DSEControl

DEEP SEA ELECTRONICS

DSEM870 & DSEM871 CODESYS Software Manual

Document Number: 057-320

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DSEM870 & DSEM871 CODESYS Software Manual

Revision History

Issue No.	Comments
5	First release of the document as a separate manual taken from 057-246 DSEM870 Operator Manual V4. Additional information applicable to M870 V5: SVG images, Manual Shutdown function, Camera Mirror parameter.
6	Added DSEM871

TABLE OF CONTENTS

Section **Page**

1 INTRODUCTION

This document details the CODESYS software programming requirements of the DSEM870 and DSEM871 CODESYS 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.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 the product, 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.programming. Contact DSE Technical Support for further details.

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 DSEM870 to control the machine it is connected to. The Application within the DSEM870 is designed and provided by the manufacturer of the complete machine.
Bootloader	The Bootloader is the program within the DSEM870 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. DSEM870 supports CODESYS V3.5
ECU	Electronic Control Unit. For example the DSEM870 device.
Firmware	The Firmware of the DSEM870 is the Operating System of the DSEM870 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 IC003 means Input 3 on Connector C.
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 QC002 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.deepseaelectronics.com or by contacting DSE technical support: support@deepseaelectronics.com.

1.3.1 TECHNICAL INFORMATION

DSE Part	Description
057-246	DSEM870 Installation and Operation Manual
053-321	DSEM870 Qt Software Manual
053-187	DSEM870 Installation Instructions
055-199	DSEM870 Datasheet

2 CONNECTING TO CODESYS

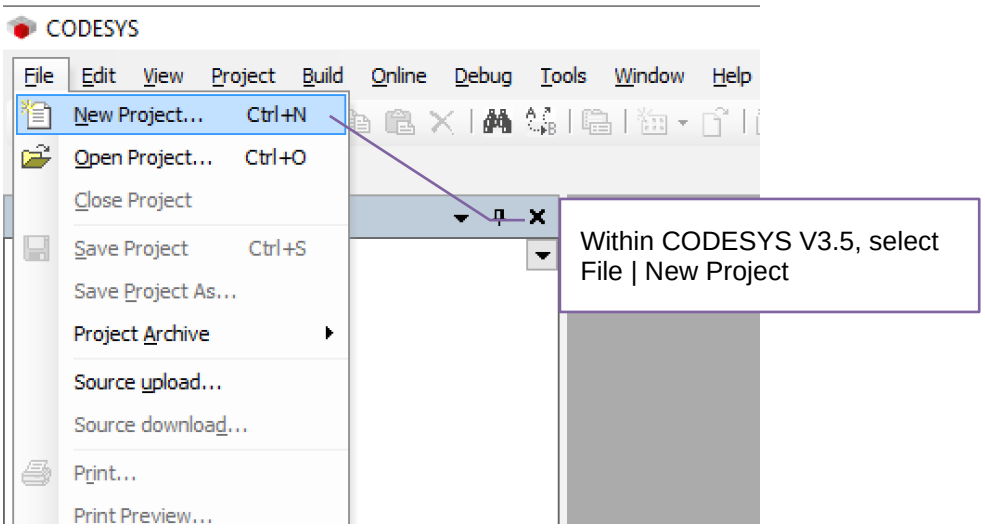
NOTE: DSEM870 supports CODESYS version 3.5.12.0. Ensure Compiler version, Visualisation version and the versions of any 3S libraries used in the project are no later than version 3.5.12.0. Contact support@deepsealectronics.com if assistance is required.

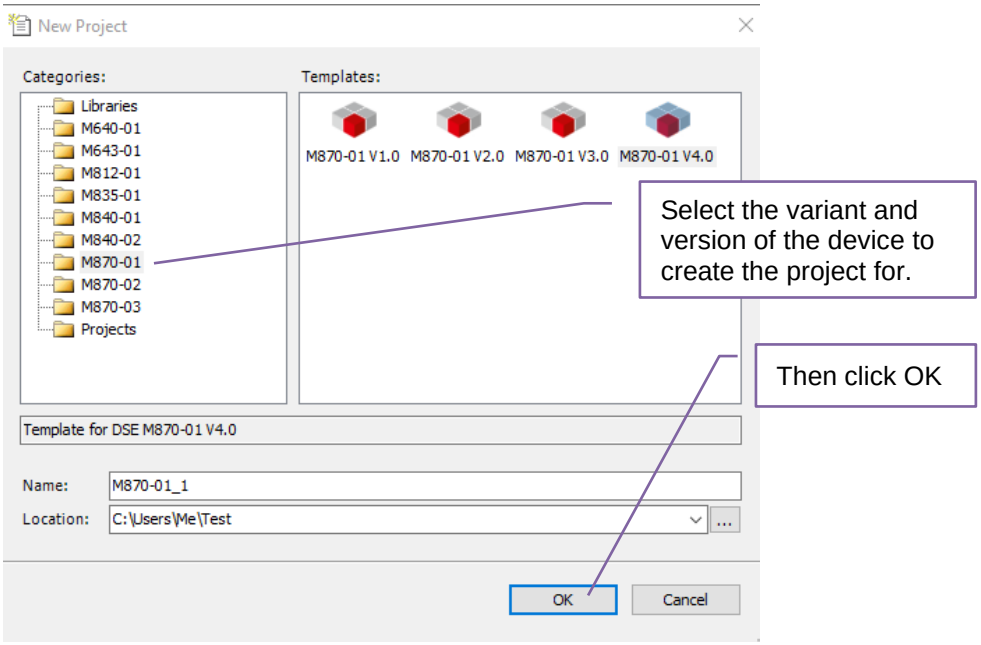
NOTE: Connector C is not fitted to DSEM871.

DSEM870 communicates with, and is programmed by, the CODESYS V3.5 Integrated Development Environment (IDE).

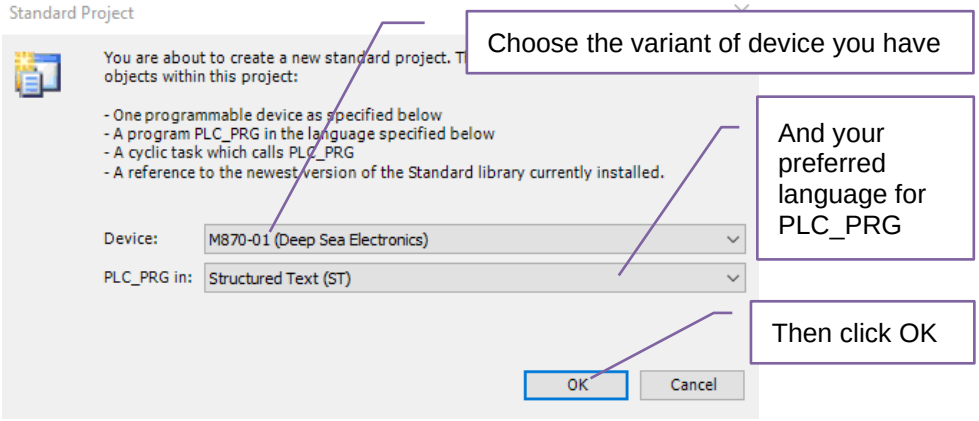
2.1 START NEW PROJECT

To begin, start a new project as shown.





If you didn't select a template from the previous dialogue, now select the model type



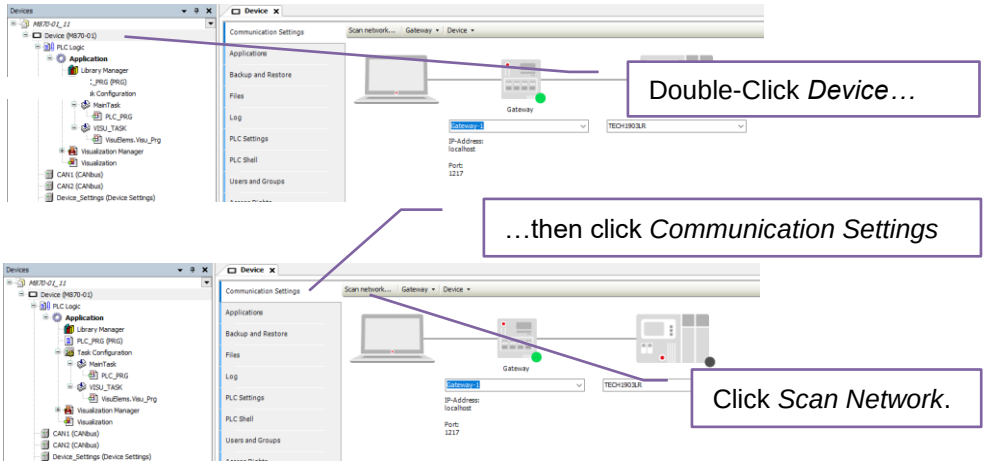
2.2 CONNECT BY AUTOMATIC SCAN

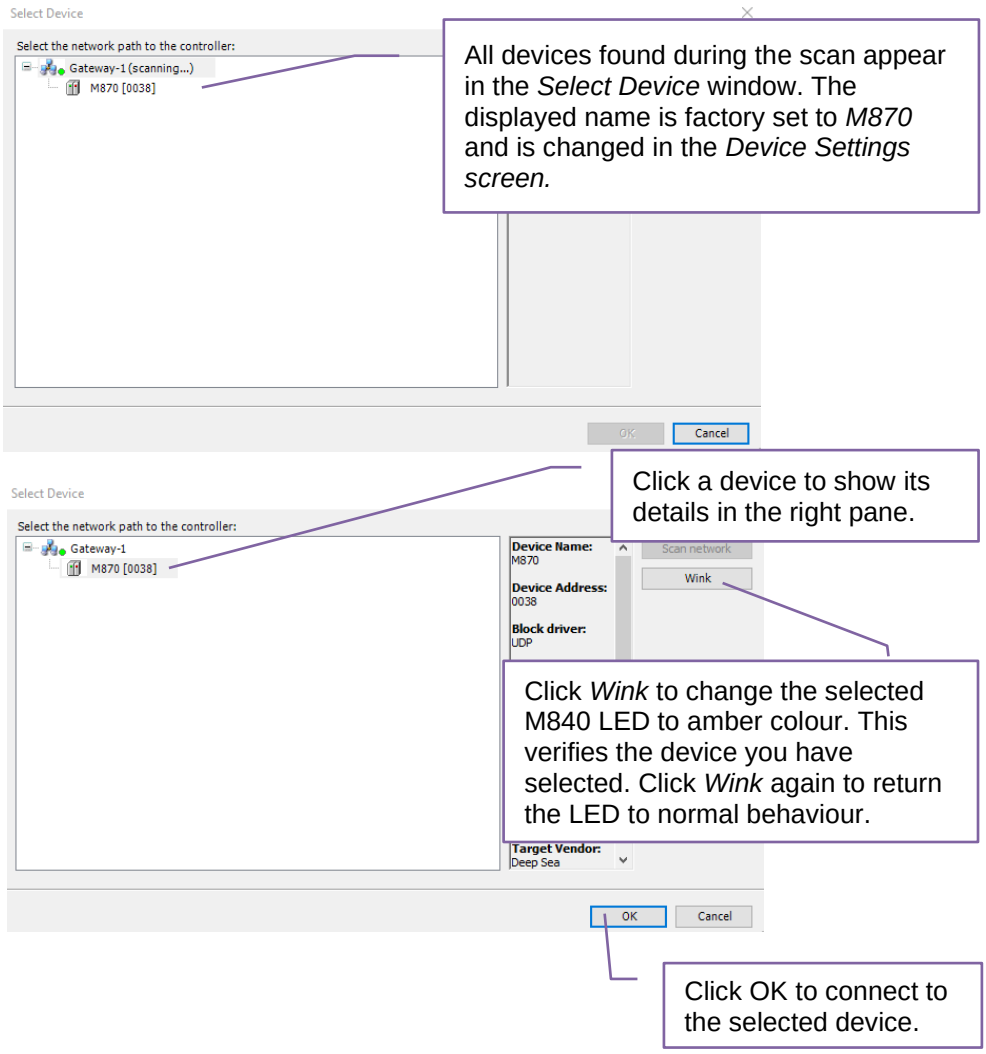
NOTE: A device in *System Settings* or *Bootloader* mode cannot be found in the *Scan* and cannot connect to CODESYS.

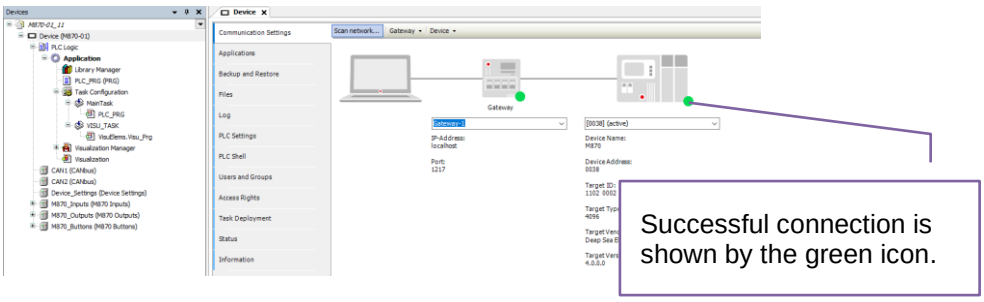
NOTE: The *Scan* requires the device to be on the same subnet as the PC. If this is not possible, locate the IP address of the device and connect a detailed in the section entitled *Ethernet TCP* elsewhere in this document.

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.

This method of connection is suitable only for devices in the same subnet as the PC.
With the device connected to the same Ethernet network as the PC, Select *Device* | *Communication Settings* in the CODESYS V3.5 IDE.




Select Device
Select the network path to the controller:
Gateway-1 (scanning...)
M870 [0038]
OK
Cancel
All devices found during the scan appear in the *Select Device* window. The displayed name is factory set to *M870* and is changed in the *Device Settings screen.*
Select Device
Select the network path to the controller:
Gateway-1
M870 [0038]
Device Name:
M870
Device Address:
0038
Block driver:
UDP
Scan network
Wink
Target Vendor:
Deep Sea
OK
Cancel
Click a device to show its details in the right pane.
Click *Wink* to change the selected M840 LED to amber colour. This verifies the device you have selected. Click *Wink* again to return the LED to normal behaviour.
Click OK to connect to the selected device.


Devices
Device
Communication Settings
Scan network...
Gateway
Device
Applications
Backup and Restore
Files
Log
PLC Settings
PLC Shell
Users and Groups
Access Rights
Task Deployment
Status
Information
Gateway
Successful connection is shown by the green icon.

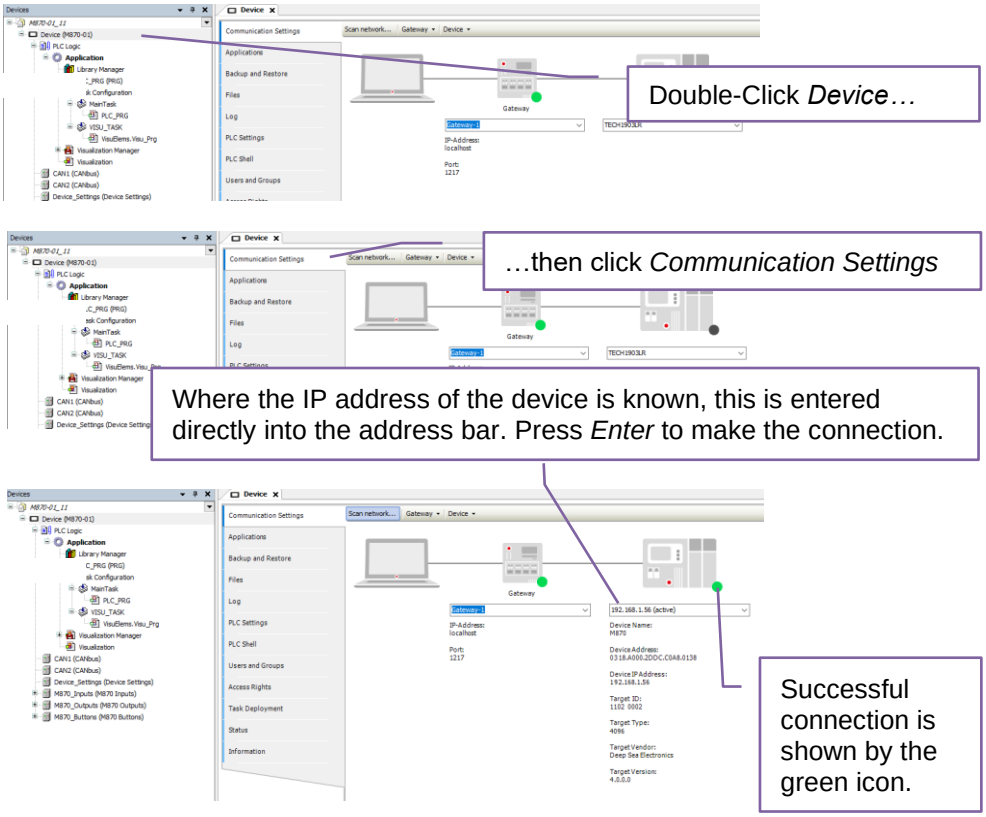
2.3 CONNECT BY IP ADDRESS

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

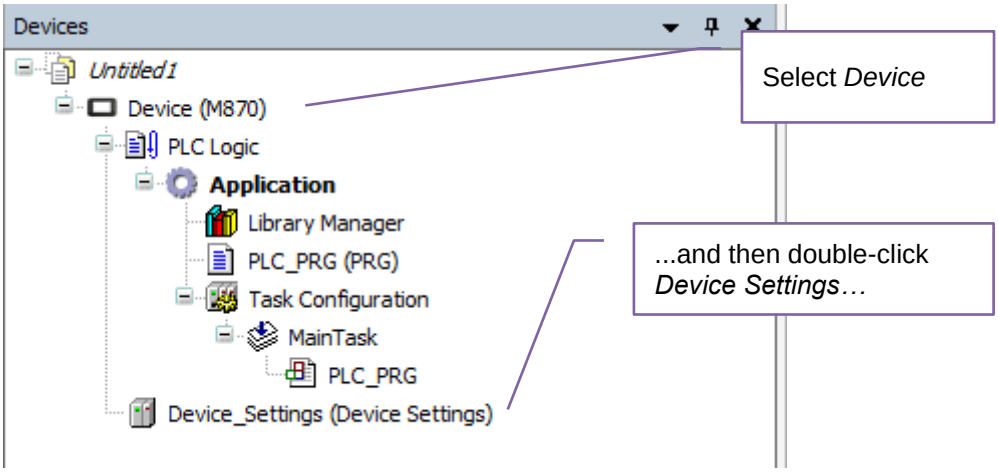
NOTE: If the IP address of the device is not known, see the section entitled *Connect by Automatic Scan* elsewhere in this document.

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.



2.4 CONFIGURE SETTINGS AND MONITOR THE DEVICE



2.4.1 DEVICE SETTINGS PARAMETERS

2.4.1.1 ETHERNET PARAMETERS

Parameter	Description
Save Config	Selects how ethernet settings are applied at device power up. ***No:*** Ethernet settings are left unchanged and remain as they were prior to the last shutdown. ***Yes***: Configured Ethernet settings are applied at device power up. This may change settings in use at the time of the previous power shutdown.
IP Mode	***DHCP:*** The device communicates with the DHCP server to obtain network settings. ***Static:*** Configured network settings are used. Ensure to select *Save Config: Yes* to enable the settings to be applied at tne next device power up.
IP Address Subnet Mask Gateway Address DNS Address	Network settings to be applied when *IP Mode: Static* is selected.
Hostname	Hostname used by the device on the network.

2.4.1.2 VOLTAGE REFERENCE

Parameter	Description
Voltage Reference	Enables the *VREF* output. This is an auxiliary output supply (max 100 mA) used for example to supply external input sensors. ***Disabled:*** The outputs is OFF. ***5V:*** The output gives 5 V dc. ***10V:*** The output gives 10 V dc.

2.4.1.3 SCREEN ROTATION

Parameter	Description
Screen Rotation	**NOTE: After changing the setting of *Screen Rotation, DSEM870 must be power cycled for the change to take effect.***
	NOTE: For Screen Rotation ROT_90 and ROT_270 (portrait mode) the Visualisation must be created accordingly to fit to the full screen size as detailed below. CODESYS does not automatically adjust the Visualisation Size upon changes to the Screen Rotation setting.
	Sets the device screen rotation. ***ROT_0:*** Visualisation is not adjusted, to suit the 'normal' device orientation with the Encoder at the BOTTOM RIGHT of the display. (Landscape 800 px X 480 px)  ***ROT_90:*** Visualisation is rotated 90° clockwise to suit the device orientation with the Encoder at the TOP RIGHT of the display. (Portrait 480 px X 800 px).  ***ROT_180:*** Visualisation is rotated 180° suit the device orientation with the Encoder at the TOP LEFT of the display. (Landscape 800 px X 480 px).  ***ROT_270:*** Visualisation is rotated 270° clockwise to suit the device orientation with the Encoder at the BOTTOM LEFT of the display. (Portrait 480 px X 800 px). 

2.4.1.4 PERSISTENCE SETTINGS

NOTE: These settings are available in DSEM870 V5.0 onwards. For versions 1 to 4, *Ignition* pin must be removed to allow persistent values to be saved and begin the device shutdown sequence.

NOTE: For details of *Persistent Variables*, see section entitled *Connecting to CODESYS | Using Persistent Variables in the Project* elsewhere in this document.

Parameter	Description
Active (V5,0 onwards)	***FALSE:*** Persistent Variables are not saved. ***TRUE:*** Persistent Variables are cyclically saved at the period of *Time.*
Time (V5.0 onwards)	Applicable only when *Active* is set to *TRUE.* Select the period (milliseconds) of the cyclic saving of Persistent Vars. ***Minimum Value:*** 1000 ms. Values below this must not be used. This allows time for the device to write to the Non-Volatile memory block. ***Recommended Value:*** 1000 ms to 2000 ms.

2.4.1.5 MANUAL SHUTDOWN

NOTE: *Manual Shutdown* feature is available from M870 V5.0 onwards.

NOTE: For details how to operate *Manual Shutdown*, see section entitled *Utilising Manual Shutdown* elsewhere in this document.

Parameter	Description
Active	***FALSE:*** Persistent Variables are not saved. ***TRUE:*** Persistent Variables are cyclically saved at the period of *Time.*
Time	Applicable only when *Active* is set to *TRUE.* Select the period (milliseconds) of the cyclic saving of Persistent Vars. ***Minimum Value:*** 1000 ms. Values below this must not be used. This allows time for the device to write to the Non-Volatile memory block. ***Recommended Value:*** 1000 ms to 2000 ms.

2.4.2 DEVICE SETTINGS I/O MAPPING

NOTE: Connector C is not fitted to DSEM871. Inputs and Outputs are not available on DSEM871.

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

Parameter	Description
Device Error Code	A bitfield to allow the error code to be mapped to a variable. This enables the application to decode and display internal errors. See Section Entitled *M870 CODESYS ERROR CODES* elsewhere in this document for more details.
Device Temperature	The actual temperature (°C) as measured within the device. Typical temperatures are more than 25°C above ambient temperature and vary depending upon device usage.
Battery Voltage	The voltage measured at the *ECU Power* terminals, PINs A1 (-ve) and A7 (+ve).
Supply Voltage 1	The voltage measured at the *Supply Voltage 1* terminals, PINs C1 (-ve) and C7 (+ve). This voltage is used to supply the device outputs on PINS C2, C3, C4 and C5 when configured as *Active High*.
Ignition Switch	Contains the state of the *Ignition Switch* on PIN A13. Upon ignition removal the variable changes from TRUE to FALSE. A short time later the device completes the shutdown process and the application is shutdown.
Voltage Reference	Provides the voltage of the *VREF* output on PINS C6 (-ve) and C18 (+ve). This output is used as an auxiliary DC supply for example to power input sensor devices.
Light Sensor	Gives indication of the amount of ambient light detected by the devices light sensor. This may be used for example to vary *Backlight* according to local conditions. (0 = Dark, 100 = Maximum Brightness)
Backlight	Sets the percentage of the display LCD Backlight. (0 = minimum, 100 = maximum). Setting *Backlight* to the value 255 enables *Automatic Backlight Control* whereby brightness automatically increases as ambient light levels increase.
Keyboard Backlight	Sets the percentage of the Keyboard surround Backlight.

2.4.2.1 LED

NOTE: User configuration of LED is overridden upon system alarm.

NOTE: M870 LED is *Tri-Colour*, with options of Red, Green and Amber.

NOTE: *DSE Standard* library contains *DSE.SystemSetLED* to control the LED programmatically.

Allows configuration of the System LED. Internal system errors take over control of the LED and indicate the fault in *Device Error Code*.

Parameter	Description
Colour	Use enum DSE.LEDColour_t to select one of RED, AMBER, GREEN.
Frequency:	Use enum DSE.LEDFrequency to select one of Off, ONE_HZ, TWO_HZ, THREE_HZ, FOUR_HZ, FIVE_HZ, SIX_HZ, SEVEN_HZ, EIGHT_HZ, NINE_HZ, TEN_HZ, ON
Enable	***True:*** Selected Colour and Frequency are applied whenever there is no system alarm. ***False:*** LED remains as System LED.

2.5 UTILISING MANUAL SHUTDOWN

NOTE: *Manual Shutdown* feature is available from M870 V5.0 onwards.

NOTE: Enable *Manual Shutdown* in *Device Settings*. For details, see section entitled *Device Settings Parameters* | *Manual Shutdown* elsewhere in this document.

NOTE: Calling *DSE.SystemShutdown* when *Ignition* pin remains active, results in the device 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:*

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 the device 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:

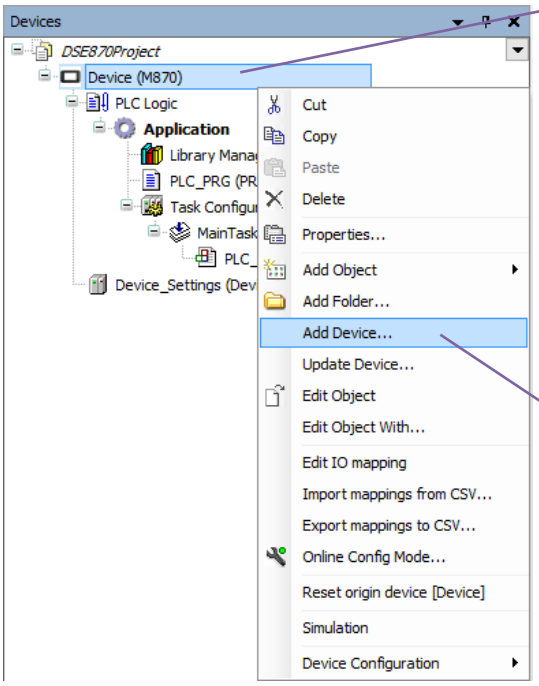
```
DSE.SystemGetIgnition(Ignition => bIgnitionState);
```

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

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

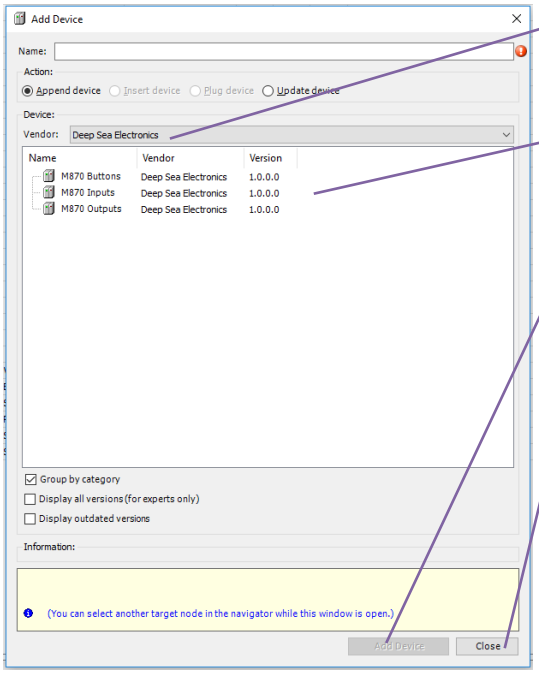
2.6 ADD INPUTS, OUTPUTS AND BUTTONS TO THE PROJECT

NOTE: Connector C is not fitted to DSEM871. Inputs and Outputs are not available on DSEM871.



Right-Click *Device*…

And select *Add Device.*



Select *Deep Sea Electronics*

Select the device to add…

And click *Add Device.*

Add other devices if required, then click *Close* when finished.

2.6.1 BUTTONS AND ROTARY ENCODER

NOTE: F10 is not fitted to DSEM870 or DSEM871.

2.6.1.1 BUTTON LOCATION

2.6.1.2 BUTTON POSITION ON THE VISUALISATION

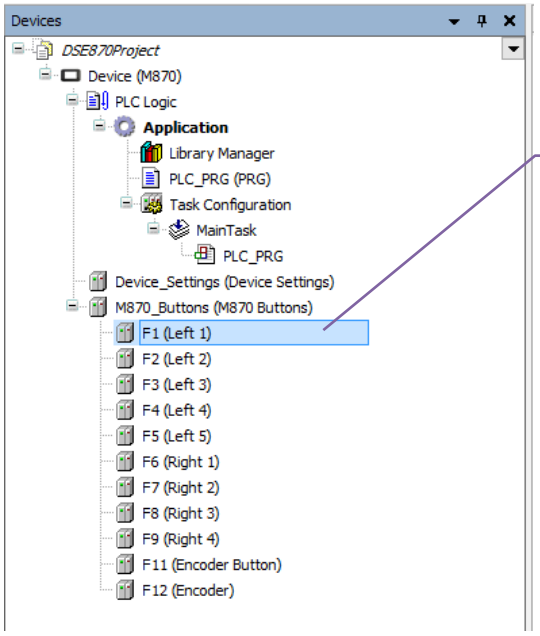
To aid positioning of icons on the visualisation, the vertical position of the centre of each button is as follows.

Button	Pixel Position From Top of Display
F1 & F6 (centre)	30
F2 & F7 (centre)	130
F3 & F8 (centre)	230
F4 & F9 (centre)	330
F5 (centre)	430
Encoder & F11 (top)	430

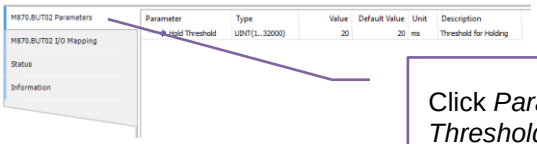
2.6.1.3 BUTTON SETTINGS (F1 TO F11)

NOTE: F10 is not fitted to DSEM870 or DSEM871. In its place is fitted the Encoder Button (F11) and Rotary Encoder (F12).

NOTE: *DSE_UTILS* library includes the function *DSE_UTILS.M870_Buttons* to allow programmatic reading of the buttons and encoder.

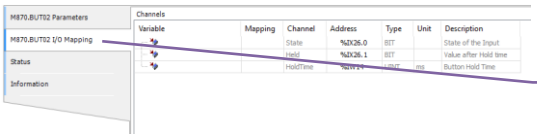


Double-Click the Button to configure the *Hold Time* and variable mappings.



Click *Parameters* to edit the *Hold Threshold*

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



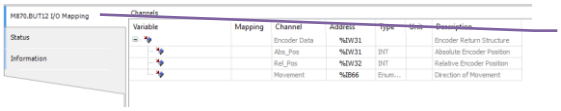
Click *Mapping* to view and edit the variable mapping.

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).

2.6.1.4 ROTARY ENCODER (F12)

NOTE: *DSE_UTILS* library includes the function *DSE_UTILS.M870_Buttons* to allow programmatic reading of the buttons and encoder.

The rotary encoder may be turned to make selections and adjust values.

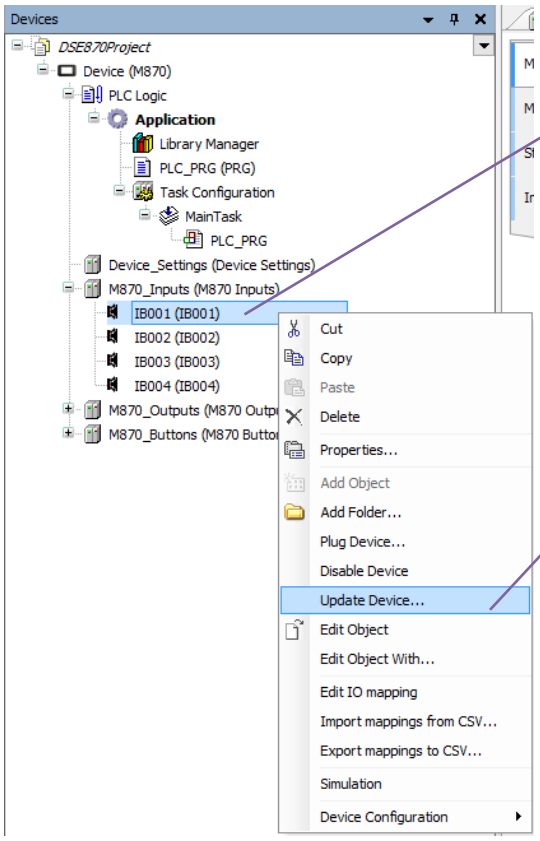


Click *Mapping* to view and edit the variable mapping.

Parameter	Description
Abs_Pos	The absolute position of the encoder. Increases with Clockwise rotation, Decreases with Anti-Clockwise rotation.
Rel_Pos	The relative position of the encoder. Increases with Clockwise rotation, Decreases with Anti-Clockwise rotation.
Movement (M870 V3 onwards)	***0:*** Indicates that the rotary encoder is not being rotated. ***1:*** Indicates that the rotary encoder is being rotated Anti-Clockwise. ***2:*** Indicates that the rotary encoder is being rotated Clockwise.
Movement (M870 V1, V2)	***0:*** Indicates that the rotary encoder is not being rotated. ***1:*** Indicates that the rotary encoder is being rotated Clockwise. ***2:*** Indicates that the rotary encoder is being rotated Anti-Clockwise.

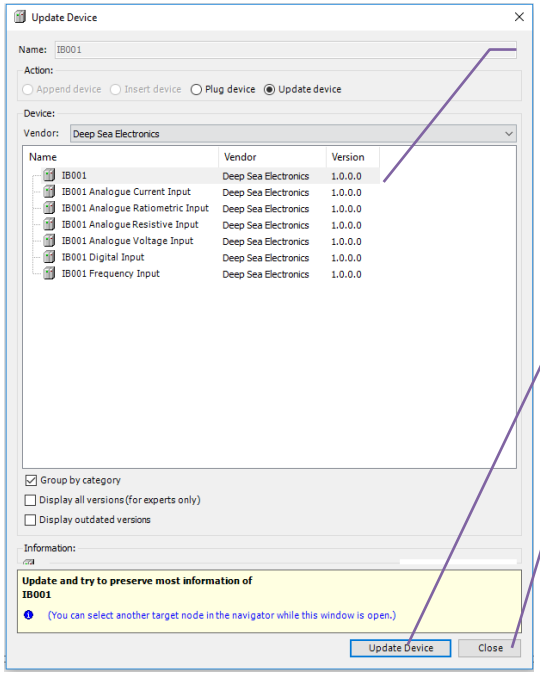
2.6.2 INPUTS AND OUTPUTS

NOTE: Connector C is not fitted to DSEM871. Inputs and Outputs are not available on DSEM871.



Right-Click the Input / Output to configure…

And select *Update Device.*



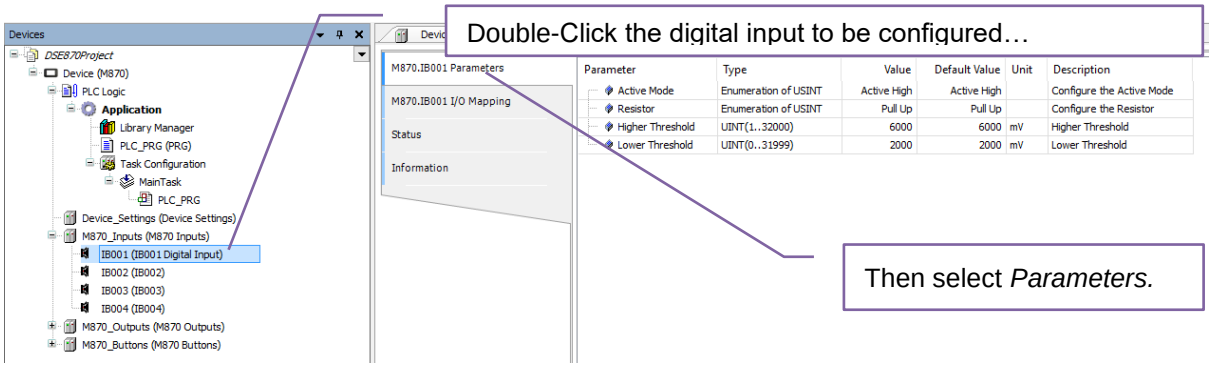
Select the required configuration for the Input / Output.

And click *Update Device.*

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

2.6.3 DIGITAL INPUT PARAMETER CONFIGURATION

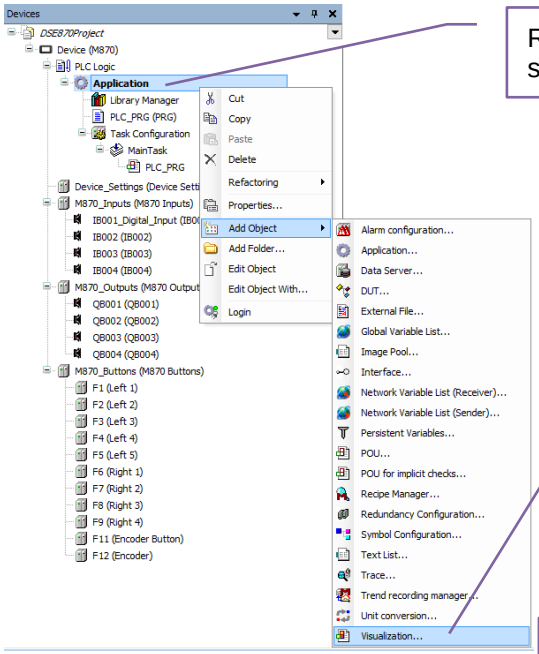
NOTE: Connector C is not fitted to DSEM871. Inputs and Outputs are not available on DSEM871.



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 *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.

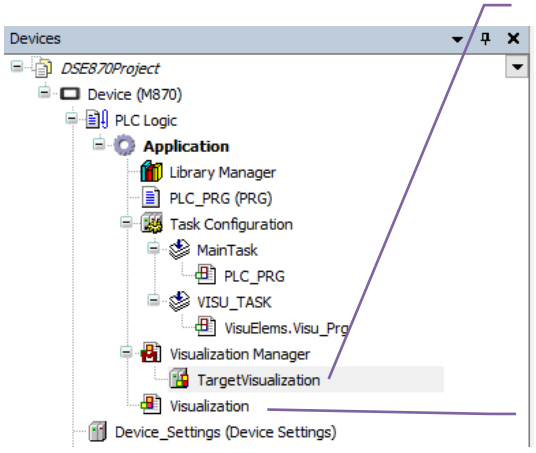
2.7 USING THE DISPLAY IN THE PROJECT

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.



Right-Click *Application,* select *Add Object*….

Then select *Visualisation.*



Double-Click TargetVisualization to view/change the settings for the *Visualisation* on the *Target Device*

Double-Click Visualisation to begin editing. Refer to CODESYS online documentation for details.

2.7.2 INSTALLING FONTS ON THE DEVICE

DSEM870 includes a *default* ready installed on the device. To use other fonts, first the font must be installed on the device using the *System Pages.* For details of this, see DSE Publication *057-246 DSEM870 Installation and Operation Manual.*

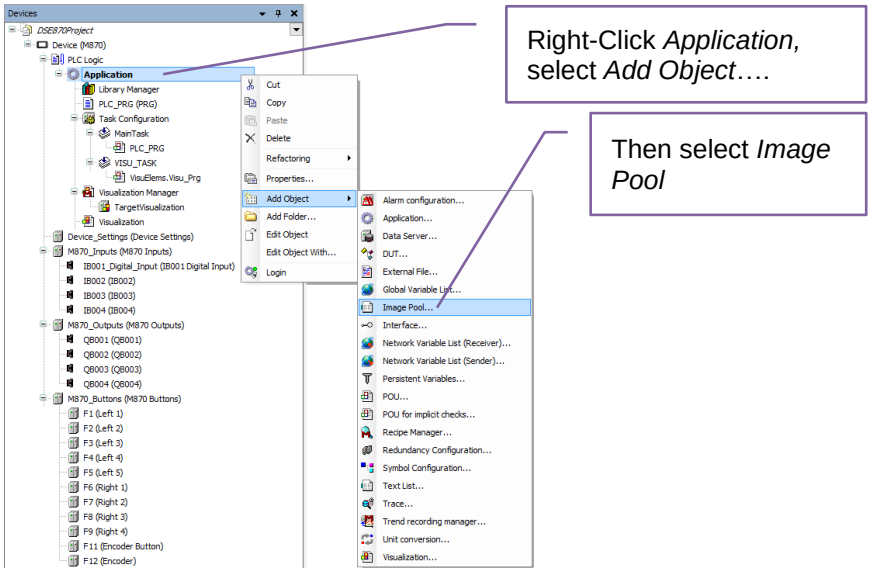
2.7.3 USING CUSTOM IMAGES ON THE DISPLAY

NOTE: svg image type supported from M870 V5.0 onwards.

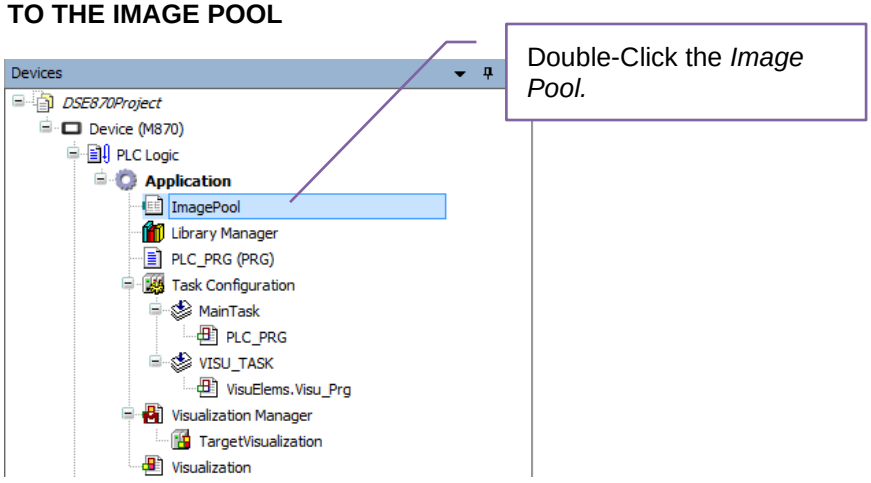
NOTE: Support images are bmp, jpg, png, svg.

Many applications require custom images to be placed on the M870 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.

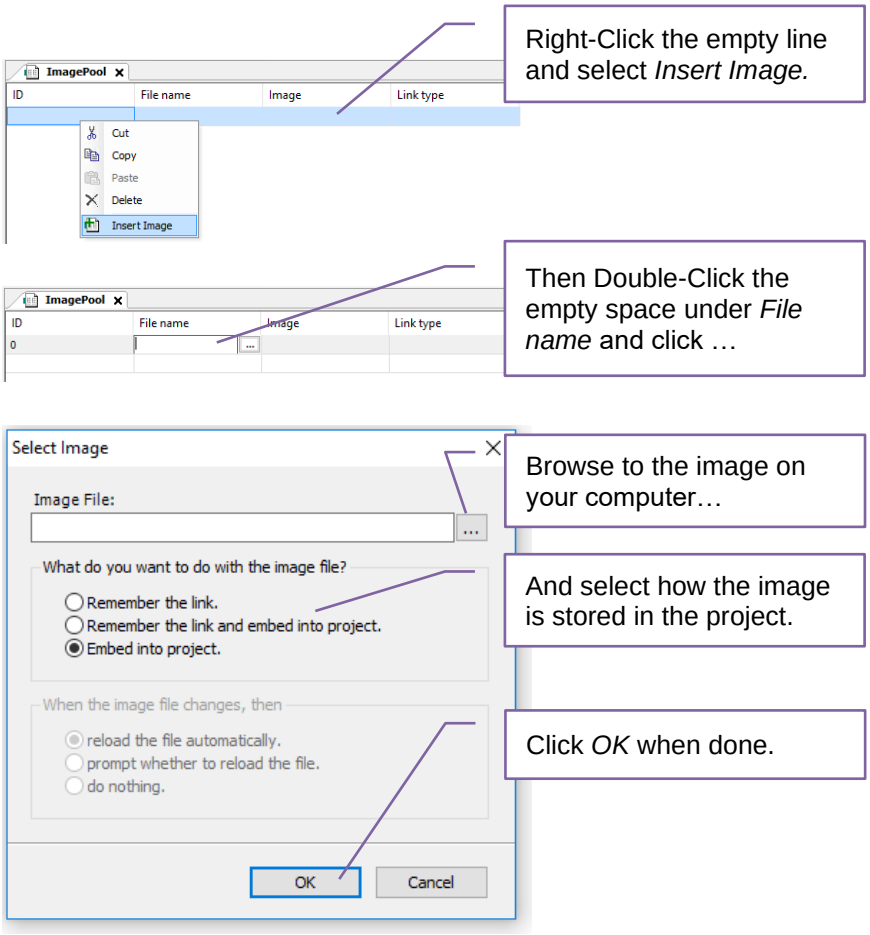
2.7.3.1 ADDING AN IMAGE POOL



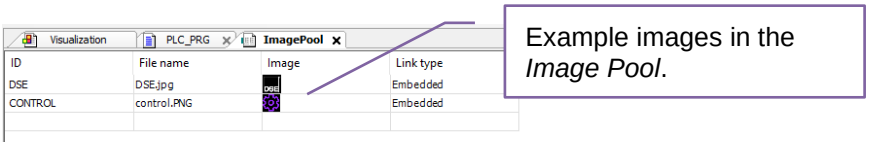
2.7.3.2 ADDING IMAGES TO THE IMAGE POOL



Continued overleaf…

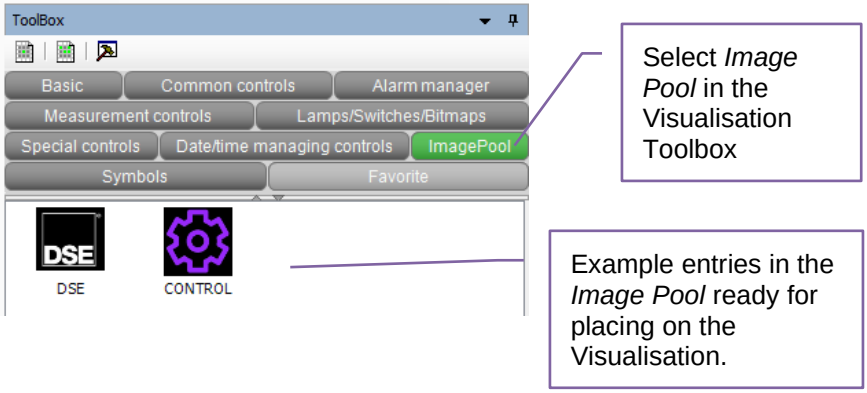


NOTE: Ensure the *ID* in the image pool contains only alphanumerical characters, - (minus), and _ (underscore). Many other characters, including . (full stop) and spaces are not supported and may result in the image not appearing on the display.



2.7.3.3 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.



2.7.4 UTILISING THE TOUCHSCREEN AND WEBVISU

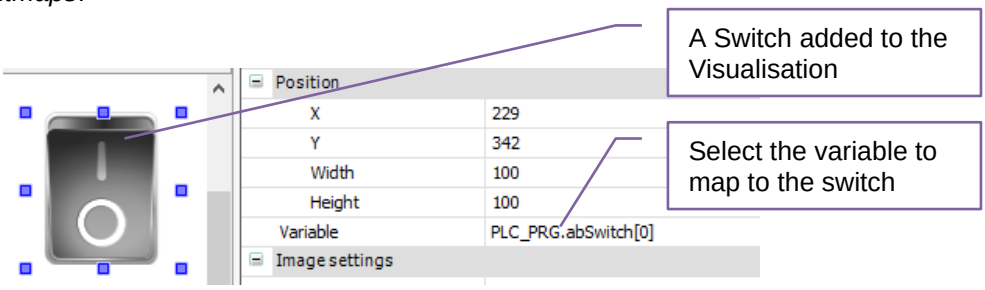
NOTE: Touchscreen functionality is available only on DSEM870-02 and DSEM870-03. WebVisu functionality is available only on DSEM870-03.

The capacitive touchscreen of DSEM870-02 mimics the operation of a mouse within the CODESYS environment. The following examples show how to utilise this functionality within the Visualisation.

2.7.4.1 SWITCHES, SLIDERS, COMBO BOXES, RADIO BUTTONS

Many CODESYS visualisation elements require no additional coding or settings to enable them for use with the Touchscreen. These include Switches, Sliders, Comboboxes and Radio Buttons. Simply add them to the Visualisation and map a variable to them. Touch them on the screen or click on the Webvisu to operate them.

Example:
Add a switch to the Visualisation. Usually these are found in the *Toolbox* under *Lamps/Switches/Bitmaps*.



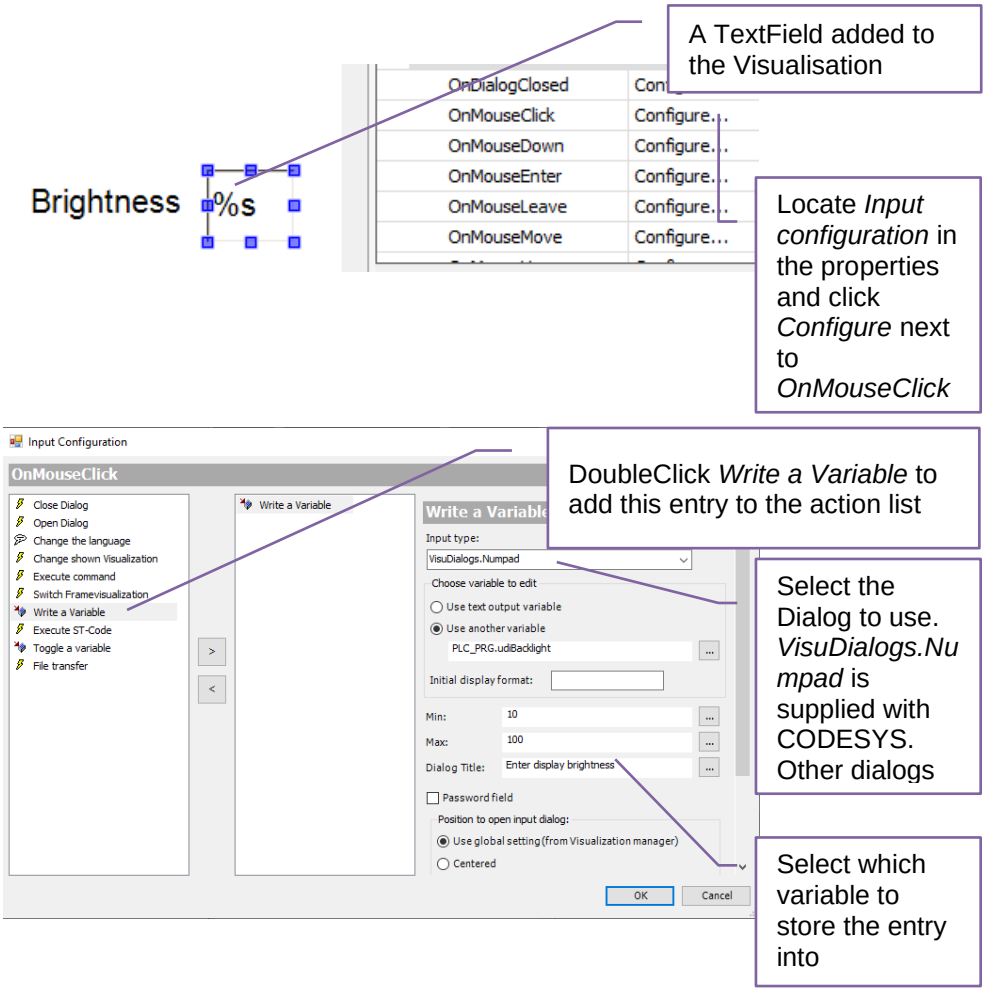
During the execution of the application, simply touch the switch on the screen or click on the WebVisu to operate it.

2.7.4.2 NUMBER AND TEXT ENTRY

NOTE: DSE_VISU library includes additional Dialogs for number and text entry, including UK keyboard layout.

Number entry via the M870 Touchscreen requires the use of a *Virtual Numpad.*
Text entry via the M870 Touchscreen requires the used of a Virtual Keypad.

CODESYS include a simple number pad and a German layout keypad as a *Dialog* and are utilised as follows.

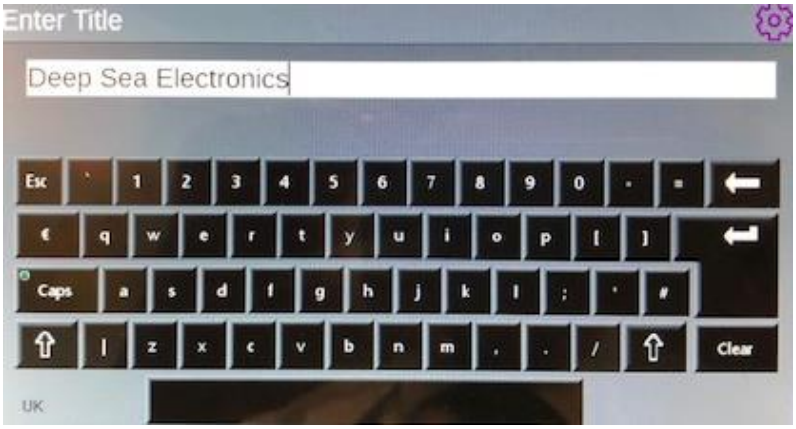


Example:

Upon touching the screen on the Visualisation element, CODESYS displays the selected Dialog.
Enter the value required.
ESC: Exit without saving the value.

OK or  : Exit and update the variable with the text or value entered.

Should the value be outside the configured range, this is indicated, and the dialog remains on screen to allow the correction to be made.



Virtual Keypad

Virtual Numpad

2.7.5 WEBVISU ACCESS

NOTE: WebVisu functionality is available only on DSEM870-03.

DSEM870-03 includes CODESYS WebVisu functionality. DSEM870 includes an integral webpage server, whereby a full copy of the project visualisation is available for viewing and control by an external device supported by a web browser.

Example:
Connect a PC to ethernet. Ensure the PC can “route” through to the DSEM870. You may need to consult your IT department to set up the network to allow this.
On the web browser, point it to port 8080 of the DSEM870. For example, if the DSEM870 IP address is 192.168.1.100 then point the web browser to `http://192.168.1.100:8080`.

2.8 USING THE CAMERA OVERLAY

NOTE: M870 V3.0 and above blends the camera overlay with CODESYS visualisation and the camera display allowing all to be visible at the same time.

Type *M870CameraOverlaySettings*, contains options to Enable/Disable the overlay and control the transparency.

2.9 M870CAMERAOVERLAYSETTINGS

Structure used for M870 camera overlay display.

Variable	Type	Description
Enable	BOOL	Turns overlay ON / OFF ☐: Camera is not displayed. ☑: Camera is displayed according to the settings of *Transparency* and *FileName* below.
Transparency	UDINT	**NOTE: This parameter is NOT applicable if *FileName* is specified.** Specifies the transparency of the overlay over the camera display. ***0:*** Overlay is not visible, Camera Only. ***1 to 254:*** Overlay is 'more visible' the higher the value. ***128:*** Overlay and Camera are equally visible. ***255:*** Camera is not visible.
Mirror	BOOL	**NOTE: Mirror parameter available in M870 V5.0 onwards.** ***FALSE:*** Camera appears as normal. ***TRUE:*** Camera image is mirrored (horizontally switched) so appears as if 'in a mirror'. This is useful to swap images when the camera is pointing in another direction (behind, for example).
FileName	STRING	**NOTE: Leave this parameter empty if an overlay image is not required. In this case, use *Transparency* to control the blending of Camera and Visualisation.** **NOTE: Ensure FileName is correct when used. If FileName does not exist, no *Alpha Channel* data is available and the camera appears at 0 % visibility (behind the CODESYS visualisation) and hence not visible.** Overlay Image Filename (png, jpg, bmp). The image should be sized to match the size of the camera display within the application. *Transparency* setting is not used, and the overlay image transparency is taken from the *Alpha Channel* value contained within the image. Some PC 'Paint' applications may call this *Transparency* or use similar wording.

2.10 USING THE USB DRIVE WITHIN APPLICATIONS

NOTE: M870MultiDemo application available from Deep Sea Electronics Technical Support (support@deepseaelectronics.com) includes a simple demonstration writing to a csv file.

Using the *Sysfile* library, applications can read/write data from/to files on the USB device. A typical use for this is storing data in *csv* (comma separated value) files for datalogging.
Within CODESYS, the device is accessed via the following path.

Firmware Version	Path to USB device
V5 onwards	'USBDRIVE/Partition_Name'
V1, V2, V3, V4	/media/usb0, /media/usb1 etc where each partition of the USB is given a different number

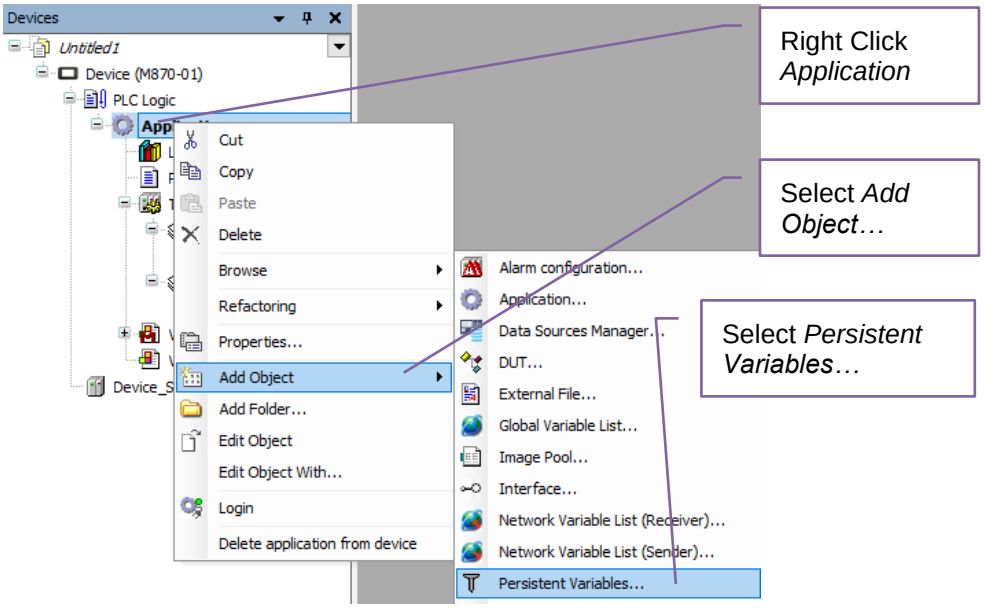
Example for DSEM870 V5:

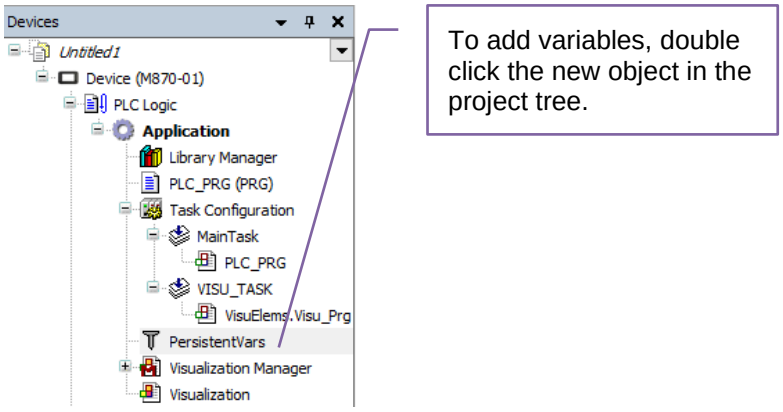
```
// Open the file and get the handle
hFile := SysFileOpen(szFile:= 'USBDRIVE/DSE_PENDRIVE/Test.csv', am := AM_WRITE, pResult := ADR(eResult));
```

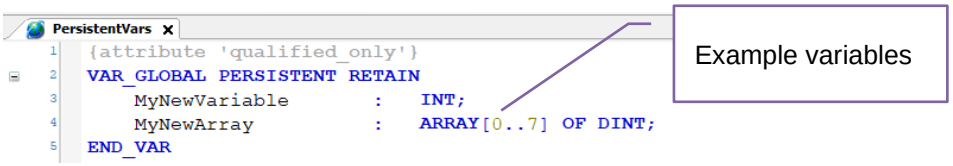
2.11 USING PERSISTENT VARIABLES IN THE PROJECT

NOTE: For details how to enable and configure the storage interval of Persistent Variables, see section entitled *Connecting to CODESYS | Device Settings | Persistence Settings* elsewhere in this document.

Variables placed in a Persistent Variables object are stored at regular intervals and maintained when the device is powered off. The variables are automacally loaded when the device powers up.







Within the POU the variables are address as normal. In this example we've named the object *PersistentVars* however any IEC compatible name can be used. Multiple *Persistent Variable* objects can be used as required.

Example:

```
PersistentVars.MyNewVariable:=2512;
PersistentVars.MyNewArray[2]:=32167;
```

2.12 ALTERNATIVE METHODS TO LOAD THE APPLICATION

2.12.1 USB

NOTE: For details of the *Clone/Recover* process see DSE publication *057-246 DSEM870 Installation and Operation Manual.*

A *Clone File* of the device can then be created and used to *Recover* onto other devices of the same variant and firmware version.

2.12.2 DSESERVICETOOL PC SOFTWARE

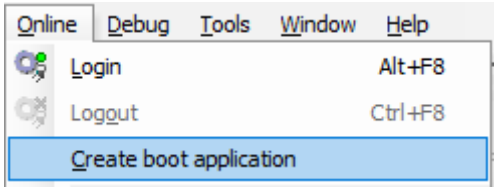
NOTE: For details using DSEServicetool PC Software see DSE publication *057-265 DSE Servicetool PC Software Manual.*

DSEServicetool PC Software is used to transfer applications to the device. This allows OEMs to update equipment application software without requiring a connection to CODESYS. However, CODESYS is required to create the *Boot Application* files in the first instance.

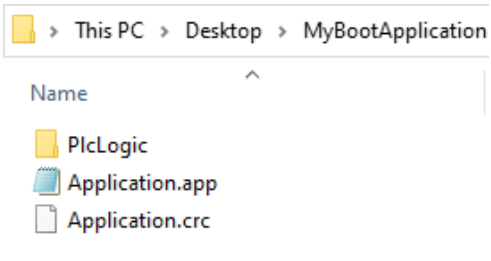
2.12.2.1 CREATION OF THE BOOT APPLICATION

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 files into a new (empty) folder. The example, to the right shows the boot application files in the new folder.
All these files (including the sub folder) make up the boot application and must be kept together.



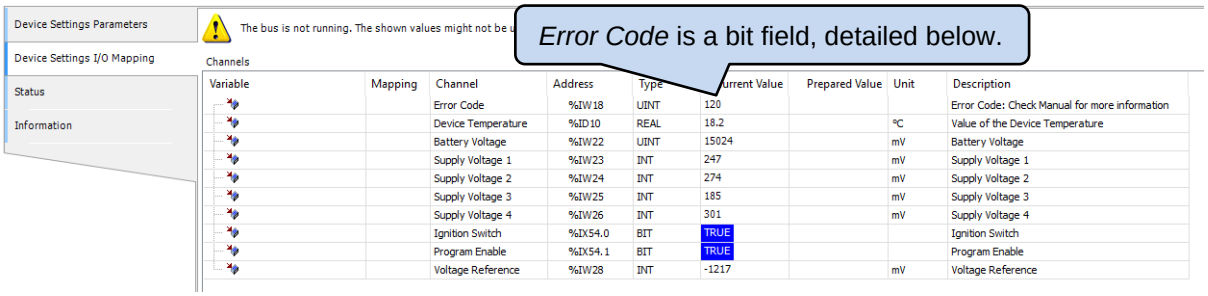
2.12.2.2 UPDATE USING DSESERVICETOOL AND ETHERNET CONNECTION

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

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

3 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.



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.*

3.1 DEVICE

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

3.2 ANALOGUE INPUTS

NOTE: Connector C is not fitted to DSEM871. Inputs and Outputs are not available on DSEM871.

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

3.3 DIGITAL INPUTS

NOTE: Connector C is not fitted to DSEM871. Inputs and Outputs are not available on DSEM871.

Input Configuration	MSB 8	7	6	5	4	3	2	LSB 1
	Bit							
Digital	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Error
Frequency	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Freq Over Range	Reserved	Error

3.4 DIGITAL OUTPUTS

NOTE: Connector C is not fitted to DSEM871. Inputs and Outputs are not available on DSEM871.

Output Configuration	MSB 8	7	6	5	4	3	2	LSB 1
	Bit							
Digital	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Current	Wire Break (Config)	Error

4 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).

5 DISPOSAL

5.1 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

6 MISCELLANEOUS

This product includes copyrighted third-party software licensed under the terms of the GNU General Public License. A copy of the corresponding source code for all included third-party software is available on request, please contact DSE Technical Support for additional information.

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