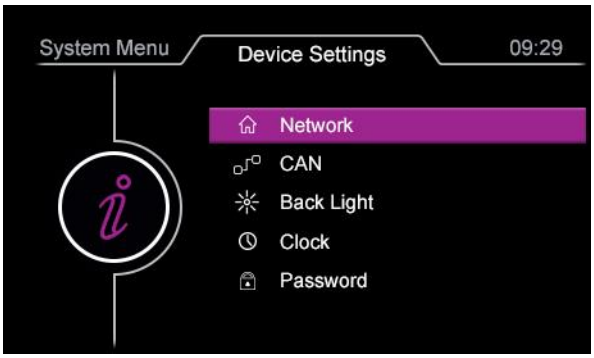
While viewing the selected page, use the ◄ / ► buttons to move through the options, Press **OK** to select the option for editing.

While editing the selected parameter, use the ▲ / ▼ buttons to change the value, Press **OK** to save the change.
Press **ESC** to exit the editor.

4.1.2 DEVICE SETTINGS

This section allows access to the *Device Settings*.





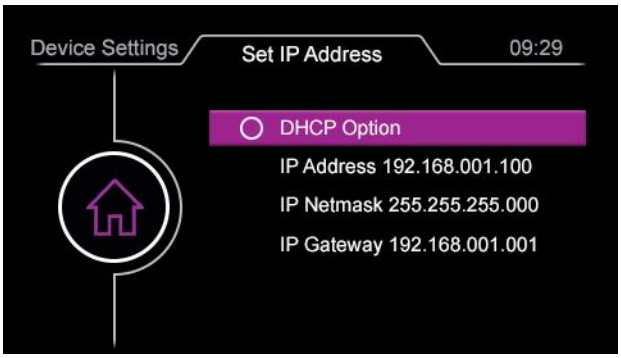
4.1.2.1 NETWORK

This section allows selection of DHCP or Static IP address.
When connecting the device to a third party network, these settings must be made after consulation with the network manager.

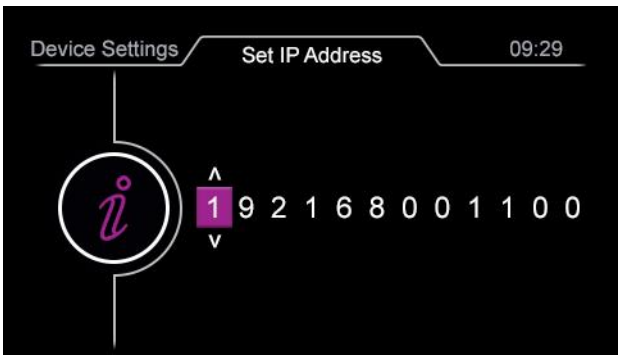
Press **OK** to enable / disable *DHCP Option.*

Selecting *DHCP Option* instructs the device to obtain the network settings automatically from a DHCP server on the connected network. When unselected, the network options are user configured.

Press the ▲ / ▼ buttons to move through the options, Press **OK** to select the option for editing.
Press **ESC** to exit the editor.



While editing the parameter, use ◀ / ▶ buttons to move through the digits, use ▲ / ▼ buttons to change the value of the selected digit. Press **OK** to save the change.
Press **ESC** to exit the editor.

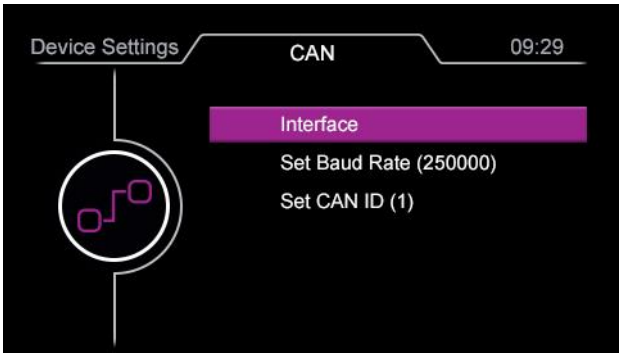


4.1.2.2 CAN

This section allows configuration of the CAN interface parameters.

Press the ▲ / ▼ buttons to move through the options, Press **OK** to select the option for editing.

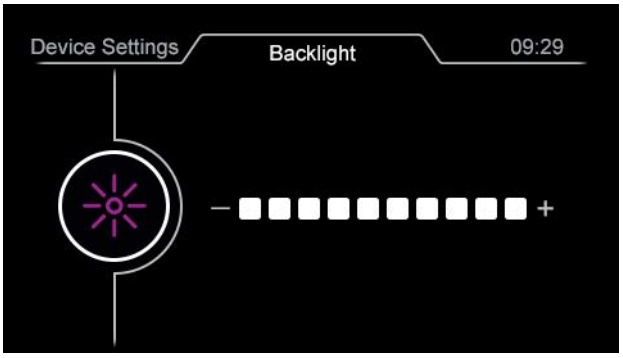
Selecting *Interface* and pressing **OK** cycles between the two CAN ports (0 & 1).



4.1.2.3 BACKLIGHT

This section allows adjustment of the LCD backlight brightness.

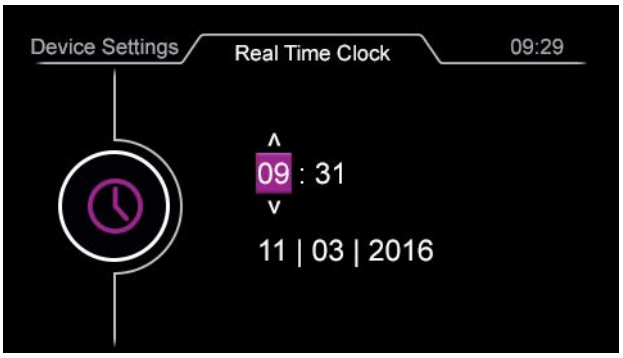
Use the ◀ / ▶ buttons to change the brightness, Press **OK** to save the change.
Press **ESC** to exit the editor.



4.1.2.4 REAL TIME CLOCK

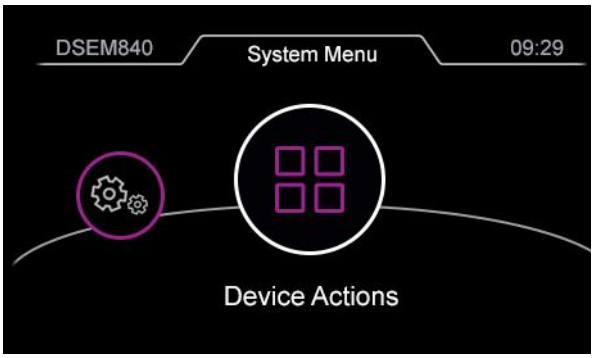
Allows the setting of the Real Time Clock and Calendar.

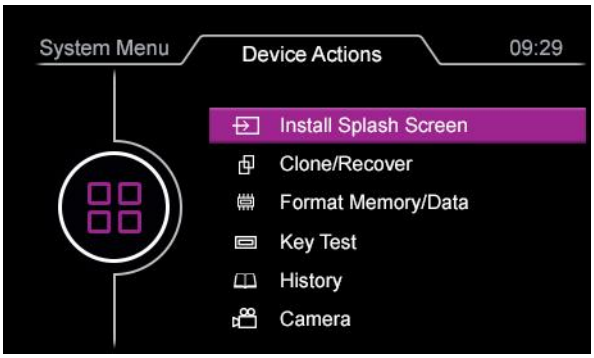
While editing the parameter, use the ◀ / ▶ buttons to change between fields and ▲ / ▼ buttons to change the highlighted value.
Press **OK** to save the change.
Press **ESC** to exit the section.



4.1.3 DEVICE ACTIONS

Allows selection of device actions.



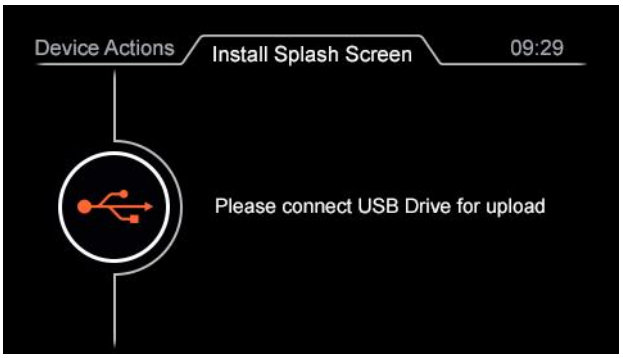


4.1.3.1 INSTALL SPLASH SCREEN

DSEM840 supports the display of a *Splash Screen* at power up of the device. This is typically used to display the OEM logo image.

The device Password is required (when enabled) to allow Splash Screen installation.

Supported Splash Screen Image Type:
Uncompressed Bitmap Image (BMP)
24-bit Colour
480 x 272
Spaces are not permitted within the image filename.

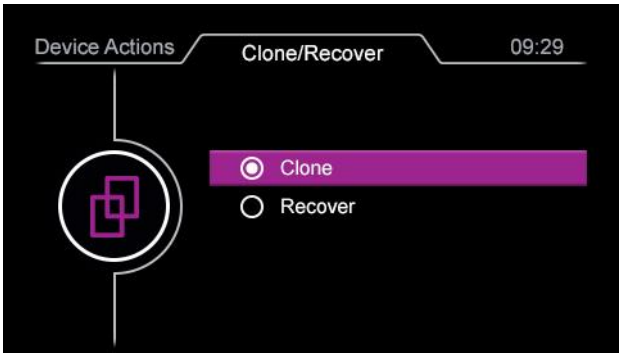


Press **ESC** to exit the section.
Press the ▲ / ▼ buttons to select the required file, Press **OK** to apply it

4.1.3.2 CLONE / RECOVER SELECTION

The device Password is required (when enabled) to allow Clone or Recover operations.

Press the ▲ / ▼ buttons to select the required function, Press **OK** to access it.
Press **ESC** to exit the section.



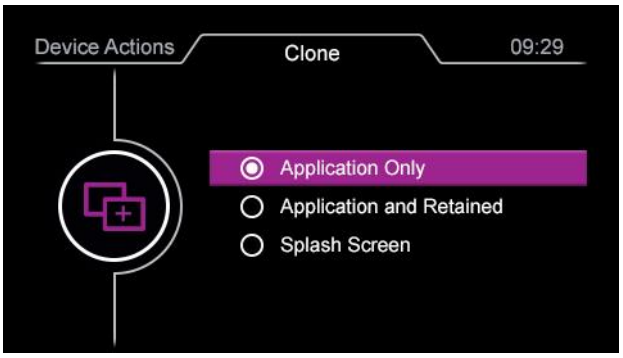
CLONE

NOTE: Max 8 GB USB Memory Device is supported for *Clone* function.

This section is used to create a backup file of the device, selecting the elements to backup.
This file may then be used to recover the device, or create *Clones*, sending the file to other devices.

Press the ▲ / ▼ buttons to select the required section to Clone, Press **OK** to action it.

Ensure the USB device (FAT / FAT32 formatted, Max 8 GB) used to store the Clone file(s) is connected to the controller.
Press **ESC** to exit the section.



RECOVER

NOTE: The *Recover* process replaces files on the target device and may change the Application of the device.

This section is used to recover the device from a previously stored Clone (backup) file.

Ensure the USB device containing the file(s) to Recover is connected to the controller. All applicable files are listed.

Press the ▲ / ▼ buttons to select the required file, Press **OK** to apply it.
Press **ESC** to exit the section.

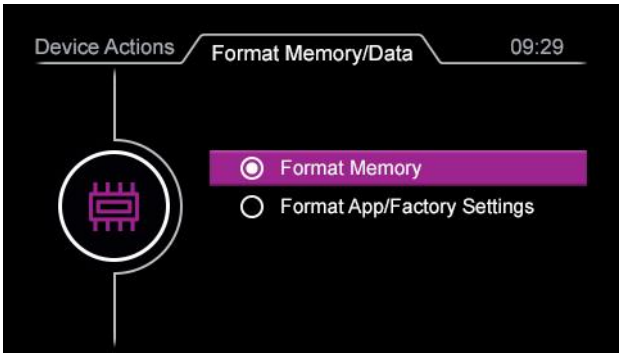


4.1.3.3 FORMAT MEMORY / DATA

NOTE: The *Format* process deletes files on the target device and may change the operation of the device.

Select which memory area to Format.

Press the ▲ / ▼ buttons to select the required function, Press **OK** to access it. Press **ESC** to exit the section.

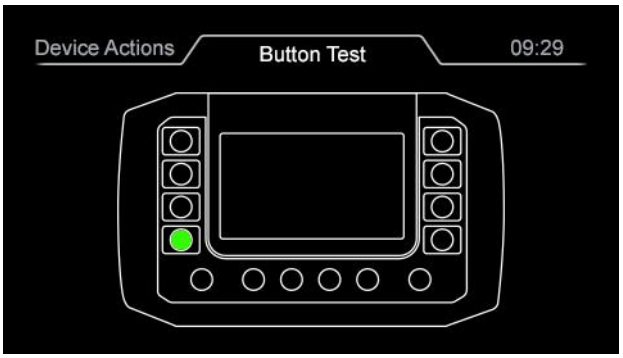


4.1.3.4 KEYTEST

This section allows the device fascia buttons to be tested.

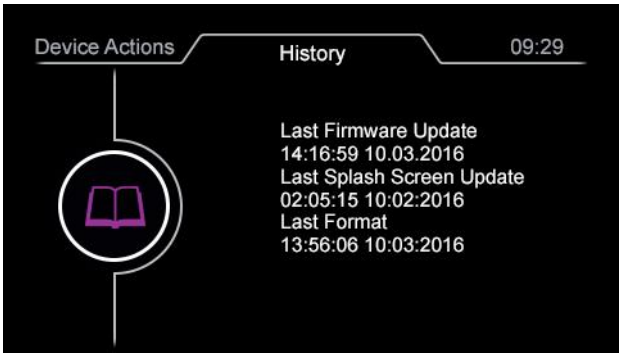
Press the keys to receive feedback of their operation.

To exit the Keytest, release all buttons for five seconds.



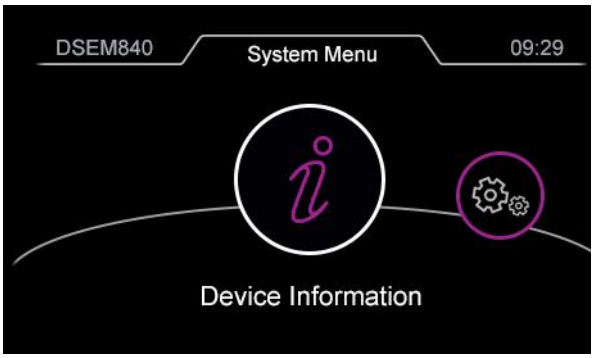
4.1.3.5 ‘HISTORY

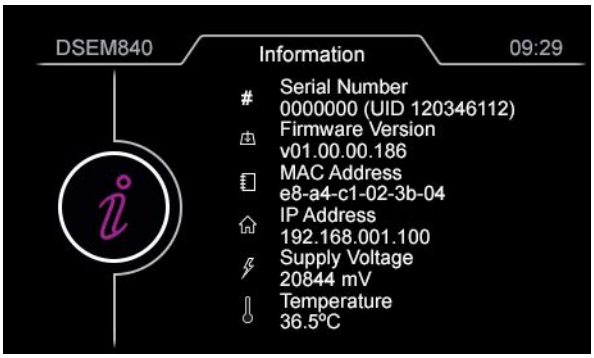
Used to display a log of the date of certain actions.
Press **ESC** to exit the section.



4.1.4 DEVICE INFORMATION

This section shows the *Device Information*.





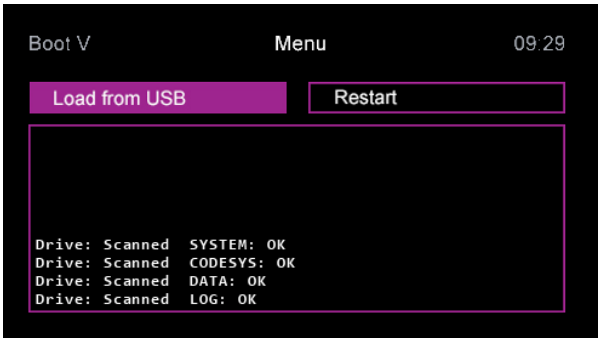
4.2 FIRMWARE UPDATE AND FILE SYSTEM OPERATIONS

NOTE: *Load from USB* process deletes files on the target device and may change the operation of the device.

This section allows new files and firmware to be installed.

- Remove Ignition from the DSE840.
- Press and hold any three buttons. Reapply Ignition until the *Boot Menu* is displayed. Now release the buttons to enter the Boot Menu.

Press ◀ / ▶ / ▲ / ▼ buttons to select the required option.
Press **OK** to access the selected function.
Press **ESC** to exit the section.

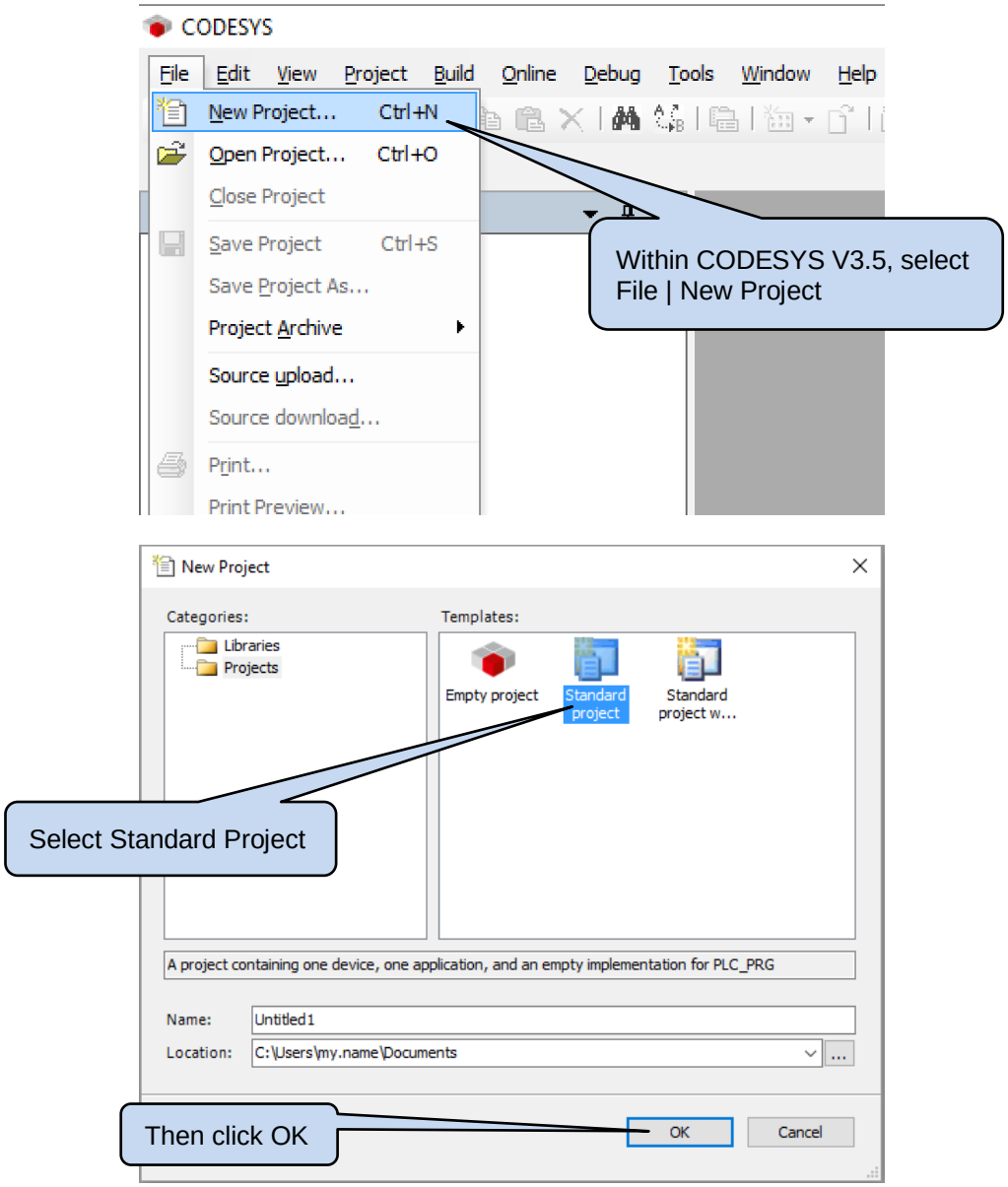


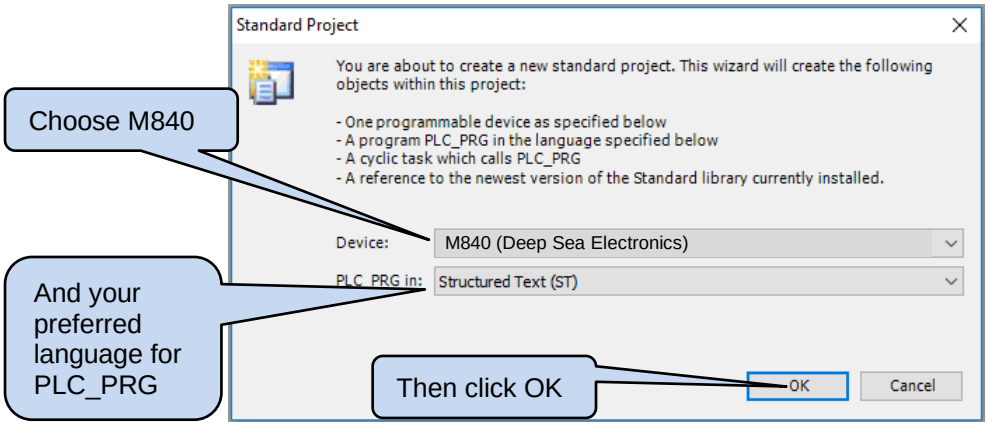
5 CONNECTING TO CODESYS

DSEM840 communicates with, and is programmed by, the CODESYS V3.5 Integrated Development Environment (IDE) version 3.5.12.0.

5.1 START NEW PROJECT

To begin, start a new project as shown.

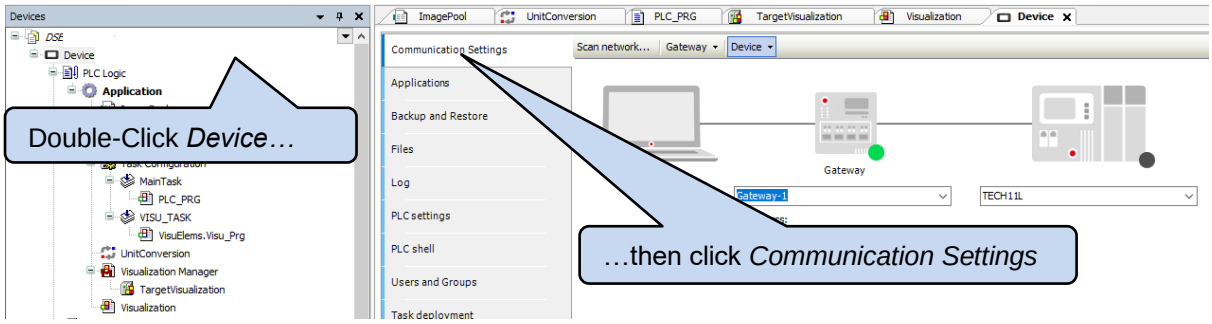


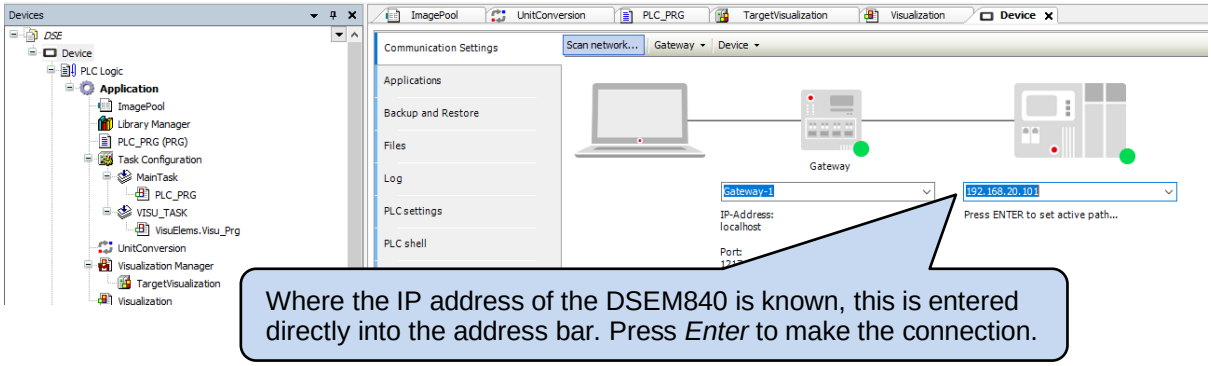


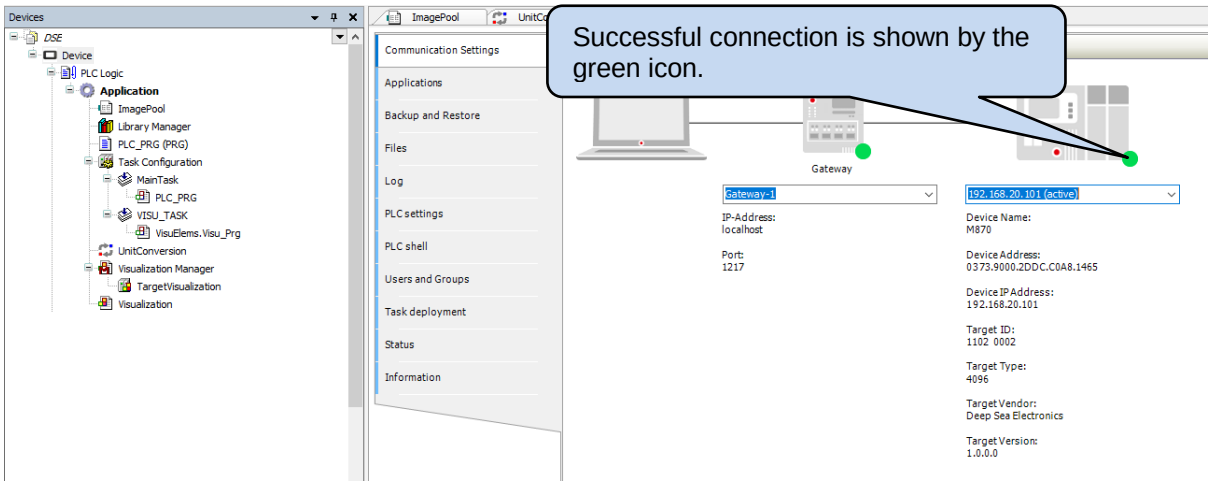
5.2 ETHERNET TCP

NOTE: If the IP address of the device is not known, see the section entitled *Ethernet UDP* elsewhere in this document.

With the DSEM840 connected to the same Ethernet network as the PC, Select *Device* | *Communication Settings* in the CODESYS V3.5 IDE.



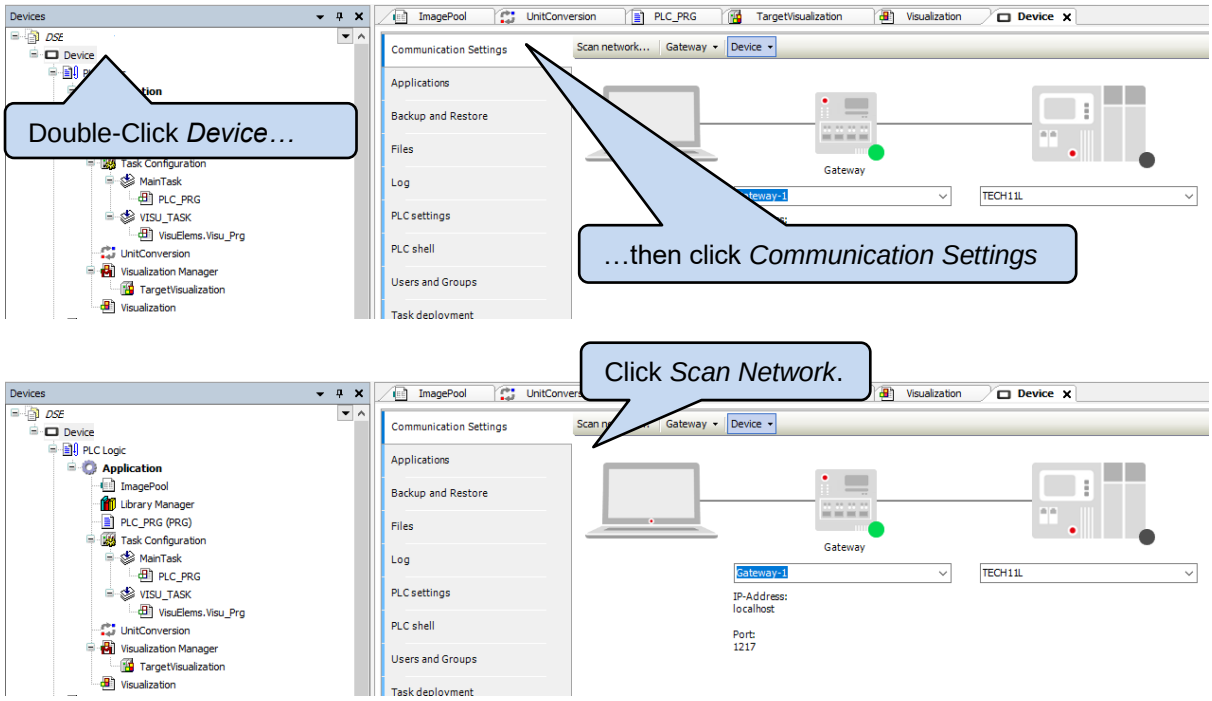




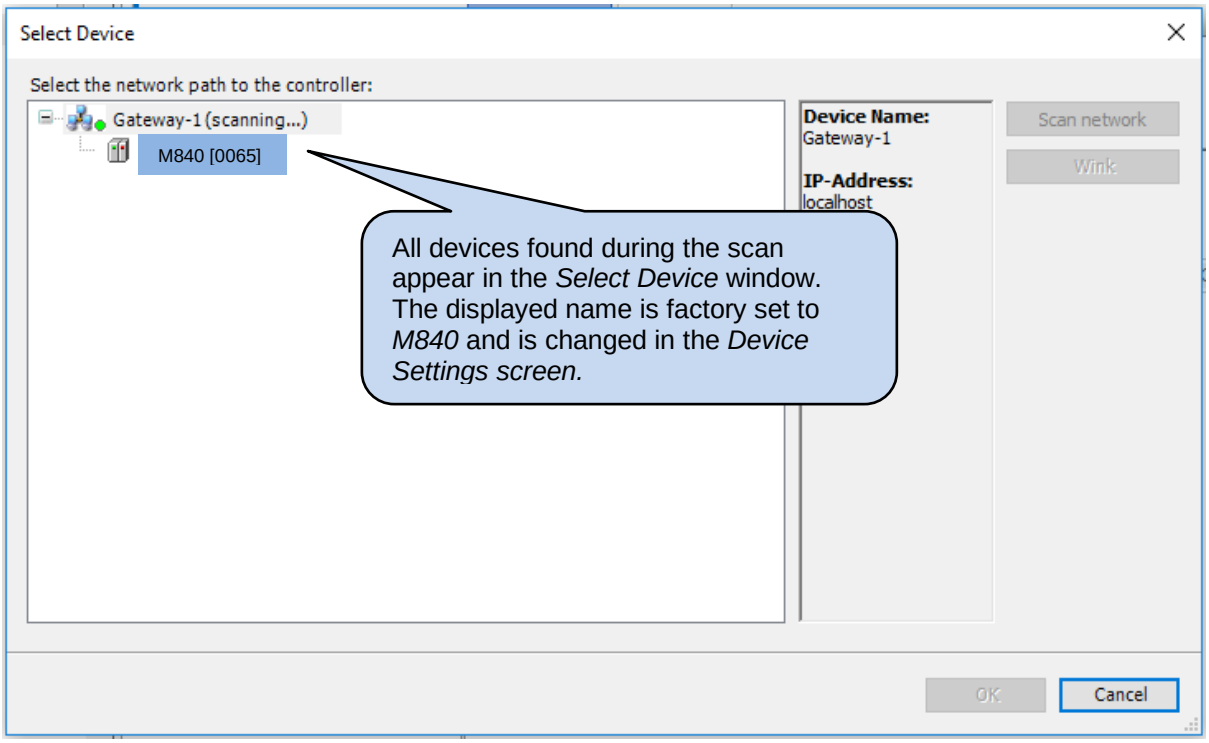
5.3 ETHERNET UDP

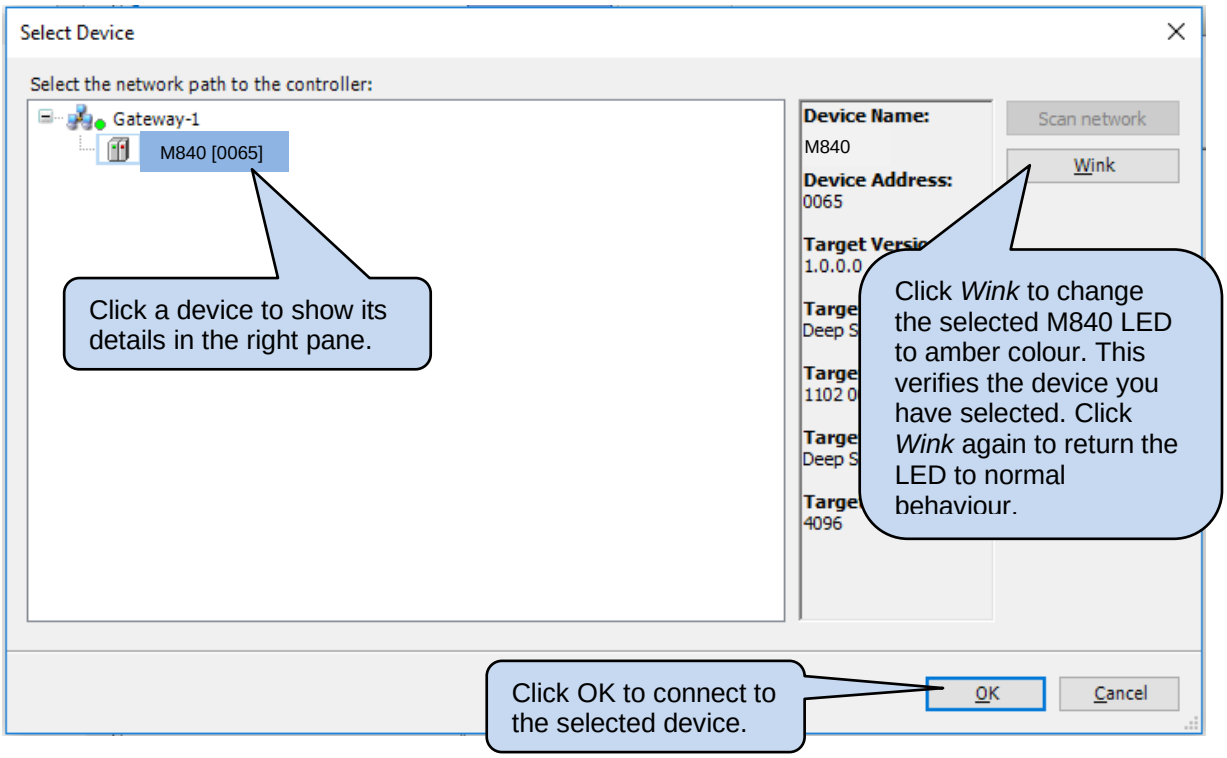
NOTE: If the IP address of the device is known, connection may also be achieved manually as detailed in the section entitled *Ethernet TCP* elsewhere in this document.

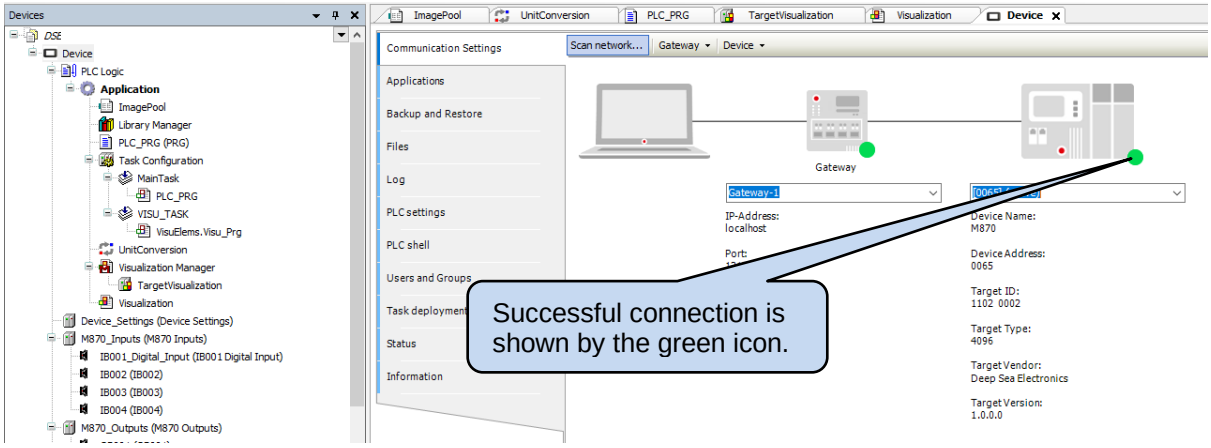
With the DSEM840 connected to the same Ethernet network as the PC, Select *Device* | *Communication Settings* in the CODESYS V3.5 IDE.



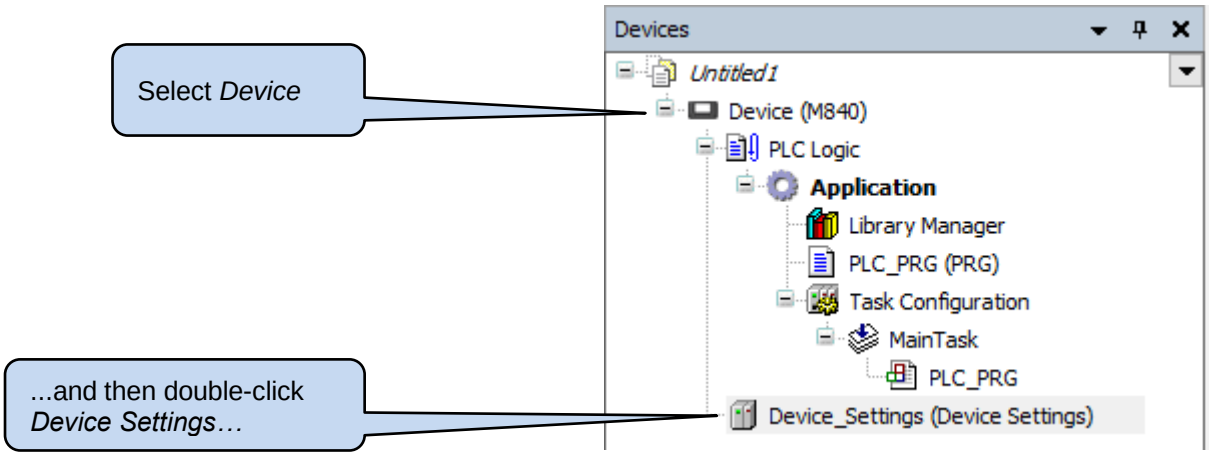
NOTE: A device in *Setup* mode is not discoverable by the Scan.





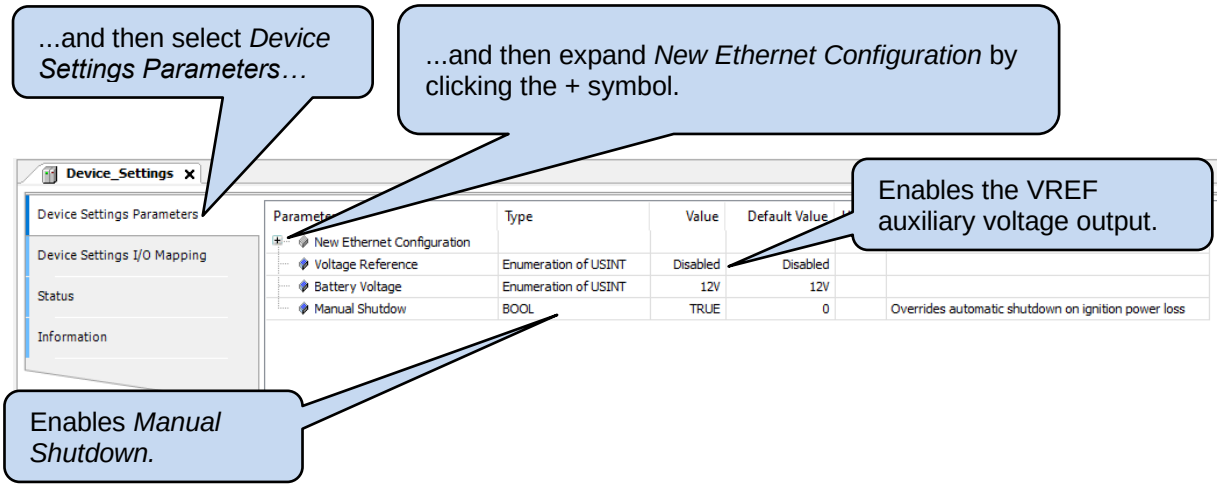


5.4 CONFIGURE SETTINGS AND MONITOR THE DEVICE

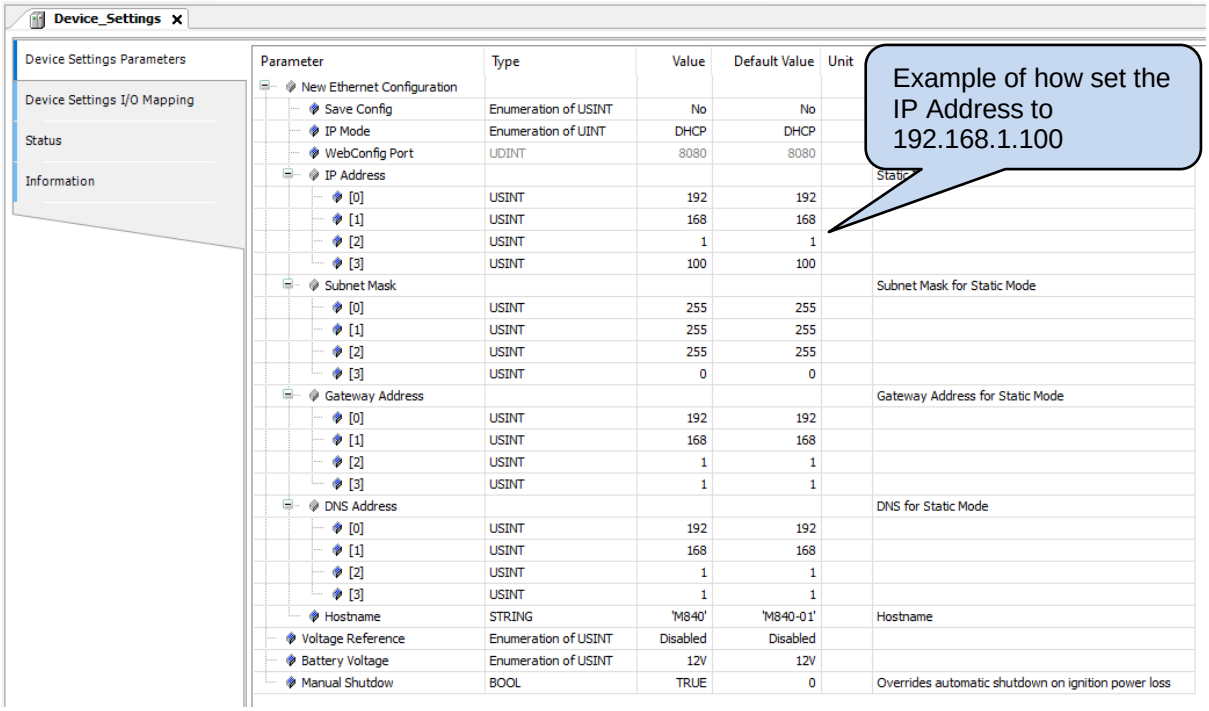


See the following subsections for details of the Device Settings pages.

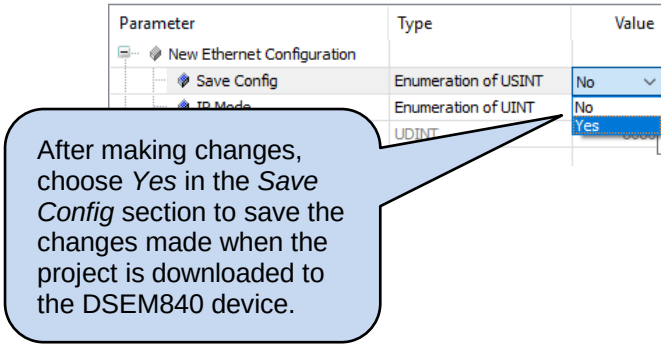
5.4.1 DEVICE SETTINGS PARAMETERS



5.4.1.1 ETHERNET SETTINGS



SAVE CONFIG



5.4.2 MANUAL SHUTDOWN

NOTE: Calling *DSE.SystemShutdown* when *Ignition* pin remains active, results in DSEM840 shutting down and restarting (ie similar to a power cycle).

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 DSEM840 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:

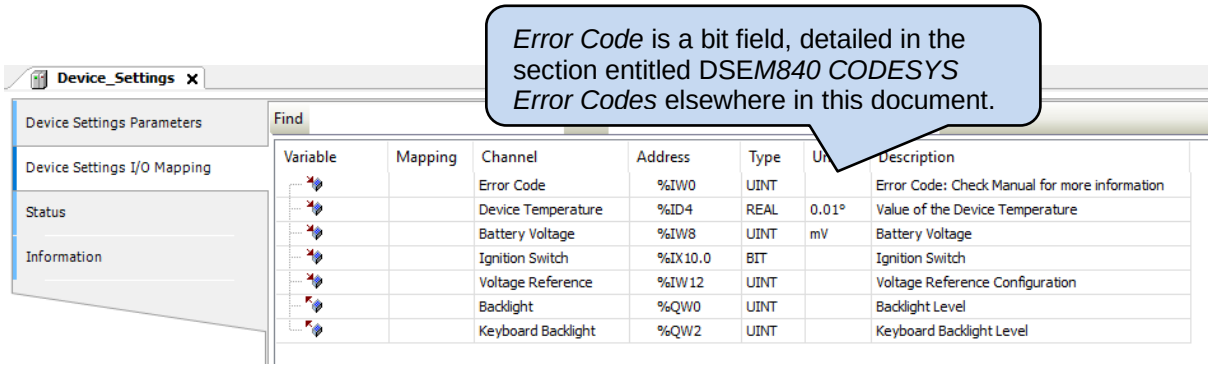
```
DSE.SystemGetIgnition(Ignition => bIgnitionState);
```

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

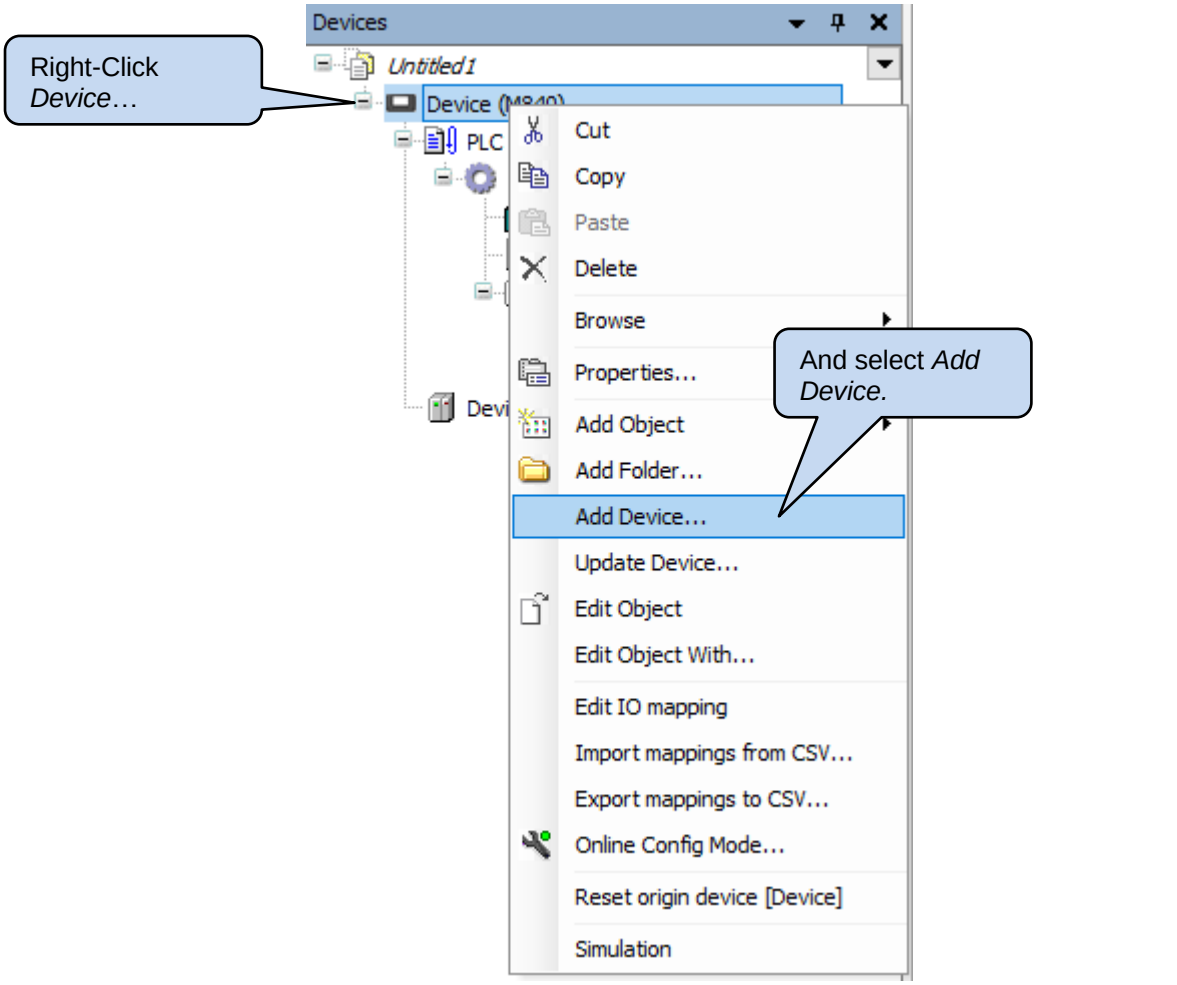
To restart the M840 application, reapply *Ignition* pin.

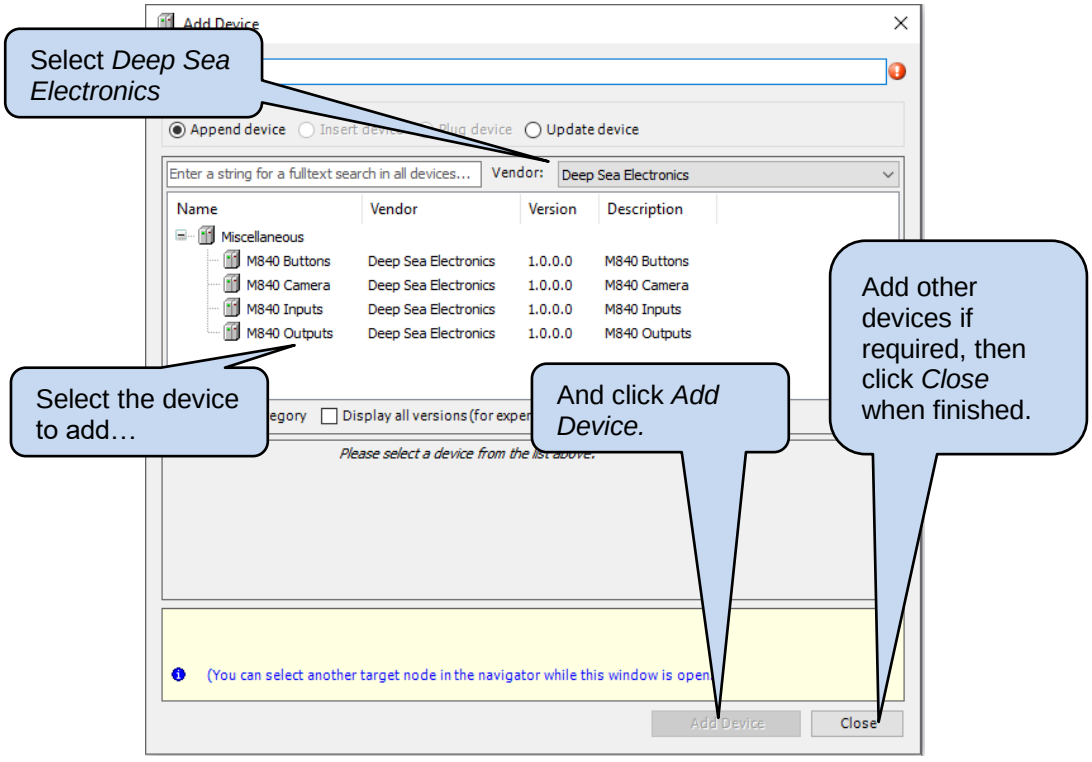
5.4.3 DEVICE SETTINGS I/O MAPPING

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



5.5 ADD INPUTS, OUTPUTS AND BUTTONS TO THE PROJECT





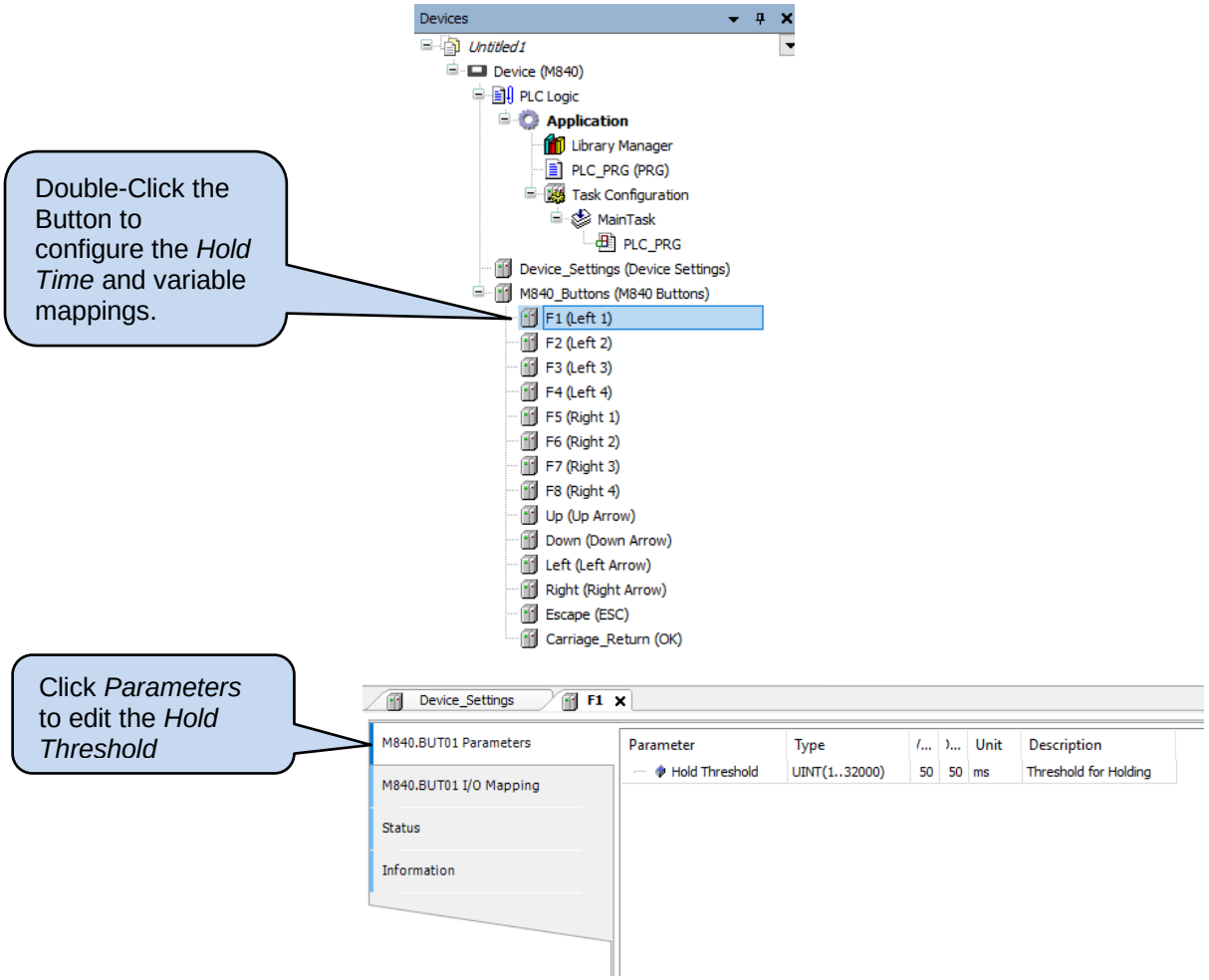
5.5.1 BUTTONS

5.5.1.1 BUTTON LOCATION

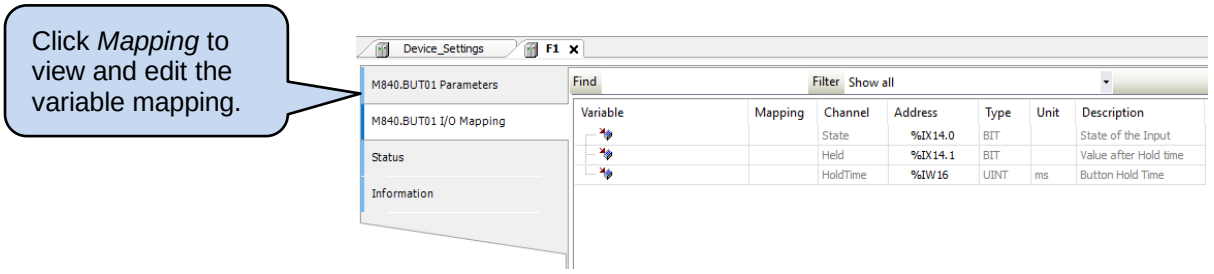
The below image shows the location of the buttons along with their default names within the CODESYS environment.



5.5.1.2 BUTTON SETTINGS

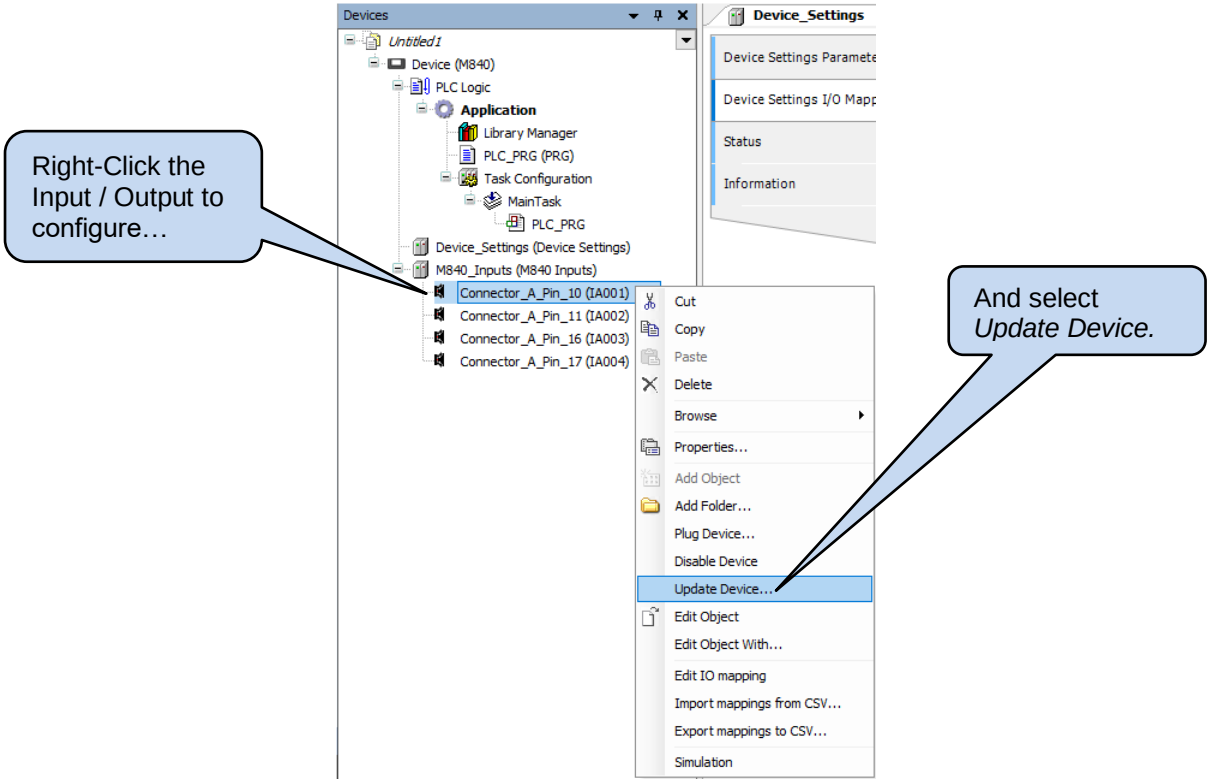


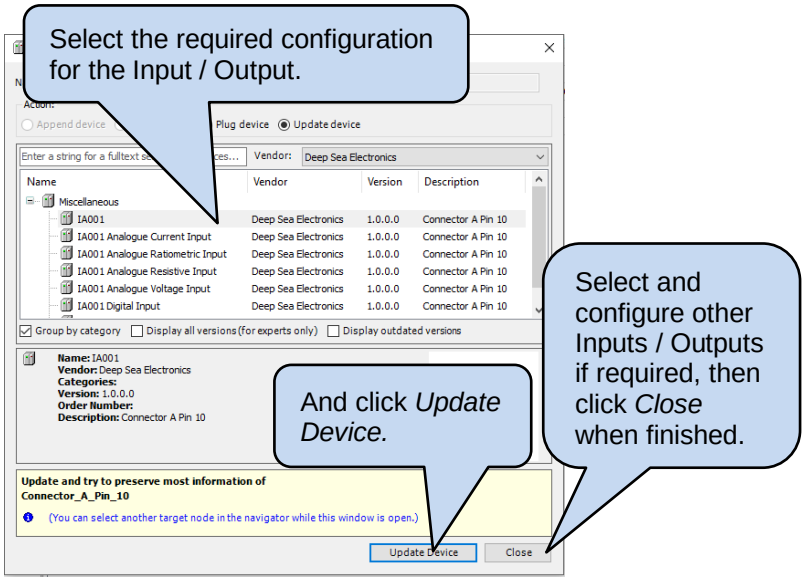
Parameter	Description
Hold Threshold	Amount of time (in milliseconds) that the button must be pressed before it is considered 'held down'.



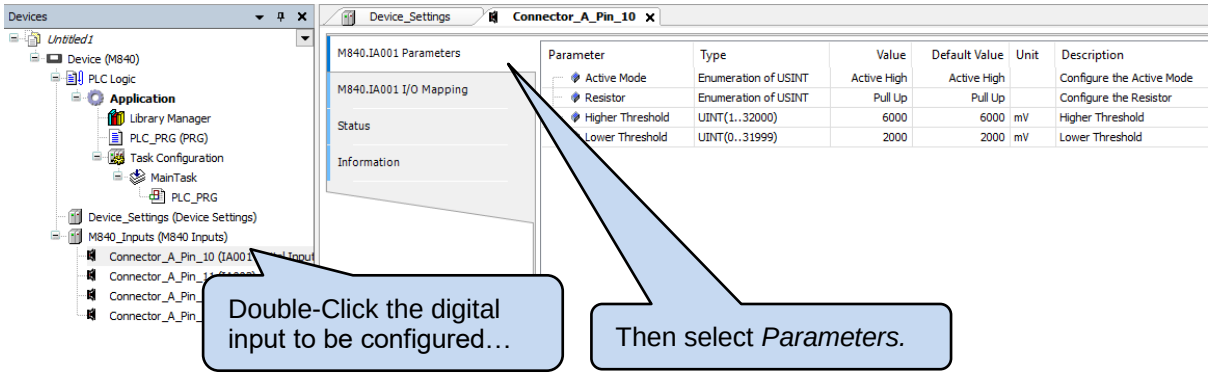
Parameter	Description
State	Indicates if the button is pressed (1) or not pressed (0).
Held	Indicates if the button has been held for longer than the duration of the *Hold Threshold* (1) or not (0).
Hold Time	The amount of time (in milliseconds) that the button has been pressed for (zero if not currently pressed).

5.5.2 INPUTS AND OUTPUTS





5.5.3 DIGITAL INPUT PARAMETER CONFIGURATION

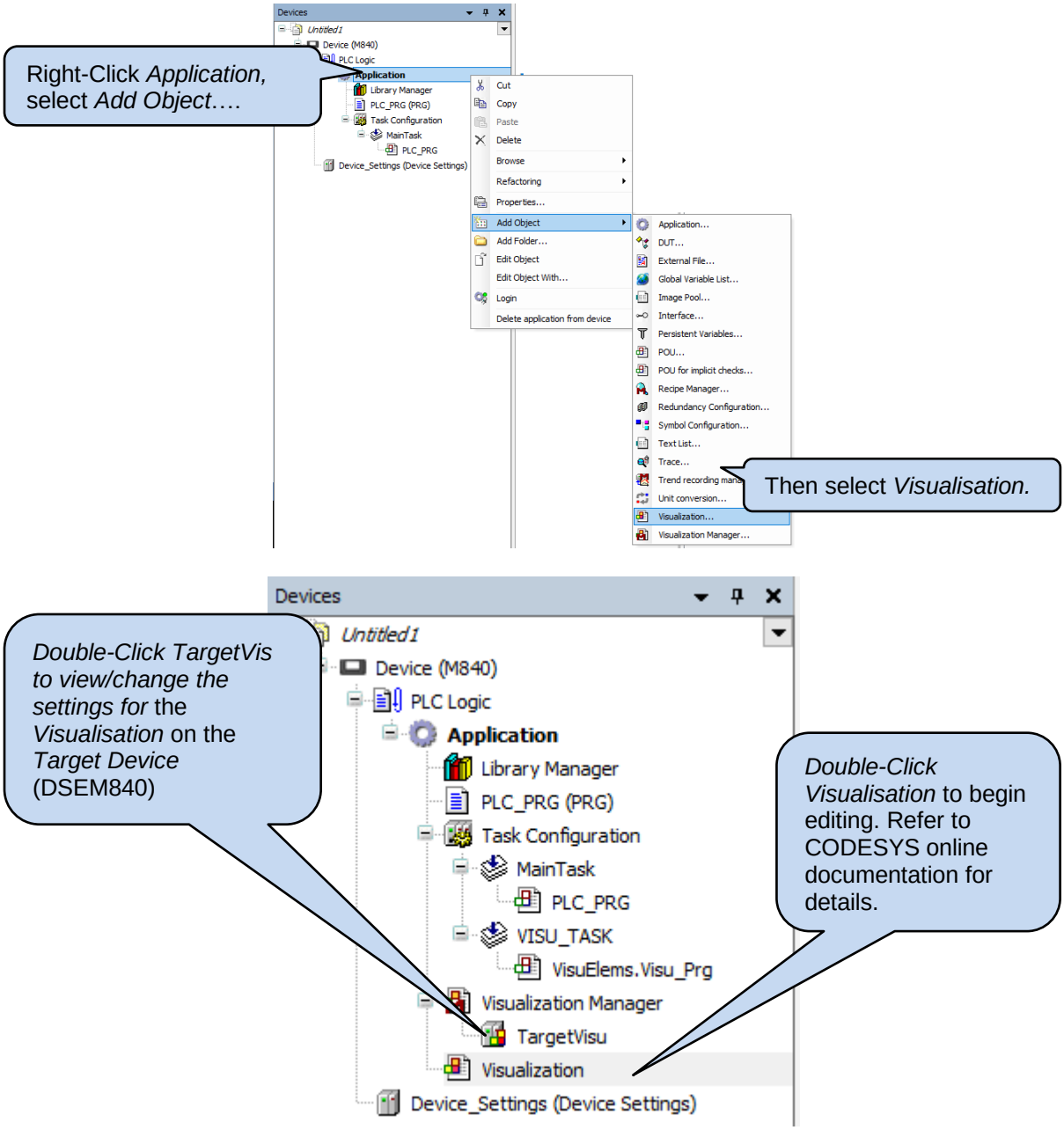


Parameter	Description
Active Mode	***Active High*****:** The input connects to the positive supply rail when activated. ***Active Low*****:** The input connects to the negative supply rail when activated.
Resistor	***Float*****:** The input is floating when no connection is made. Used where the external sensor (NPN Sinking or PNP Sourcing type) has an integrated pull-up or pull down resistor. ***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 PNP (Sourcing) type switched sensors and volt-free contacts.
Higher Threshold	For *Active High* inputs, the input is detected as being active when above this threshold with respect to the negative supply rail.
Lower Threshold	For *Active Low* inputs, the input is detected as being active when below this threshold with respect to the negative supply rail.

5.6 USING THE DISPLAY IN THE PROJECT

NOTE: Ensure Visualisation elements do not fall outside the boundary of the visible screen area.

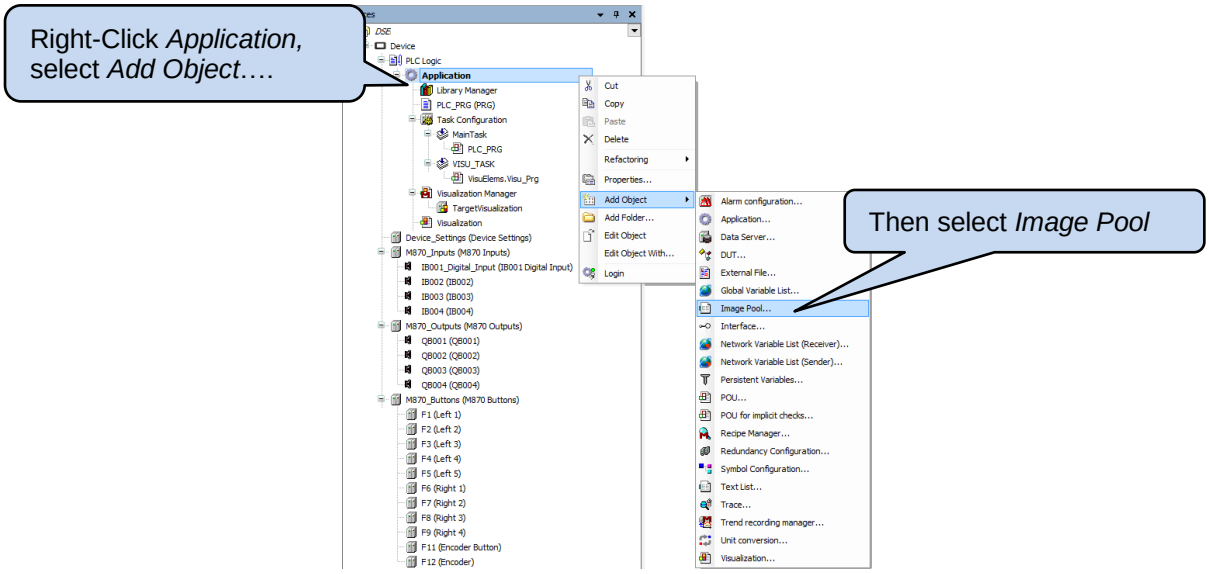
CODESYS 3.5 includes the facility to design and manipulate the LCD of the device. While the operation of the CODESYS environment is detailed within the CODESYS online document, this section provides a quick-start guide to using the *Visualisation* component of CODESYS 3.5.



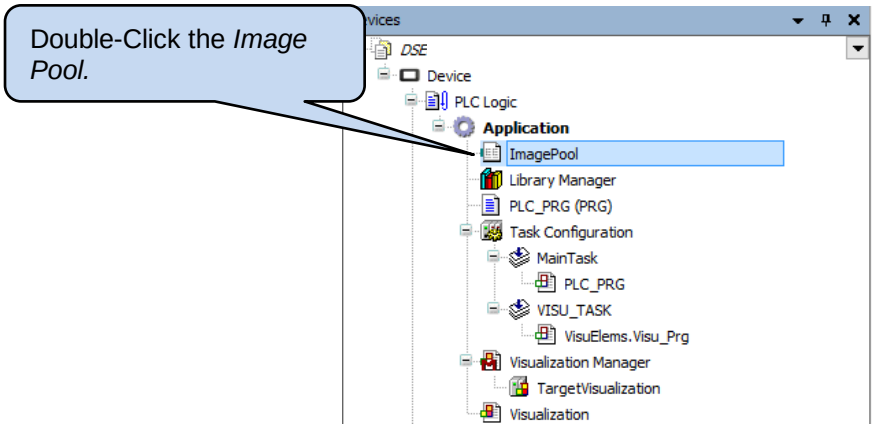
5.6.1 USING CUSTOM IMAGES ON THE DISPLAY

Many applications require custom images to be placed on the DSEM840 display. This is controlled using an *Image Pool* within CODESYS. The Image Pool acts as a container for the images, which are then selected for display.

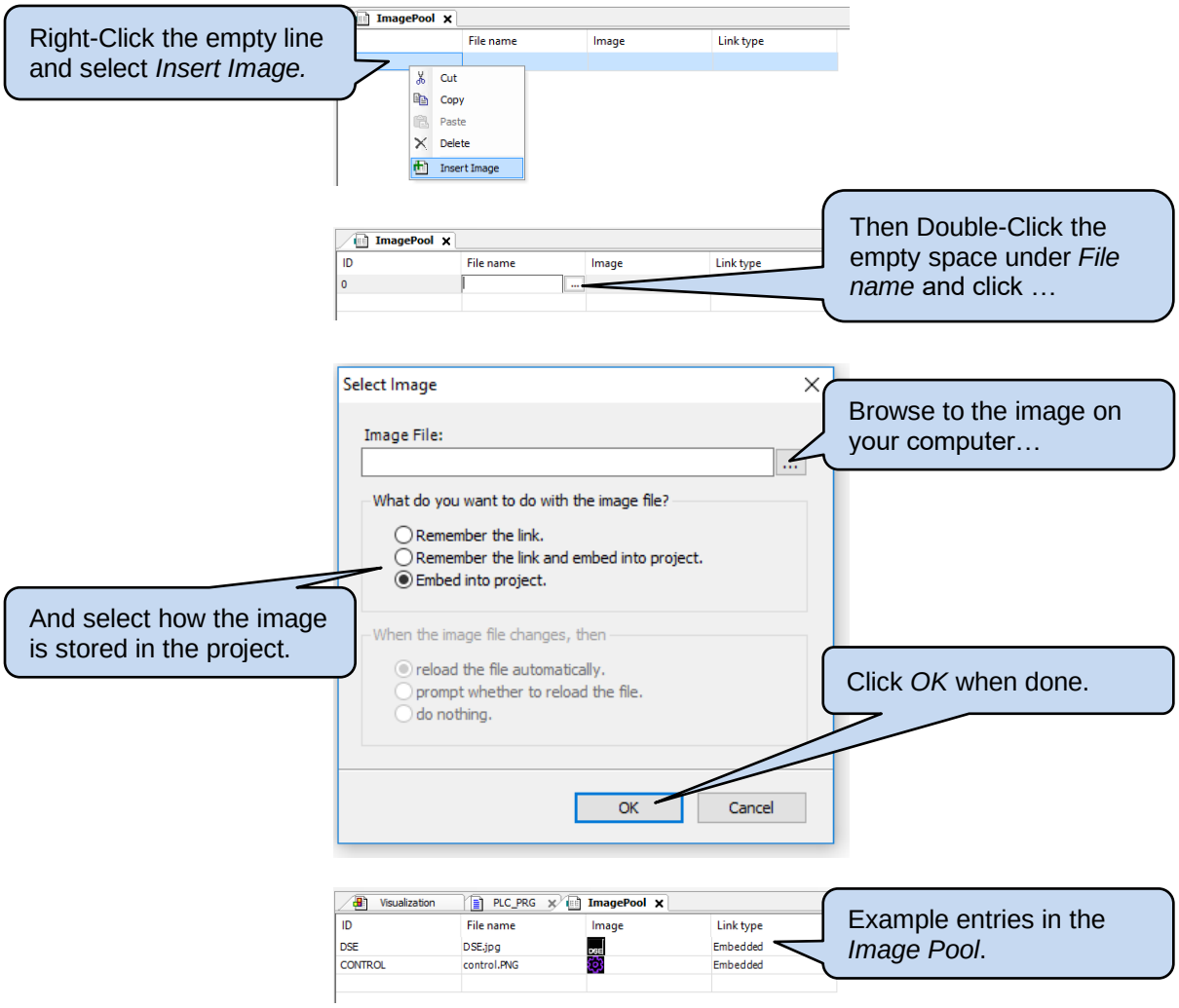
5.6.1.1 ADDING AN IMAGE POOL



5.6.1.2 ADDING IMAGES TO THE IMAGE POOL

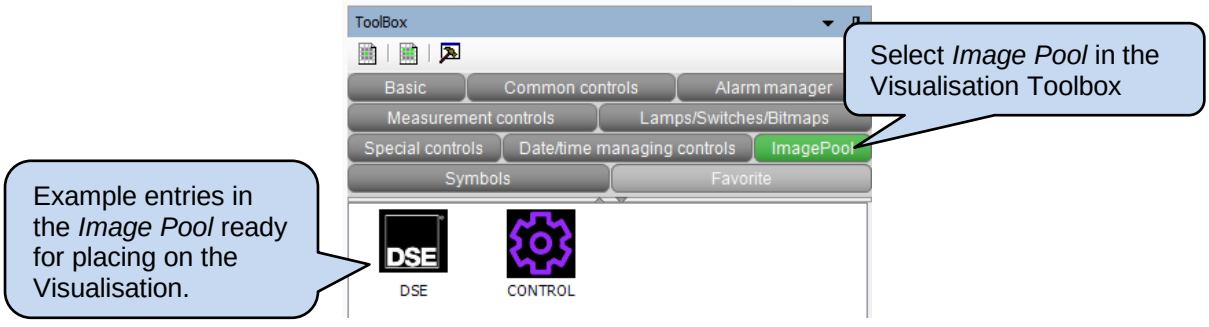


Continued overleaf…



5.6.1.3 USING THE IMAGE POOL ON THE DISPLAY

Entries within the Image Pool are automatically detected by the CODESYS Visualisation Toolbox and are available for placing on the Visualisation.



5.7 APPLICATION UPDATE

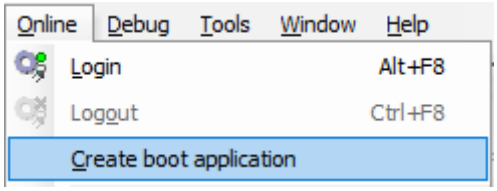
While a live CODESYS connection to the device by Ethernet is the most common method to load the application, alternatives exist as detailed below. Both options require the creation of a 'Boot Application' and the use of *DSEServicetool PC Software.* First, we must connect by Ethernet to a device to create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

5.7.1 CREATION OF THE BOOT APPLICATION AND .PKG FILE

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

NOTE: The boot application includes the folder *PlcLogic*. This contains all images, text files and associated visualisation files.

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.

Within DSEServicetool PC Software scan for and select the DSEM840 device, then select the file *Application.app* and transfer it to the DSEM840.
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.

5.7.2 APPLICATION UPDATE USING USB

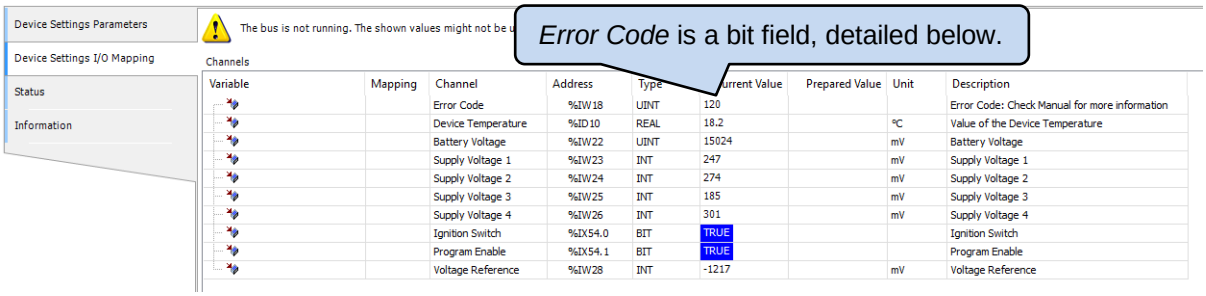
NOTE: A .pkg (package) file of the application must be pre-prepared as described in the section entitled *Creation of the Boot Application and pkg file* elsewhere in this document.

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

- Store the .pkg file on a USB memory stick.
- Remove ECU Power from the device.
- Press and hold any THREE buttons.
- Apply ECU Power.
- Wait until the display enters the Boot Menu and release the three buttons.
- Connect the memory stick to the device USB connection using the M12 to USB-A adaptor.
- Use ◄ ►▲▼ and **OK** to navigae the USB device file structure and select the .pkg file to apply.
- Press **OK** to install the file.
- After confirmation, remove DC Supply from the device.
- Remove the USB memory stick.
- The update is complete.

6 DSEM840 CODESYS ERROR CODES

DSEM840 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.



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.*

6.1 DEVICE

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

6.2 ANALOGUE INPUTS

Input Configuration	MSB 8	7	6	Bit 5	4	3	2	LSB 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

6.3 DIGITAL INPUTS

Input Configuration	MSB Bit 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

6.4 DIGITAL OUTPUTS

Output Configuration	MSB Bit 8	7	6	5	4	3	2	LSB 1
Digital	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Error

7 FIRMWARE UPDATE

NOTE: Firmware update is also possible using DSEServicetool PC Software. For further details, see DSE publication *057-265 DSE Servicetool PC Software Manual.*

- Store the update .pkg file on a USB memory stick.
- Remove ECU Power from the device.
- Press and hold any THREE buttons.
- Apply ECU Power.
- Wait until the display enters the Boot Menu and release the three buttons.
- Connect the memory stick to the device USB connection using the M12 to USB-A adaptor.
- Use ◄ ►▲▼ and **OK** to navigae the USB device file structure and select the .pkg file to apply.
- Press **OK** to install the file.
- After confirmation, remove DC Supply from the device.
- Remove the USB memory stick.
- The update is complete.

8 CABLES, CONNECTORS, HARNESSES AND SPARE PARTS

Description	DSE Part	Manufacturer Part	Manufacturer
DSEM840 Connector A	007-850	DT16-18SA-K004	TE / Deutsch
Connector Pin Crimp (0.5 mm^2 to 1.0 mm^2)	N/A	0462-201-16	TE
Connector Pin Crimp (2 mm^2)		0462-209-16	TE
DSEM840 Connector Harness Kit	016-168	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
Belden 9841 (CAN Cable)	016-030	9841	Belden
Panel Mounting Sealing Gasket	020-602	N/A	DSE

8.1 DSEM840 CONNECTOR HARNESS KIT (016-168)

DSE Part 016-168 consists of a cable with connector fitted at one end, with cable marking to identify the wires at the other end.

	Connector A
Assembly Ident	007-850
AMP Connector	DT16-18SA-K004
No of Connections	18
Wire size	0.5 mm^2 (AWG 20)
Wire Colour	Black
Wire Idents	1 to 18
Connector Pin Crimp (0.5 mm^2 to 1.0 mm^2)	0462-201-16
Connector Pin Crimp (2 mm^2)	0462-209-16

9 MAINTENANCE AND WARRANTY

The device 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).

10 DISPOSAL

10.1 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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