

Operator Manual

ehb SMARTdisplay 870

Version 4.1



- ehb5496-1 Programmable Display
- ehb5496-2 Programmable Display / Capacitive Touchscreen
- ehb5496-3 Programmable Display / Capacitive Touchscreen / CODESYS WebVisu®
available only on request

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ehb SMARTdisplay 870 Operator Manual

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1 INTRODUCTION

This document details the operation and setup requirements of the ehb SMARTdisplay 870 Mobile.

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*. ehb do not automatically inform on updates. Any future updates of this document are included on the ehb website at www.ehb-electronics.de.

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 V3.5 or C programming. Contact ehb 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 ehb SMARTdisplay 870 to control the machine it is connected to. The Application within the ehb SMARTdisplay M870 is designed and provided by the manufacturer of the complete machine.
Bootloader	The Bootloader is the program within the ehb SMARTdisplay 870 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. ehb SMARTdisplay 870 supports CODESYS V3.5
ECU	Electronic Control Unit. For example the ehb SMARTdisplay 870 device.
Firmware	The Firmware of the ehb SMARTdisplay 870 is the Operating System of the ehb SMARTdisplay 870 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 ehb publications which are obtained from the ehb website: www.ehb-electronics.de or by contacting ehb technical support.

1.3.1 TECHNICAL INFORMATION

ehb Part	Description
./.	ehb SMARTdisplay 870 Installation Instructions
./.	ehb SMARTdisplay 870 Datasheet

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 ehb. 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 heatsink at the rear heats up beyond normal ambient temperature during operation. To avoid danger caused by high 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 *Harnesses* for details of ehb 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 *Harnesses* for details.
- 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. Tighten to 0.8 Nm (0.6 lbf ft). Where IP protection is required when the interfaces are in use, suitable O-rings must be fitted.
- The heatsink must be wired to vehicle ground to comply with EMC guidelines. A screw connection point is provided for this purpose. A metallic screw must be used to create an electrical connection to vehicle / machine ground.

2 SPECIFICATIONS

2.1 PROCESSOR

Description	Specification
Technexion Freescale iMX6 SOLO Microcontroller	ARM A9
Speed	800 MHz

2.2 MEMORY

Description	Specification
Flash	2 GB available for application. 4 GB total.
RAM	512 Mb


2.3 DC SUPPLY

Description	Specification
Operating Voltage (Pin A7)	8 V to 32 V
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)	<5 mA at 24 V

2.3.1 FUSING

Description	Specification
DC Supply (Pin A7)	3 A Max
Ignition (15) (Pin A13)	1 A Max
High Current Outputs supply (Pin C1)	10 A Max
Fuse as Required by Output Loads (Pins C2, C3, C4, C5)	
Auxiliary Supply Output (Pin C13)	100 mA Max

2.4 ENVIRONMENTAL

 NOTE: 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. Tighten to 0.8 Nm (0.6 lbf ft). Where IP protection is required when the interfaces are in use, suitable O-rings must be fitted.

Description	Specification
Operating Temperature	-30 °C to +85 °C (-22 °F to 185 °F)
Storage Temperature	-40 °C to +85 °C (-40 °F to 185 °F)
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	9 (10 including Rotary Encoder Push)
Rotary Encoder	1 Rotary Encoder With Integral Push Button

2.5.2 DISPLAY

Description	Specification
Size (Across Diagonal)	177.8 mm (7")
Size (W x H)	WVGA (800 x 480)
Touchscreen (ehb5496-2)	Capacitive
Aspect Ratio	15:9
Type	Optically Bonded LED
Lifetime	> 50,000 hours
Colour	24 bit
Splash Screen Image Type	Bitmap Image (BMP) 8 bit / 24 bit colour depth 800 x 480

2.5.3 AMBIENT LIGHT LEVEL SENSOR

Description	Specification
Light Level Sensor	Measures ambient light level. This can be used to adjust display brightness based upon lighting conditions.

2.5.4 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
	1 Hz flash	Application Running.	Unit powered up, Application program loaded and running
	5 Hz 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.
	1 Hz flash	Decrypting Image	Bootloader is decrypting the downloaded image
	5 Hz 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	Super Cap for up to 800 hours

2.7 INPUTS

2.7.1 DIGITAL INPUTS

2.7.1.1 DIGITAL

Description	Specification
Applicable Pins	Pins C14, C15, C16, C17
Minimum Voltage for High Level	>6 V
Maximum Voltage for Low Level	<2 V

2.7.1.2 FREQUENCY

Description	Specification
Applicable Pins	Pins C14, C15, C16, C17
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)	>2 V
Maximum Voltage for Low Level (Space)	<1.4 V

2.7.2 ANALOGUE INPUTS

Description	Specification
Applicable Pins	Pins C14, C15, C16, C17
Reference Voltage Pins	C6, C18
Reference Voltage	Programmable 5 V / 10 V \pm 500 mV

2.7.2.1 VOLTAGE

Description	Specification
Applicable Pins	Pins C14, C15, C16, C17
Configurable Ranges	0 V to 5 V 0 V to 10 V 0 V to 32 V
Input Resistance	\geq 30 k Ω
Sampling Rate	500 Hz

Voltage Measurement Resolution and Accuracy

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

Specifications

2.7.2.2 CURRENT

Description	Specification
Applicable Pins	Pins C14, C15, C16, C17
Configurable Ranges	0 mA to 20 mA 4 mA to 20 mA
Input Type	Current sink only
Input Sink Resistance	100 Ω \pm 1%
Sampling Rate	500 Hz
Resolution (12 bits)	0.005 mA
Accuracy (\pm 1 % Full Scale Deflection)	0.2 mA

2.7.2.3 RESISTIVE

Description	Specification
Applicable Pins	Pins C14, C15, C16, C17
Measurement Range	0 Ω to 3200 Ω
Measurement Source Voltage	12 V maximum
Measurement Source Current	1 mA
Sampling Rate	500 Hz
Resolution (12 bits)	0.78 Ω
Accuracy (\pm 1 % Full Scale Deflection)	32 Ω

2.7.2.4 RATIOMETRIC

Description	Specification
Applicable Pins	Pins C14, C15, C16, C17
Measurement Voltage Reference	Input/Output Supply (Pin C1, C7)
Measurement Type	Ratio of input Pin to I/O Supply
Measurement Source Current	1 mA
Accuracy	\pm 1 % F.S.D.

2.8 OUTPUTS

2.8.1 NEGATIVE SWITCHING

Description	Specification
Applicable Pins	Pins C2, C3, C4, C5
Maximum Current	2 A
Digital Output Active Low 'ON' State Maximum Voltage at Rated Current	< 100 mV
Digital Output Active Low 'OFF' State Leakage Current	<5 μ A at 24 V output supply

2.8.2 POSITIVE SWITCHING

Description	Specification
Applicable Pins	Pins C2, C3, C4, C5
Maximum Current	2 A
Digital Output Active Low 'ON' State Maximum Voltage at Rated Current	<100 mV
Digital Output Active Low 'OFF' State Leakage Current	<10 μ A at 24 V output supply

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.

Description	Specification
Number of CAN Interfaces	2
Supported Protocols	J1939 CANopen Raw CAN
Supported Baud Rates	10 kbit/s, 20 kbit/s, 50 kbit/s, 100 kbit/s, 125 kbit/s, 250 kbit/s, 500 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
Filename Structure	Filenames must be alphanumeric only (A to Z, a to z, 0 to 9) and "." (used to separate the file extension).

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

2.9.4 CAMERA INPUTS

▲ NOTE: ehb SMARTdisplay 870 V3.0 and above blends the camera overlay with CODESYS visualisation and the camera display allowing all to be visible at the same time. See section entitled *Camera Overlay* elsewhere in this document.

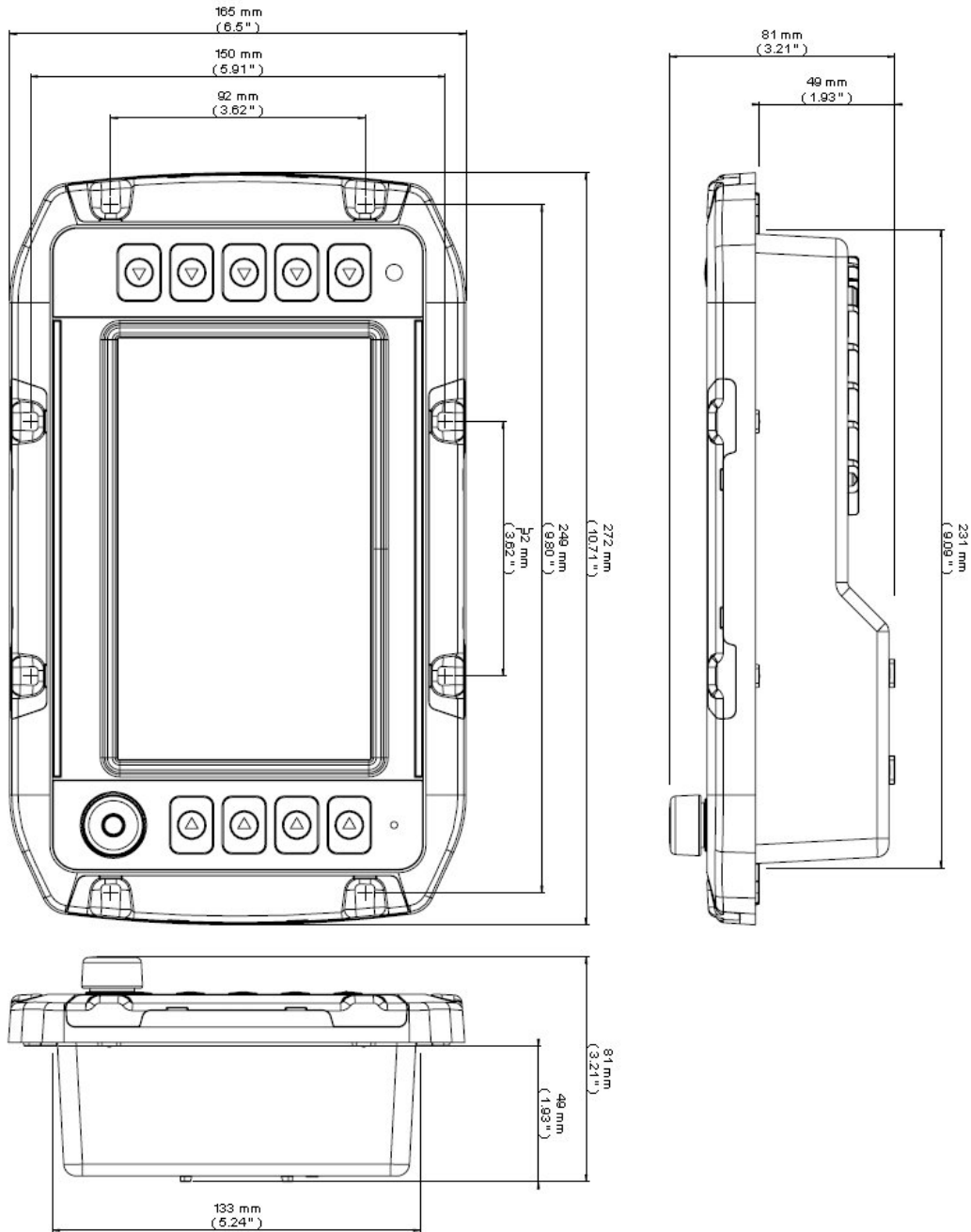
Description	Specification
Number of Camera Inputs	2
Connection Pins	A5, A11 (Camera 1) A6, A12 (Camera 2)
Camera Type	VGA
Interface Type	Analogue (Composite) Video for PAL / NTSC
Overlay Size (when utilised)	800 x 480

3 INSTALLATION

3.1 DIMENSIONS AND MOUNTING

3.1.1 DIMENSIONS

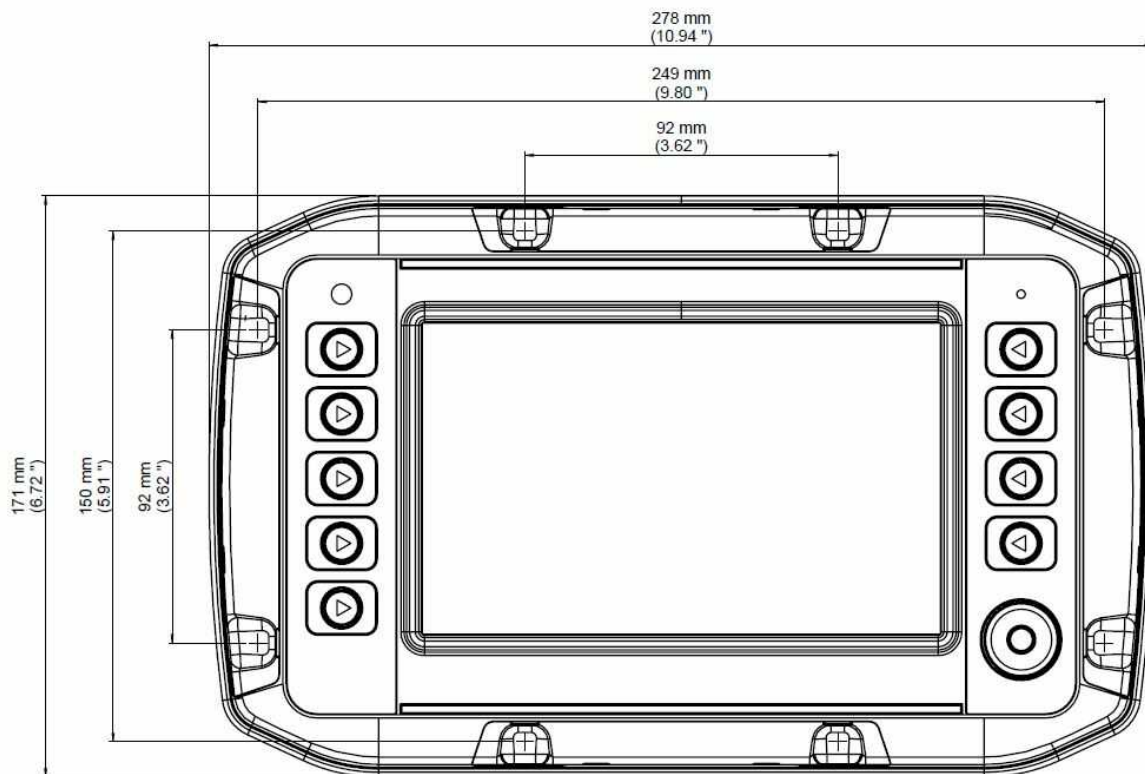
Description	Specification
Overall Dimensions (Height x Width x Depth)	272 mm x 165 mm x 81 mm (10.7" x 6.5" x 3.2")
Mounting Type	8 x mounting bolts or RAM mount.
Overall Weight	<1 kg (2.2 lb)



Overall dimensions without fascia mounting gasket

3.1.2 FASCIA MOUNTING

Description	Specification
Fascia Mounting Holes	Suitable for M5 bolts (0.3" holes)
Fascia Mounting Hole Centres	See Diagram Below
Panel Cut-Out	231 mm x 133 mm (9.09" x 5.24")
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 lbf ft Maximum)

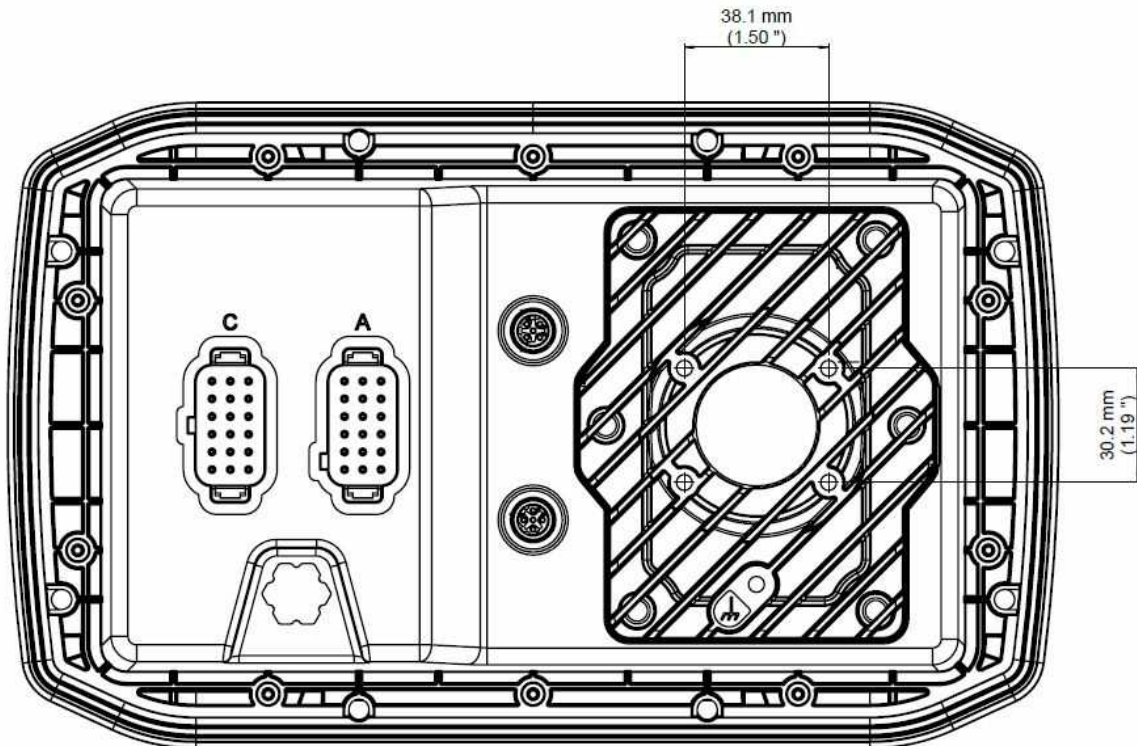


Overall dimension including fascia mount gasket.

3.1.3 RAM MOUNTING

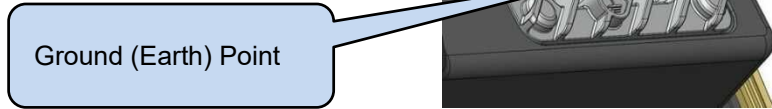
ehb SMARTdisplay 870 has four holes on the rear face, suitable for fitting of a RAM type mount with the *AMPS hole pattern*. The spacing for the mounting holes is detailed in the image below.

Description	Specification
RAM Mounting Holes	Suitable for M5 bolts (0.3" holes)
RAM Mounting Hole Centres	31.1 mm x 30.2 mm (1.50" x 1.19")
RAM Mounting Bolt Material Recommendation	Steel or Stainless Steel
RAM Mounting Bolt Tightening Torque	4 Nm Maximum (2.95 ft. lb Maximum)



3.2 GROUNDING

To ensure the protection of the device against electrical interference and the safe function of the device, the rear heatsink must be connected to the ground of the vehicle / machine. A suitable screw is provided on the rear of the device, below the RAM mount location.



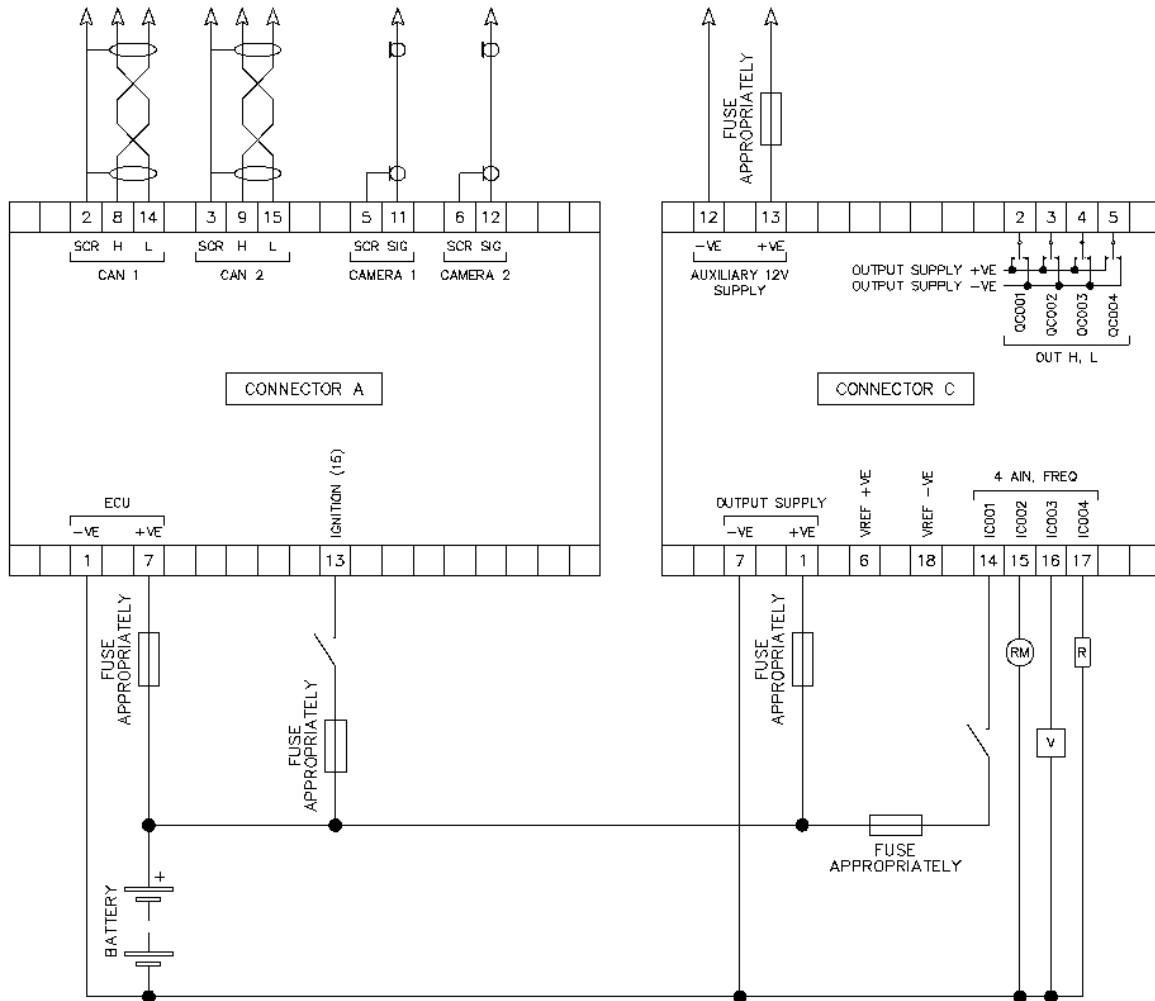
3.3 FUSING

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 ehb SMARTdisplay 870 CPU	3 A Max
A13	Ignition (15)		1 A Max
C1	Output Supply	Supplies Outputs QC001 (Pin C2) QC002 (Pin C3) QC003 (Pin C4) QC004 (Pin C5).	10 A Max
C13	Auxiliary Supply Output (100 mA)	Used to Supply External Devices Internally Protected From Overcurrent.	100 mA Max

3.4 TYPICAL CONNECTION DIAGRAM

Terminology	Meaning
QCxxx	Output
Ix	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.



USB CONNECTOR: M12 B CODED				
5 V	DATA +	DATA -	0 V	SHIELD
1	2	3	4	5

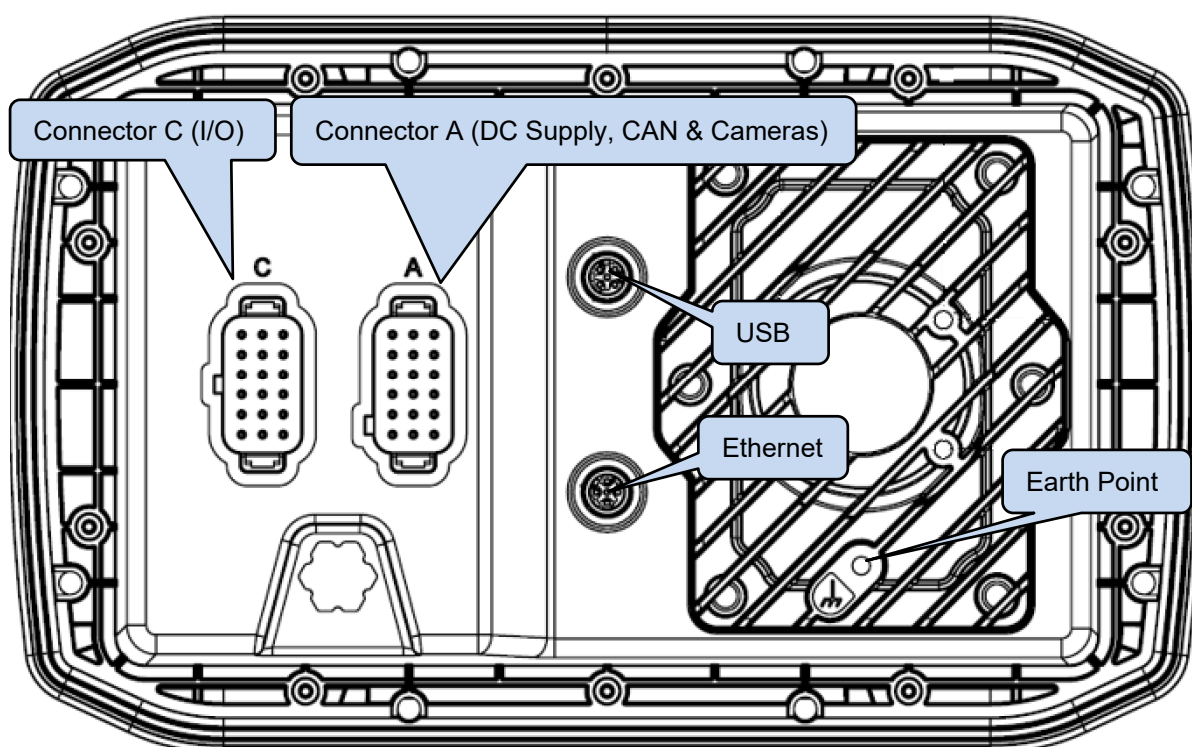
ETHERNET CONNECTOR: M12 D CODED			
TX+	RX+	TX-	RX-
1	2	3	4

3.5 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: Connectors A and C are coded differently. Do not try to force a connector into the wrong socket.

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



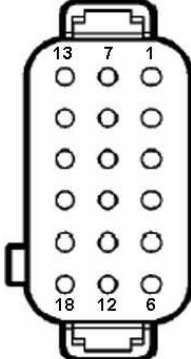
3.5.1 CONNECTOR A (DC SUPPLY, CAN AND CAMERA)

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

NOTE: Screened 120 Ω impedance cable specified for use with CAN must be used for the CAN links.

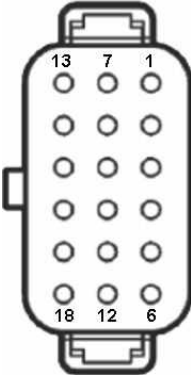
NOTE: CAN connections are NOT internally terminated. A complete CAN network must have 120 Ω terminators at each end of the network.

NOTE: Connect Camera1 and Camera2 using a single core conductor with screen (shield).

Connector A	Pin	Description	Comments
<p>(A Coded)</p> 	1	ECU Supply -ve	DC Supply for the ehb SMARTdisplay 870
	2	CAN1 SCR	Screen (shield) for CAN1
	3	CAN2 SCR	Screen (shield) for CAN2
	4	No Connection	
	5	Camera 1 SCR	Screen (shield) for Camera 1
	6	Camera 2 SCR	Screen (shield) for Camera 2
	7	ECU Supply +ve	DC Supply for the ehb SMARTdisplay 870
	8	CAN1 H	
	9	CAN2 H	
	10	No Connection	
	11	Camera 1 Signal	Analogue (Composite) video
	12	Camera 2 Signal	Analogue (Composite) video
	13	Ignition +ve (15)	Energises the ECU.
	14	CAN1 L	
	15	CAN2 L	
	16	No Connection	
	17	No Connection	
	18	No Connection	

3.5.2 CONNECTOR C (I/O)

Terminology	Meaning
QC00x	Output
IC00x	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 C	Pin	Description	Comments
<p>(C Coded)</p> 	1	Input/Output Supply +ve	Supplies Outputs 1 to 4 and <i>Ratiometric</i> inputs.
	2	QC001	OUT H, L. Supplied by C1.
	3	QC002	OUT H, L. Supplied by C1.
	4	QC003	OUT H, L. Supplied by C1.
	5	QC004	OUT H, L. Supplied by C1.
	6	Vref +	+ve Reference Output for AIN.
	7	Output Supply GND	-ve Connection for Output Supply (C1)
	8	No Connection	
	9	No Connection	
	10	No Connection	
	11	No Connection	
	12	Aux 12V -ve Output	Used to Supply External Devices
	13	Aux 12V +ve Output (Max 100 mA)	Used to Supply External Devices
	14	IC001	AIN, FREQ
	15	IC002	AIN, FREQ
	16	IC003	AIN, FREQ
	17	IC004	AIN, FREQ
	18	Vref GND	-ve Reference Output for AIN



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 DC power) of the ehb SMARTdisplay 870 Centres . Wait until *Entering Setup...* is displayed before releasing the buttons.

4.1.1 NAVIGATION

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

Icon	Function	Description
	Return	Press the adjacent button to return to a previous page.
	Encoder	Rotate to cycle through the available options. Press to select (OK) the displayed option.



4.1.1.1 PAGE SELECTION

Use the rotary encoder to move through the pages. Press the rotary encoder to select the page.



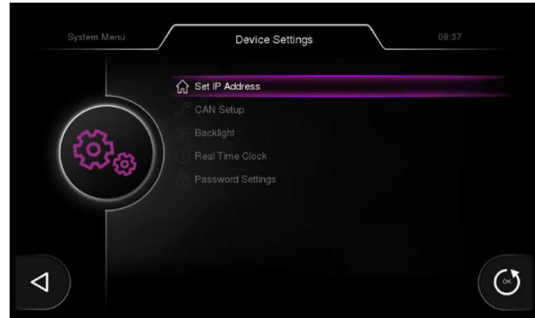
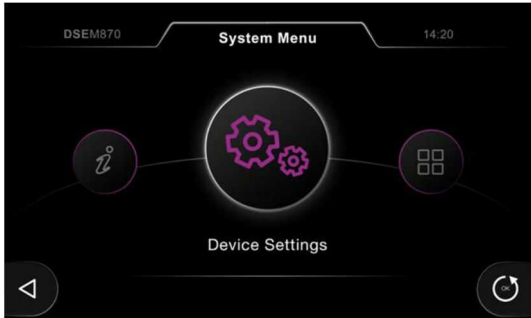
4.1.1.2 OPTION SELECTION AND EDITING

While viewing the selected page, use the rotary encoder to move through the options, Press the rotary encoder to select the option for editing.

While editing the selected parameter, use the rotary encoder to change the value, Press the rotary encoder to save the change. Press < to exit the editor.

4.1.2 DEVICE SETTINGS

This section allows access to the *Device Settings*.



4.1.2.1 SET IP ADDRESS

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 consultation with the network manager.

Turn the rotary encoder to select the item to change and press it to enter the editor.



Use the rotary encoder to select the digit. Press to accept the change and/or move to the next digit.

4.1.2.2 CAN

This section allows configuration of the CAN interface parameters.

Turn the rotary encoder to select the item to change and press it to enter the editor.

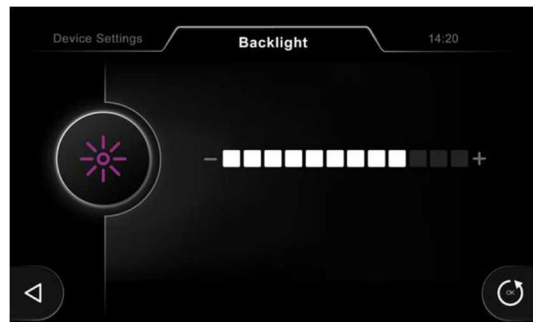
Selecting *Interface* and pressing the encoder cycles between the two CAN ports (0 & 1).



4.1.2.3 BACKLIGHT

This section allows adjustment of the LCD backlight brightness.

Use the rotary encoder to adjust the level.
Press to accept the change.



4.1.2.4 REAL TIME CLOCK

Allows the setting of the Real Time Clock and Calendar.

Use the rotary encoder to select the digit.
Press to accept the change and/or move to the next digit.



4.1.2.5 PASSWORD SETTINGS

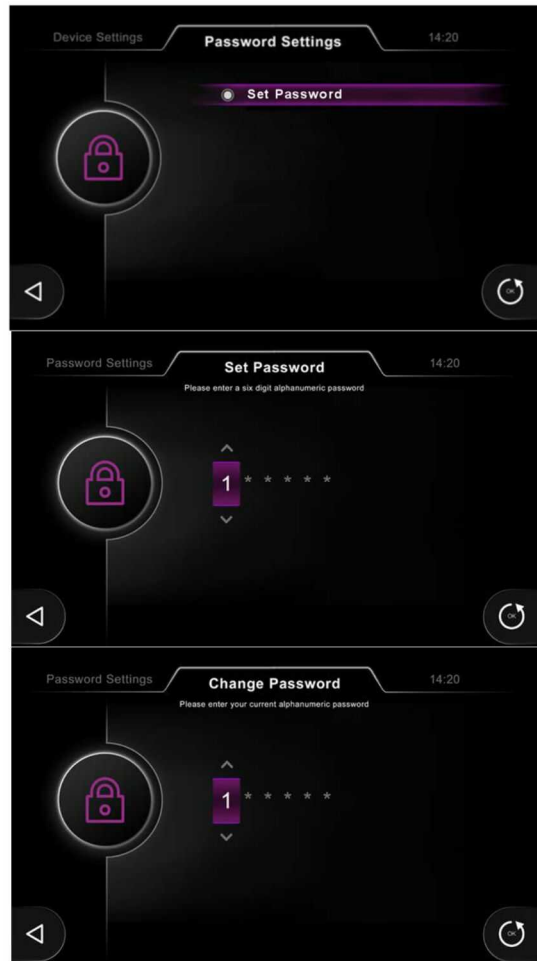
NOTE: Ensure the Password (if enabled) is not lost or forgotten!

Allows the password to be enabled and changed.

Turn the rotary encoder to select the item to change and press it to enter the editor.

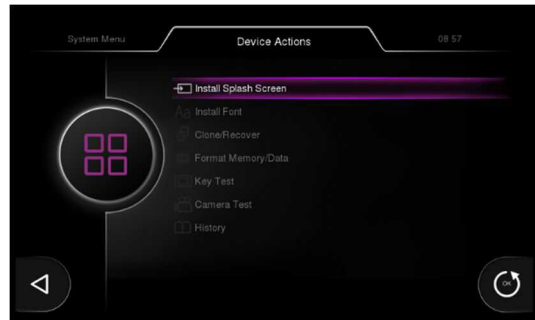
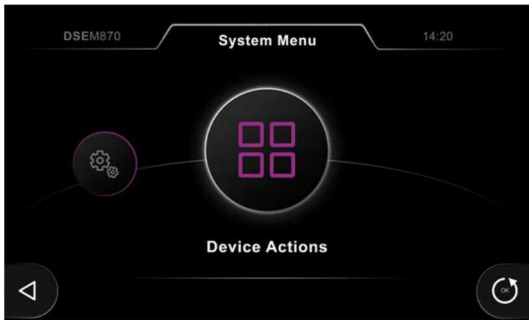
Use the rotary encoder to select the digit. Press to accept the change and move to the next digit.

Use the rotary encoder to select the digit. Press to accept the change and move to the next digit.



4.1.3 DEVICE ACTIONS

Allows selection of device actions.



4.1.3.1 INSTALL SPLASH SCREEN

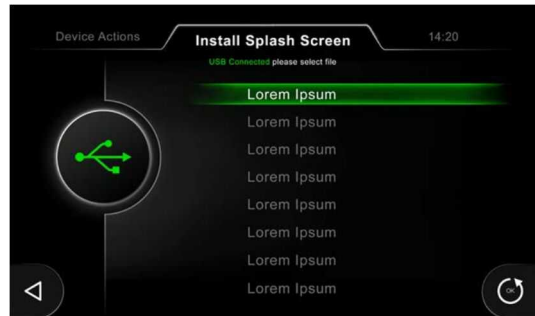
ehb SMARTdisplay 870 supports the display of a *Splash Screen* at power up and shutdown of the device. This is typically used to display the OEM logo image.

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

Splash Screen Image Type:
Bitmap Image (BMP)
8 bit / 24 bit colour depth
800 x 480

Filename must be alphanumeric only (A to Z, a to z, 0 to 9) and "." (used to separate the file extension). Spaces are not permitted in the filename

Turn the rotary encoder to choose *Startup or Shutdown* image and then to select the required image file. Press the encoder to install the file..



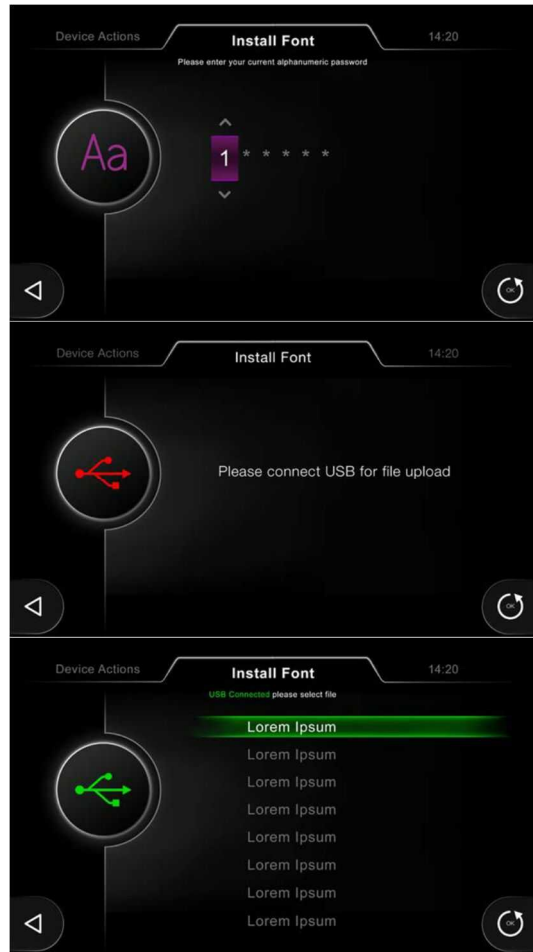
4.1.3.2 INSTALL FONT

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

Ensure the USB device containing the font(s) is connected to the controller.

Filenames must be alphanumeric only (A to Z, a to z, 0 to 9) and "." (used to separate the file extension).

Turn the rotary encoder to choose the required font and press it to select.



4.1.3.3 CLONE / RECOVER SELECTION

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



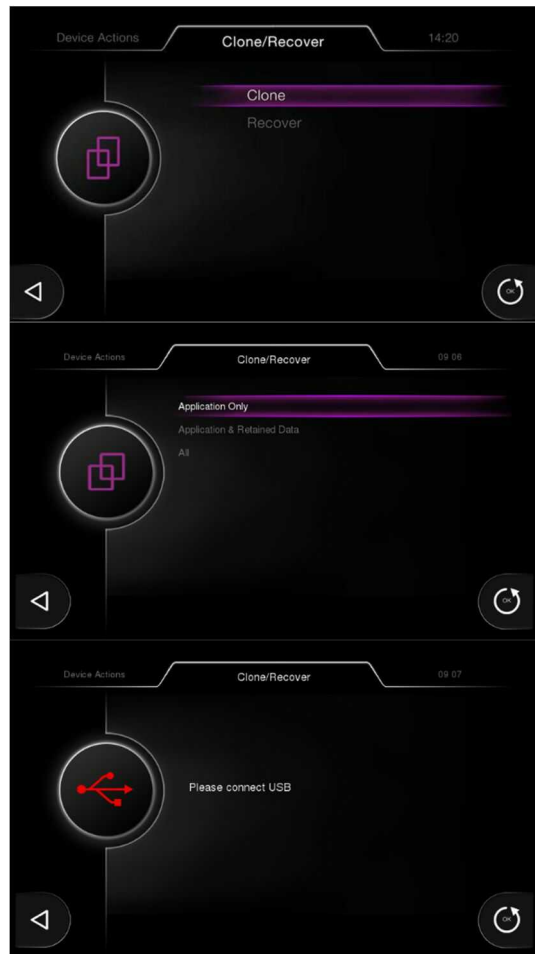
CLONE

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.

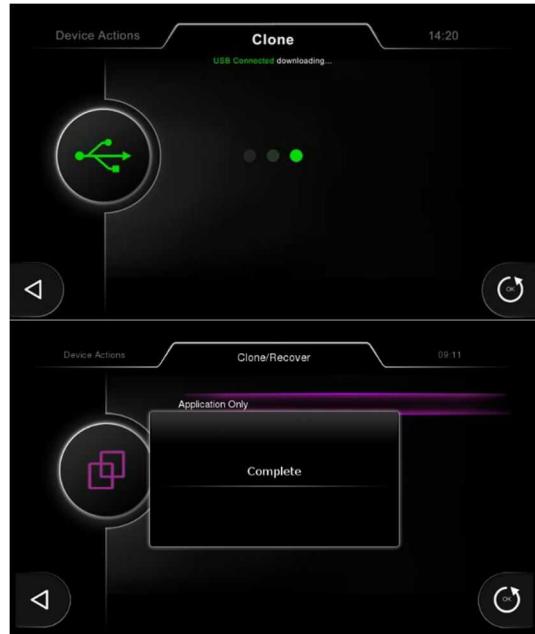
Turn the rotary encoder to choose the function and press it to access the *Clone* selector.

Turn the rotary encoder to choose the function and press it to select.

Ensure the USB device used to store the Clone file(s) is connected to the controller.



Wait while the process completes....



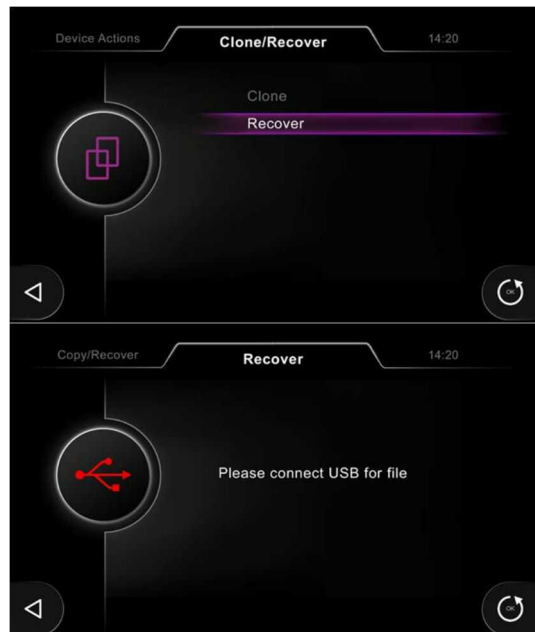
RECOVER

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, or create copies of the device, sending the file to other devices.

Ensure the USB device containing the file(s) to Recover is connected to the controller.

Filenames must be alphanumeric only (A to Z, a to z, 0 to 9) and "." (used to separate the file extension).



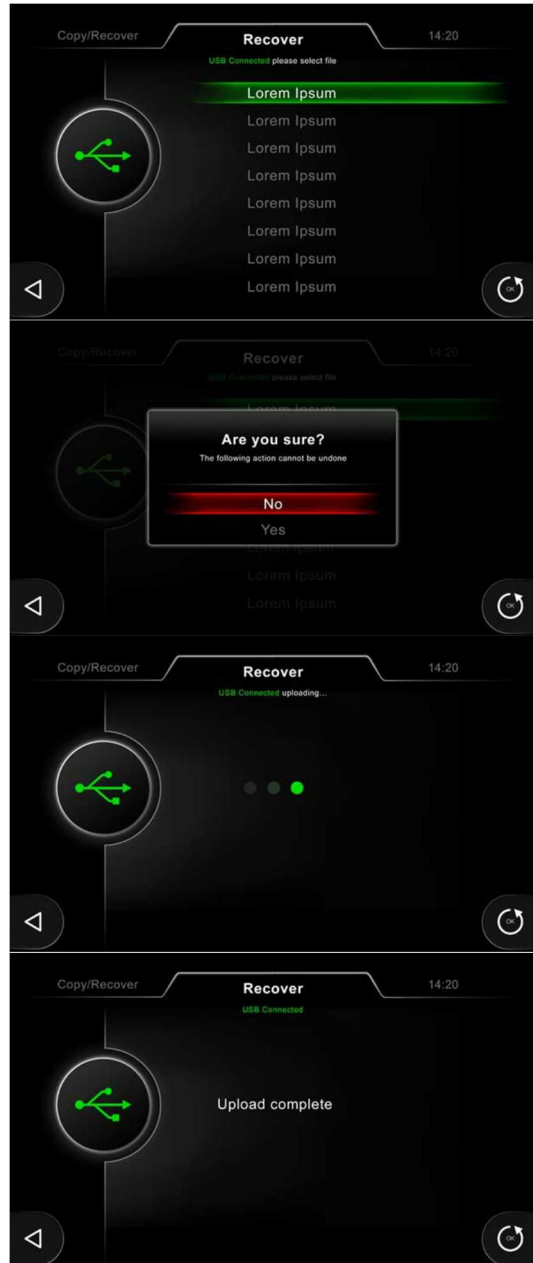
Operation

Turn the rotary encoder to choose the file to restore, and press it (*click*) to select.

Confirm that you wish to proceed with this process.

Turn the rotary encoder to choose the option, and press it to select.

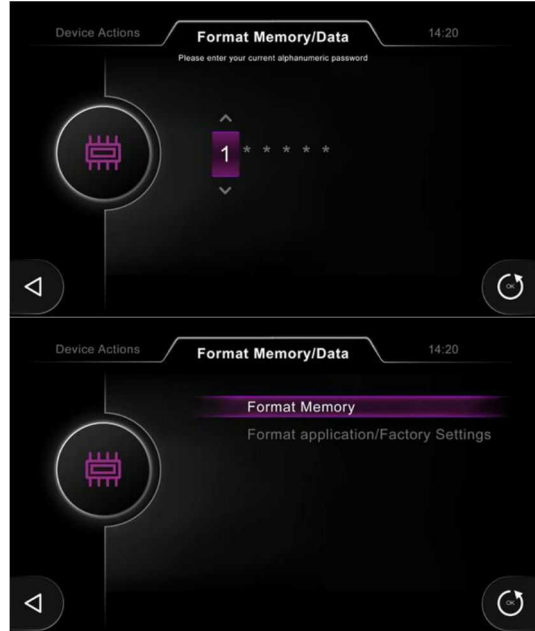
Wait while the process completes....



4.1.3.4 FORMAT MEMORY / DATA

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

Enter the Password if one has been set.



Select which memory area to Format.
Turn the rotary encoder to choose the function,
and press it to select.

Format Memory : Remove Application only.
Format Application/Factory Settings:
Removes Application and all other files including
system settings. May be considered as a
'Factory Reset'.

4.1.3.5 KEY TEST

This section allows the device fascia buttons
and rotary encoder to be tested.

Press the keys and rotate the encoder to
receive feedback of their operation.

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



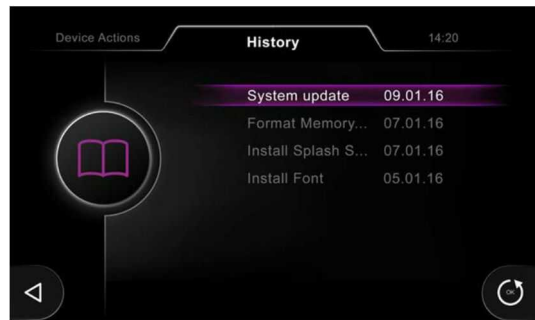
4.1.3.6 CAMERA TEST

Select the camera using the rotary encoder and press the encoder to view the selected camera.



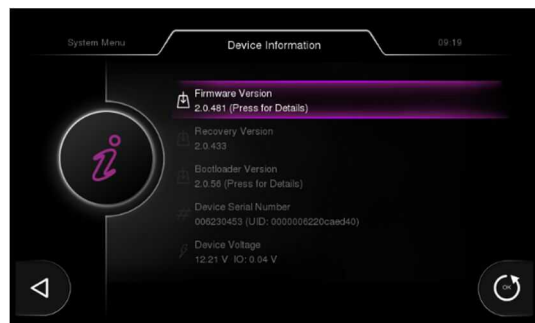
4.1.3.7 HISTORY

Used to display a log of the date of certain actions.



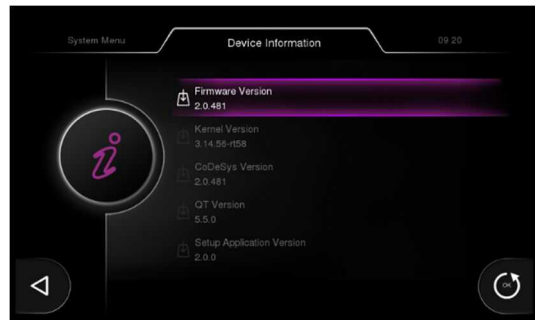
4.1.4 DEVICE INFORMATION

This section shows the *Device Information*.



4.1.4.1 FIRMWARE VERSION

Shows all details of the device versions.



4.2 FIRMWARE UPDATE

The Firmware Update is performed as follows:

- Remove DC Supply from the ehb SMARTdisplay 870 .
- Press and hold any three buttons. Reapply DC power until the ehb SMARTdisplay 870 indicates that it is *Entering Flash / Recovery*. Now release the buttons.
- When prompted, connect the USB memory stick containing the firmware update file(s). You must do this within 60 seconds. Failure to do so results in the ehb SMARTdisplay 870 restarting into normal operation mode.
- Update occurs automatically when the memory stick is inserted.
- On completion, press any button when prompted to restart the device and apply the new firmware.

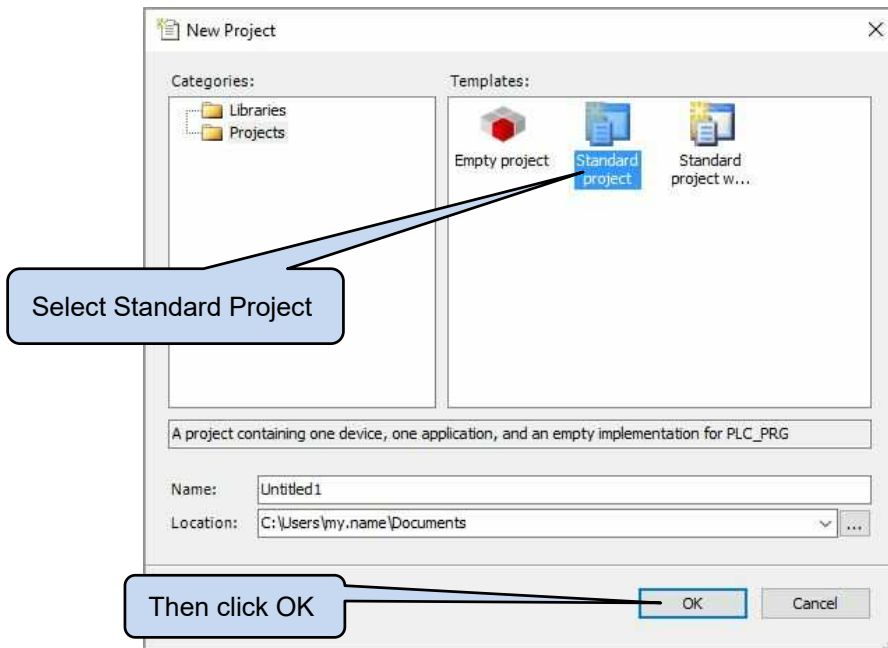
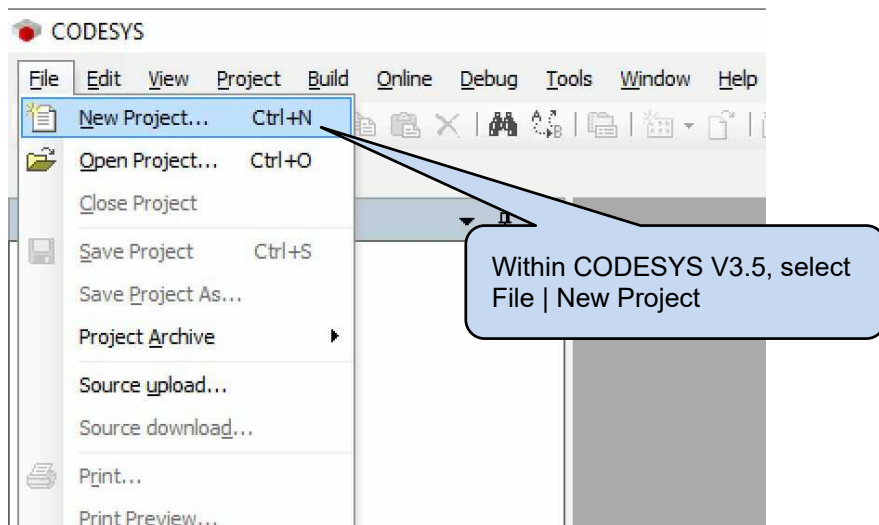
5 CONNECTING TO CODESYS

NOTE: ehb SMARTdisplay 870 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 info@ehb-electronicis.de if assistance is required.

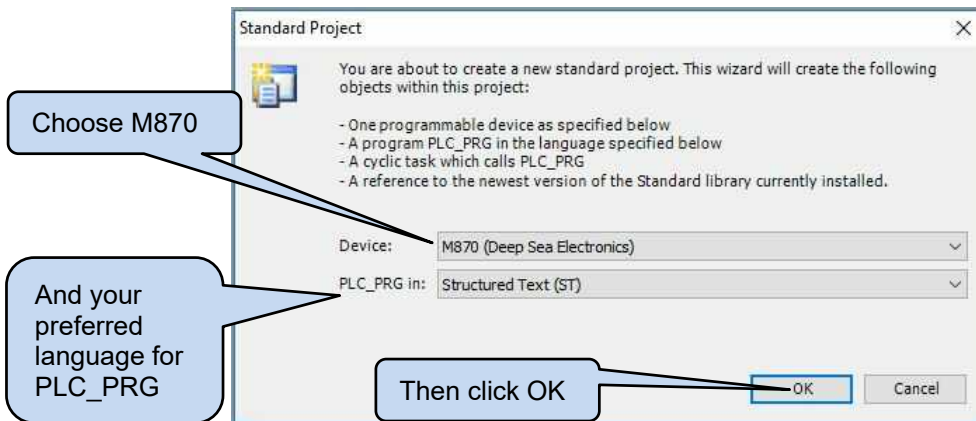
ehb SMARTdisplay 870 communicates with, and is programmed by, the CODESYS V3.5 Integrated Development Environment (IDE).

5.1 START NEW PROJECT

To begin, start a new project as shown.



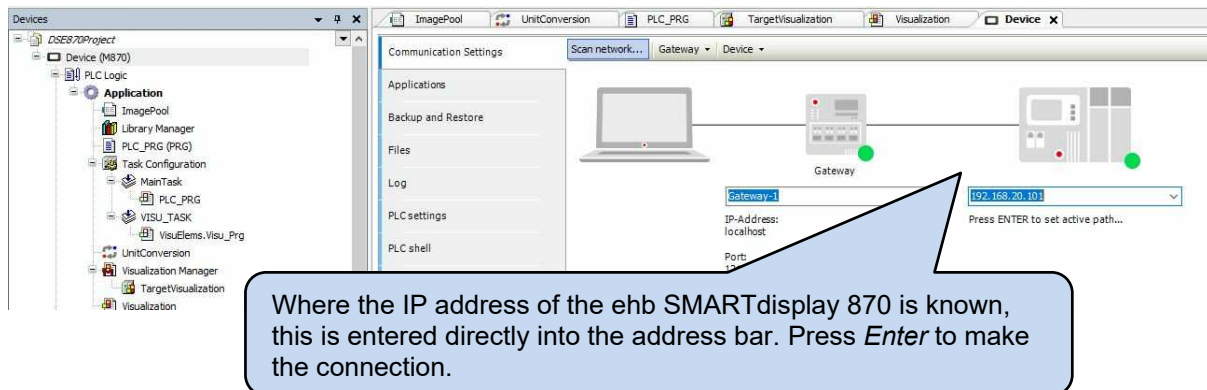
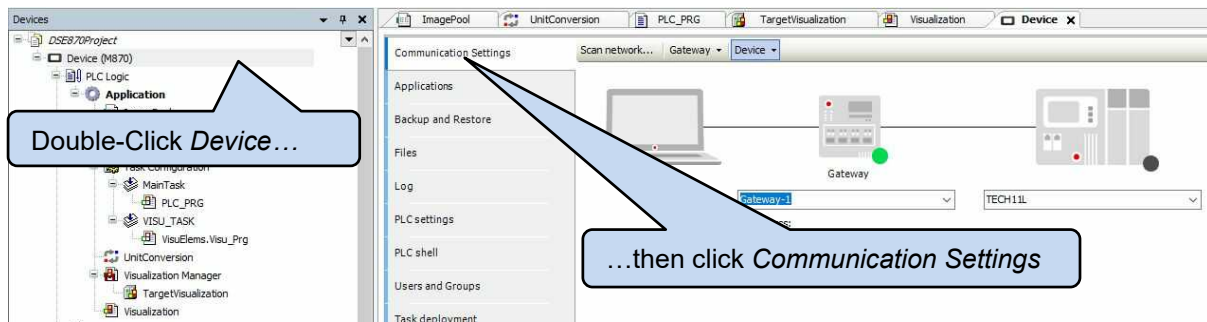
Connecting to CODESYS



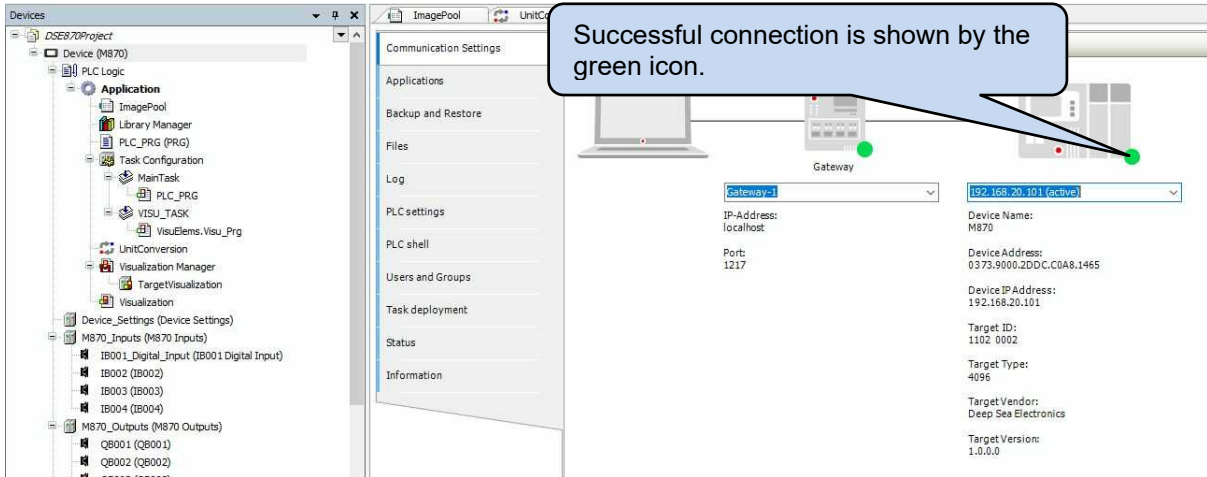
5.2 ETHERNET TCP

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

With the ehb SMARTdisplay 870 connected to the same Ethernet network as the PC, Select *Device | Communication Settings* in the CODESYS V3.5 IDE.



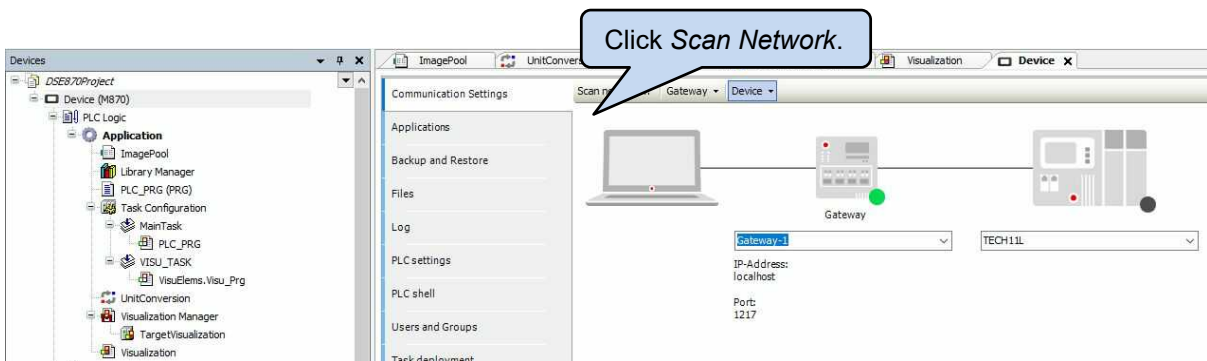
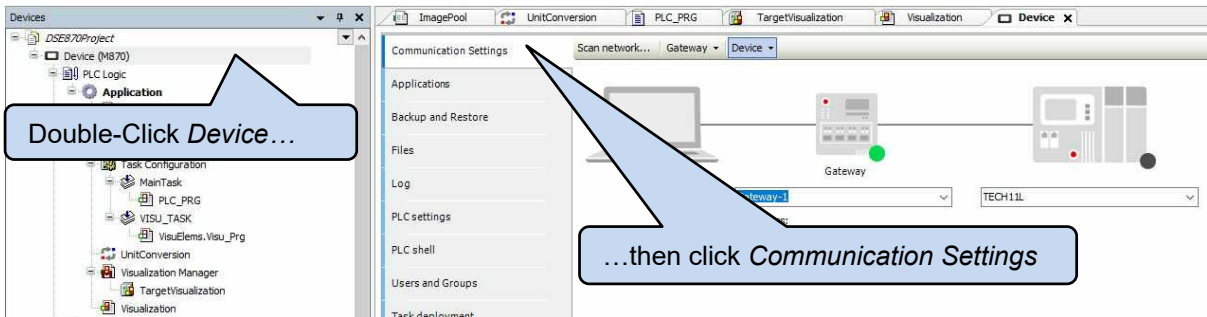
Connecting to CODESYS



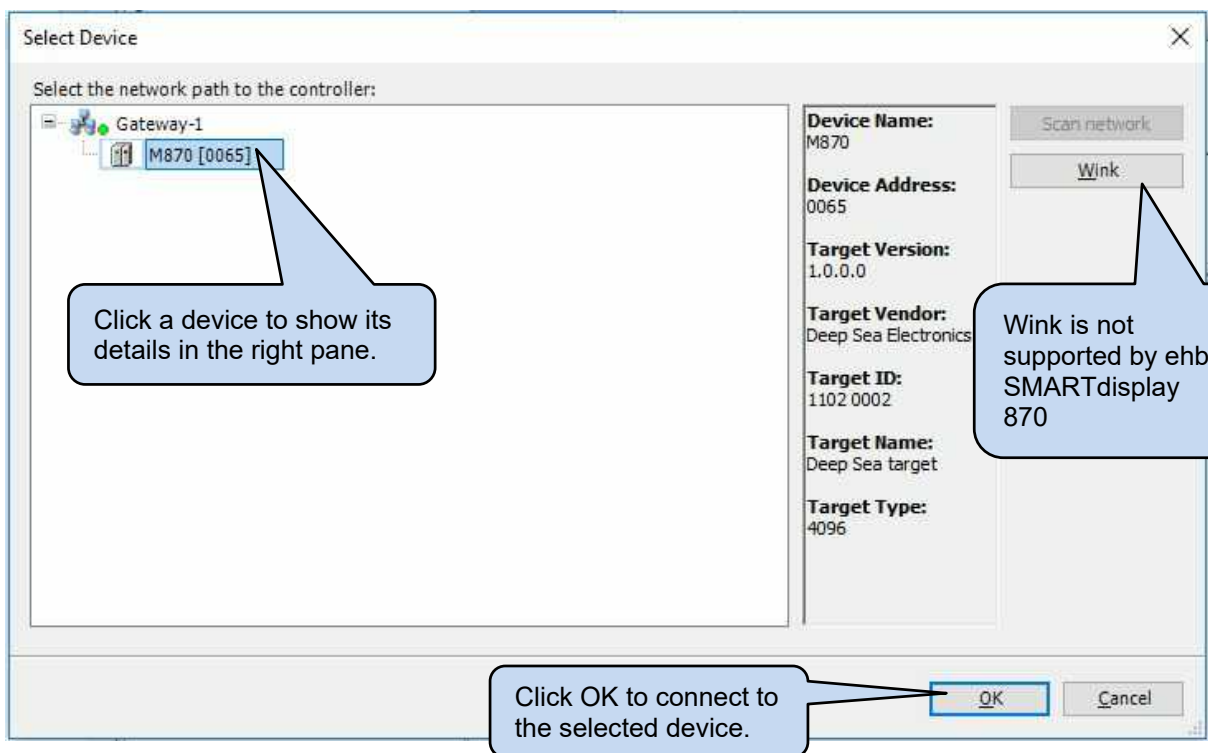
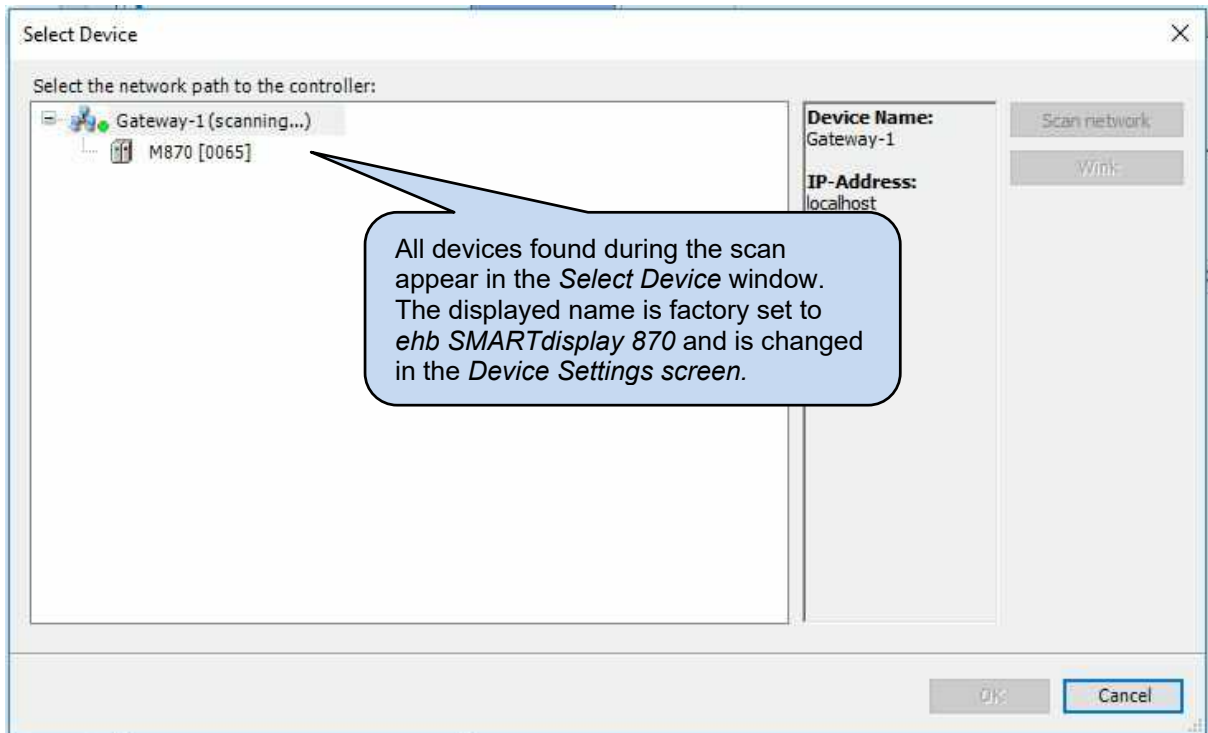
5.3 ETHERNET UDP

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.

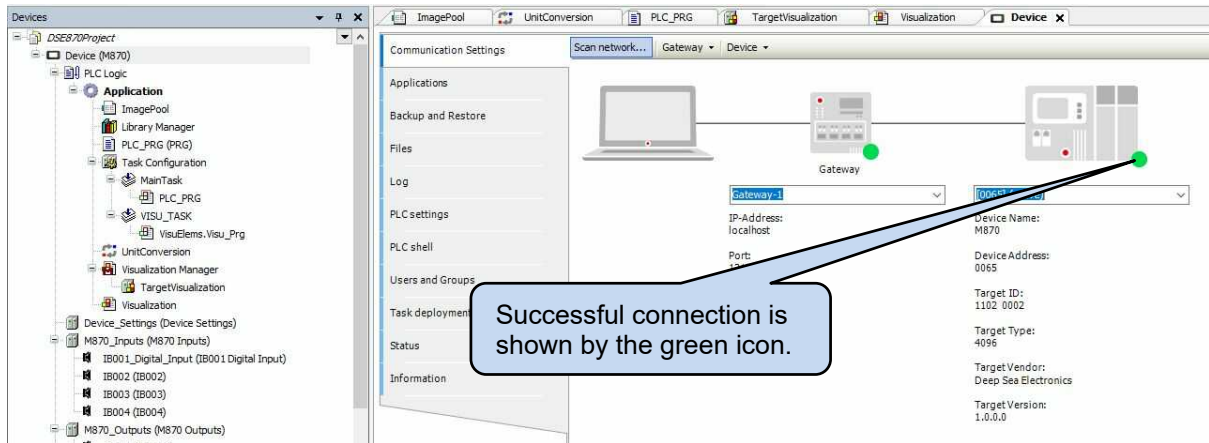
With the ehb SMARTdisplay 870 connected to the same Ethernet network as the PC, Select *Device | Communication Settings* in the CODESYS V3.5 IDE.



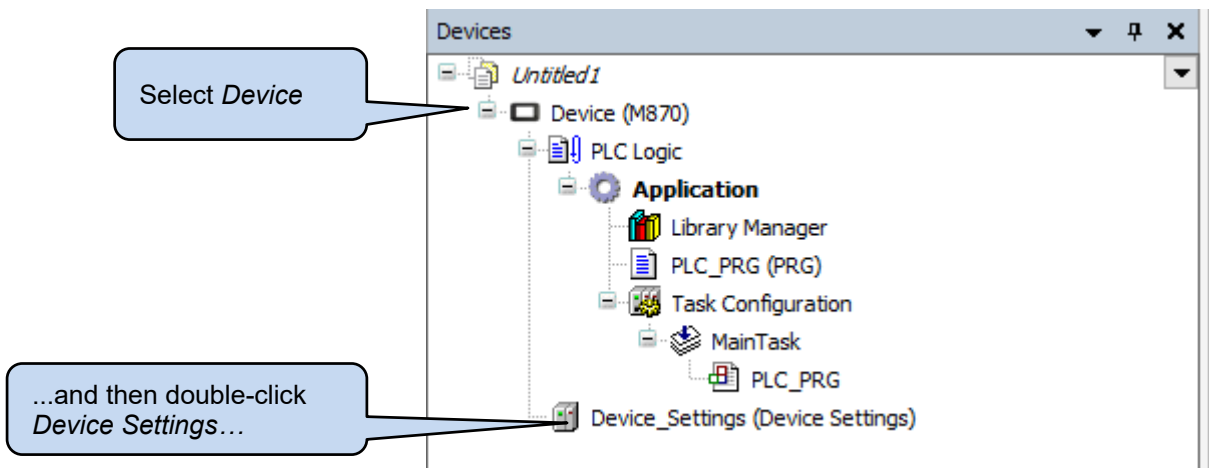
NOTE: A device in *Setup* mode is not discoverable by the Scan.



Connecting to CODESYS



5.4 CONFIGURE SETTINGS AND MONITOR THE DEVICE



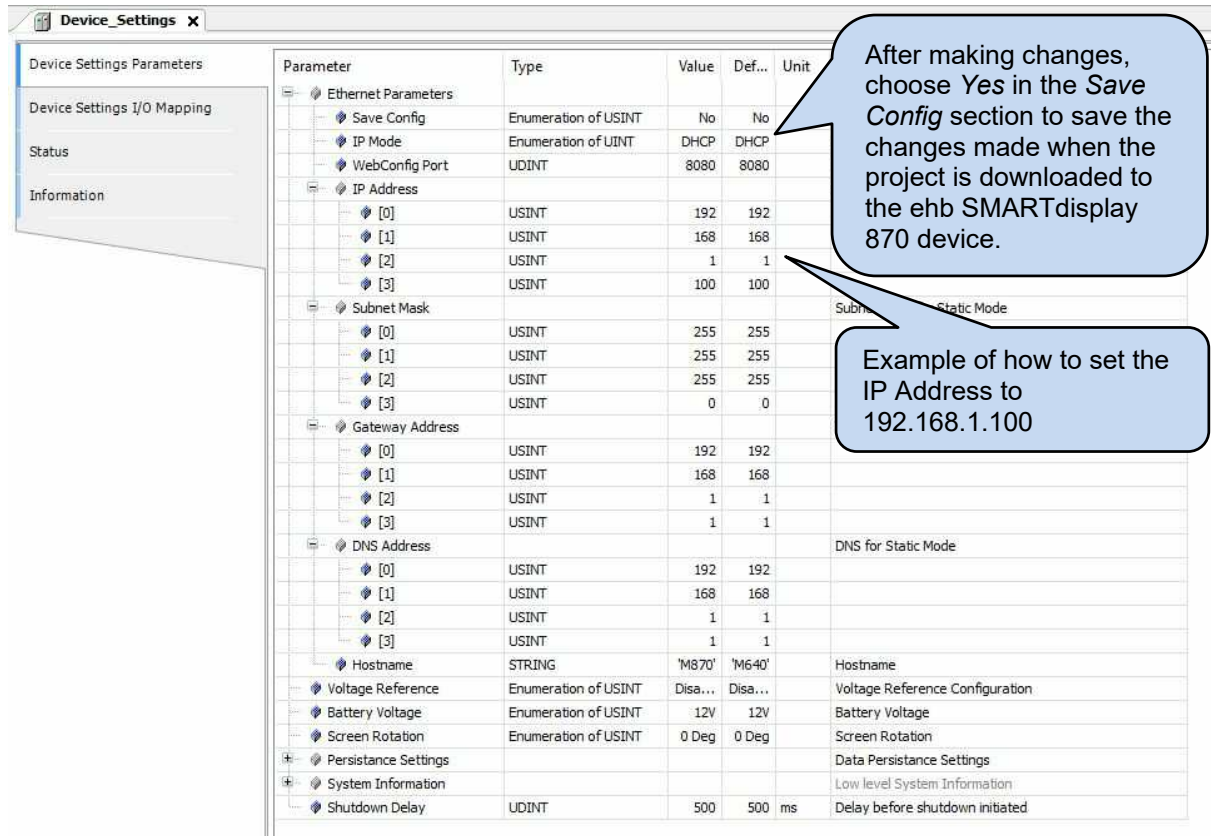
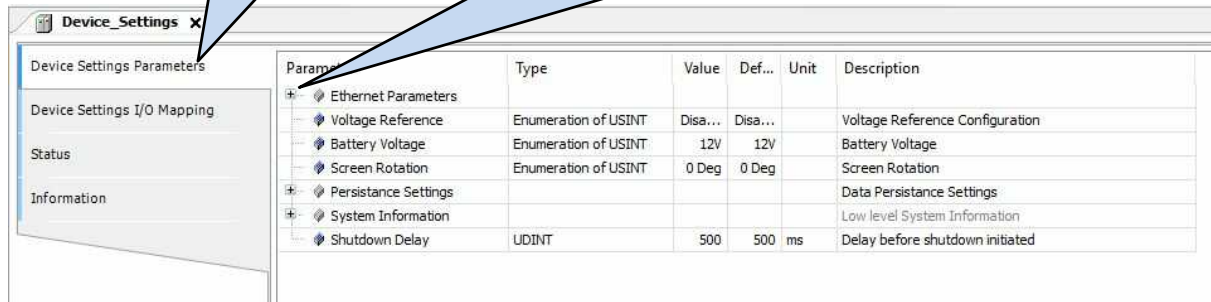
See the following subsections for details of the Device Settings pages.

5.4.1 DEVICE SETTINGS PARAMETERS

NOTE: After changing the setting of *Screen Rotation*, *ehb SMARTdisplay 870* must be power cycled for the change to take effect.





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

...and then expand *Ethernet Parameters* by clicking the + symbol.



After making changes, choose *Yes* in the *Save Config* section to save the changes made when the project is downloaded to the *ehb SMARTdisplay 870* device.

Example of how to set the IP Address to 192.168.1.100

Parameter	Description
New Ethernet Configuration	<p>NOTE: After making changes, choose Yes in the Save Config section to save the changes made when the project is downloaded to the ehb SMARTdisplay 870 device.</p> <p>Allows configuration of the device ethernet port.</p>
Voltage Reference	<p>Enables the <i>VREF</i> output. This is an auxiliary output supply used for example to supply external input sensors.</p> <p>Disabled: The outputs is OFF. 5V: The output gives 5 V dc. 10V: The output gives 10 V dc.</p>
Screen Rotation	<p>NOTE: After changing the setting of <i>Screen Rotation</i>, ehb SMARTdisplay 870 must be power cycled for the change to take effect.</p> <p>NOTE: For Screen Rotation <i>ROT_90</i> and <i>ROT_270</i> (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.</p> <p>Sets the device screen rotation.</p> <p>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) </p> <p>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). </p> <p>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). </p> <p>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). </p>

5.4.2 DEVICE SETTINGS I/O MAPPING

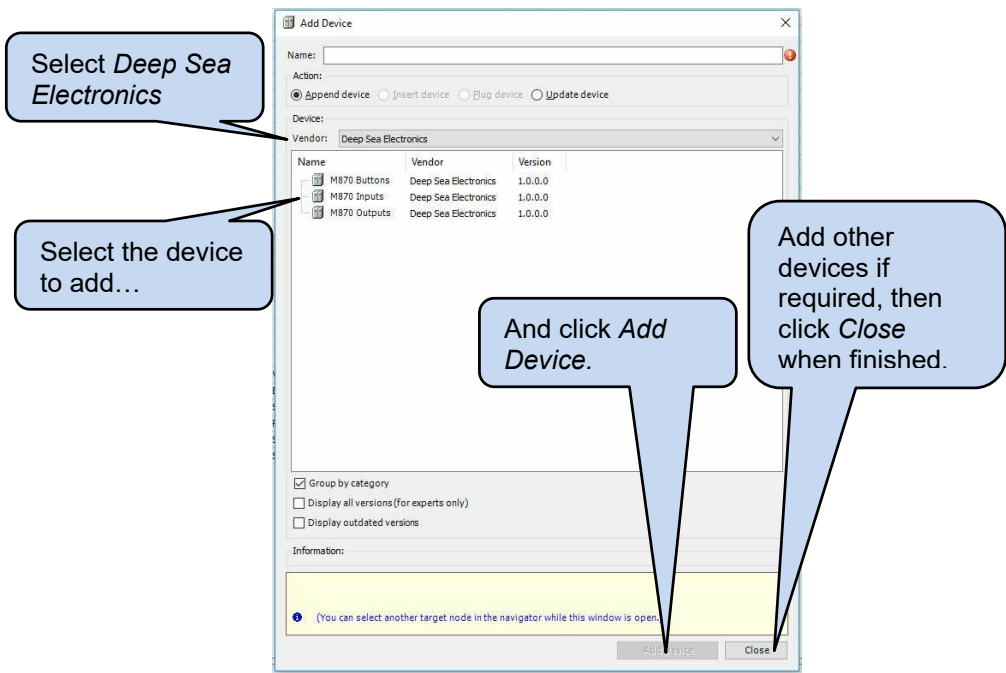
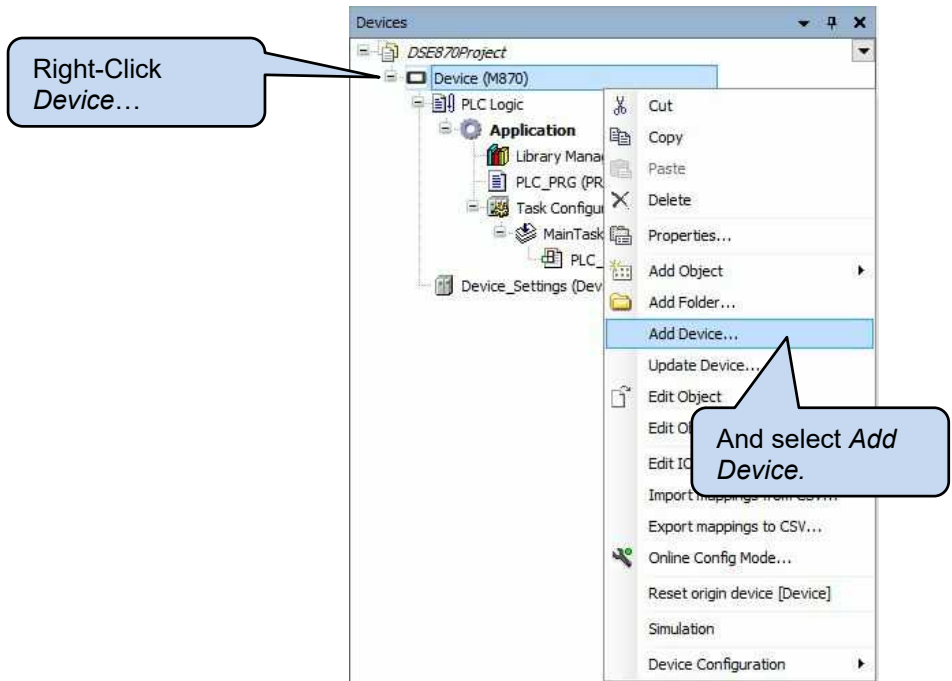
This page is used to monitor the device, and if required, to map the monitored values to program variables.

Variable	Mapping	Channel	Address	Type	Unit	Description
Device Error Code			%IW0	UINT		Error Code: Check Manual for more information
Device Temperature			%ID1	REAL	°C	Value of the Device Temperature
Battery Voltage			%ID2	DINT	mV	Battery Voltage
Supply Voltage 1			%ID3	DINT	mV	Supply Voltage 1
Ignition Switch			%IX16.0	BIT		Ignition Switch
Voltage Reference			%IW9	DINT	mV	Voltage Reference
LightSensor			%IW10	UINT	%	LightSensor
Backlight			%QW0	UINT		Backlight Level
Keyboard Backlight			%QW1	UINT		Keyboard Backlight Level
LED			%QB4			LED Configuration
LED Colour			%QB4	Enumeration of USINT		Colour of the LED when Blinking
LED Frequency			%QB5	Enumeration of USINT		LED blinking Frequency
Enable			%QX6.0	BIT		Enable LED User Control

Parameter	Description
Device Error Code	<p>A bitfield to allow the error code to be mapped to a variable. This enables the application to decode and display internal errors.</p> <p>See Section Entitled <i>M870 CODESYS ERROR CODES</i> elsewhere in this document for more details.</p>
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 <i>ECU Power</i> terminals, PINs A1 (-ve) and A7 (+ve).
Supply Voltage 1	The voltage measured at the <i>Supply Voltage 1</i> 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 <i>Active High</i> .
Ignition Switch	Contains the state of the <i>Ignition Switch</i> 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 <i>VREF</i> 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 <i>Backlight</i> according to local conditions. (0 = Dark, 100 = Maximum Brightness)
Backlight	Sets the percentage of the display LCD Backlight. (0 = minimum, 100 = maximum). Setting <i>Backlight</i> to the value 255 enables <i>Automatic Backlight Control</i> whereby brightness automatically increases as ambient light levels increase.
Keyboard Backlight	Sets the percentage of the Keyboard surround Backlight.

LED	<p>Allows configuration of the System LED. Internal system errors take over control of the LED and indicate the fault in <i>Device Error Code</i>.</p> <p>LED Colour: Use enum DSE.LEDColour_t to select one of RED, AMBER, GREEN, BLUE, MAGENTA, CYAN, WHITE</p> <p>LED 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</p>
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5.5 ADD INPUTS, OUTPUTS AND BUTTONS TO THE PROJECT



5.5.1 BUTTONS AND ROTARY ENCODER

NOTE: F10 is not fitted to ehb SMARTdisplay 870. In its place is fitted the Encoder Button (F11) and Rotary Encoder (F12).

5.5.1.1 BUTTON LOCATION



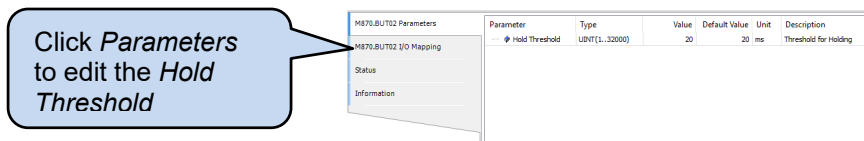
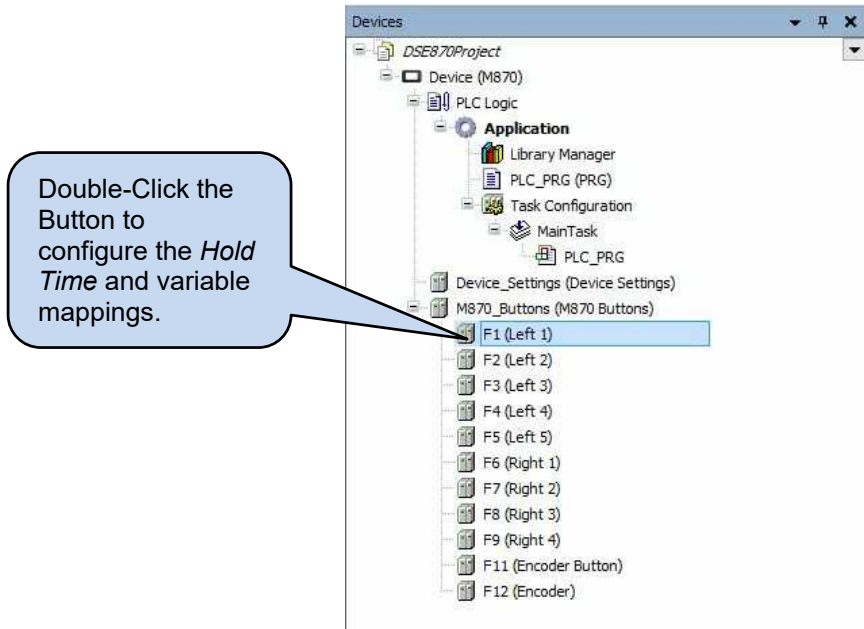
5.5.1.2 BUTTON POSITION ON THE VISUALISATION

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
F11 & F12 (top)	430

5.5.1.3 BUTTON SETTINGS (F1 TO F11)

NOTE: F10 is not fitted to ehb SMARTdisplay 870. In its place is fitted the Encoder Button (F11) and Rotary Encoder (F12).



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 <i>Hold Threshold</i> (1) or not (0).
Hold Time	The amount of time (in milliseconds) that the button has been pressed for (zero if not currently pressed).

5.5.1.4 ROTARY ENCODER (F12)

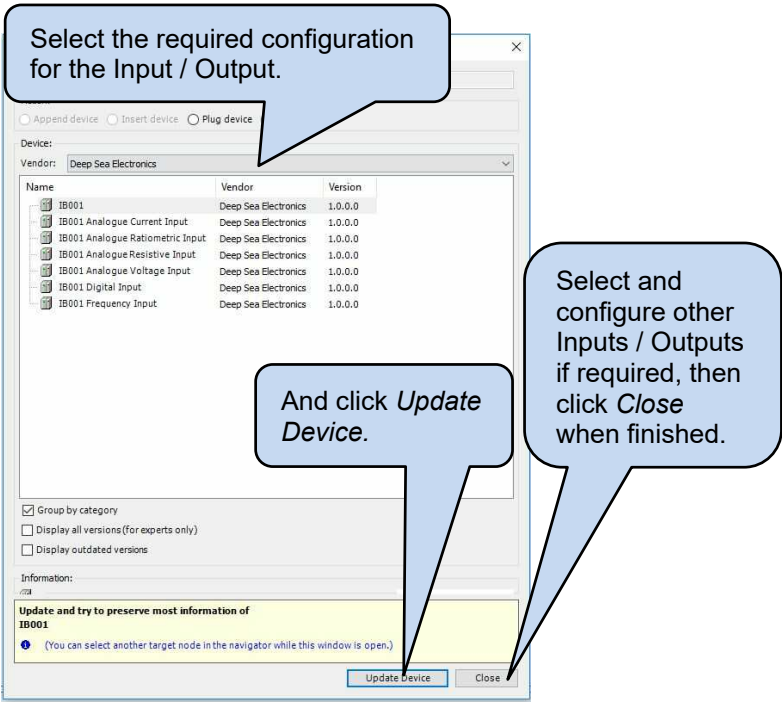
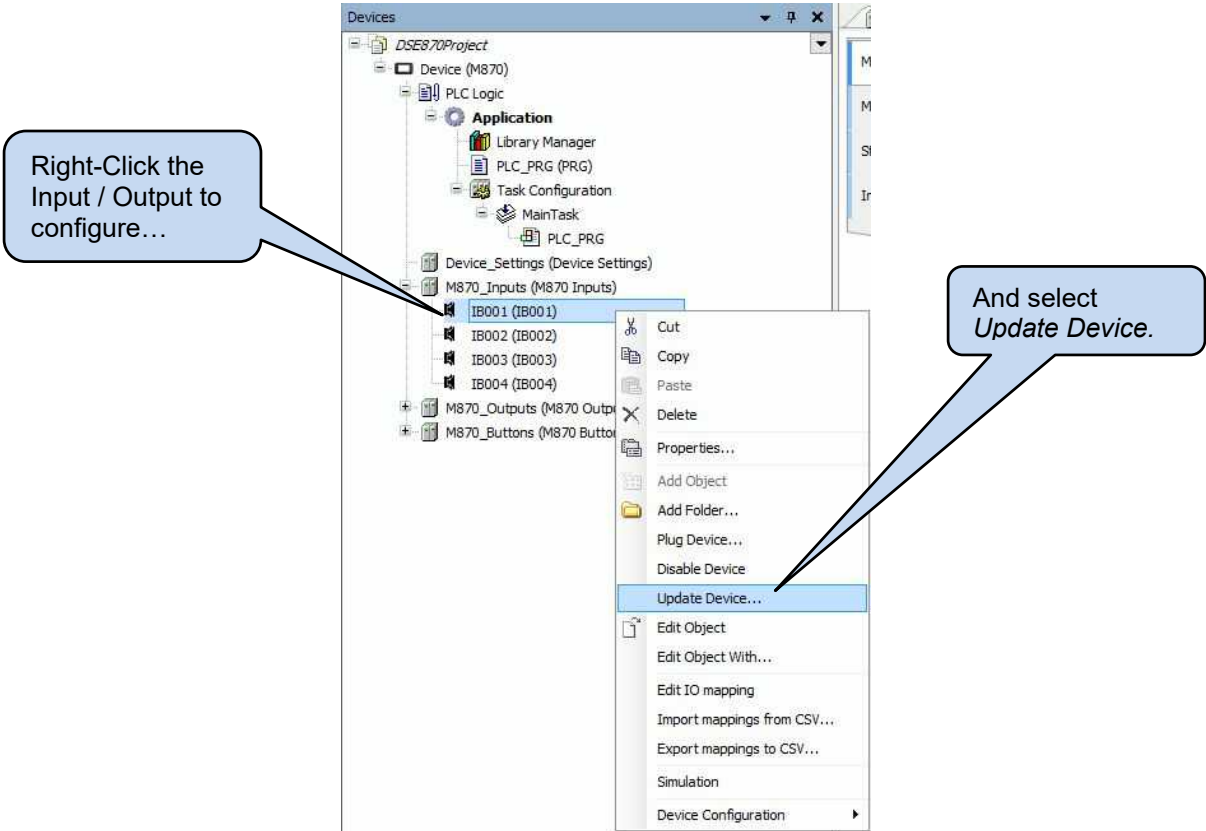
The rotary encoder may be turned to make selections and adjust values.

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

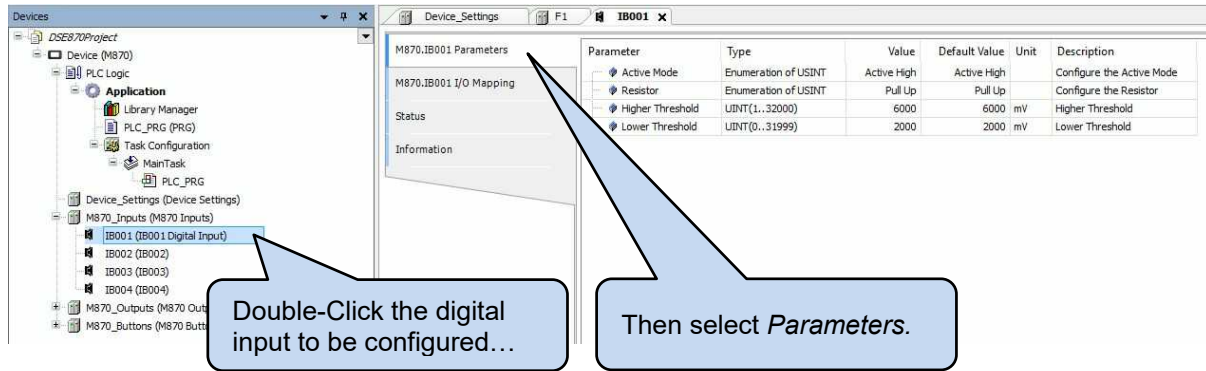
M870.BU712 I/O Mapping		Channels					
Variable	Mapping	Channel	Address	Type	Unit	Description	
Status		Encoder Data	%I011			Encoder Return Structure	
Information		Abs_Pos	%I011	INT		Absolute Encoder Position	
		Rel_Pos	%I012	INT		Relative Encoder Position	
		Movement	%I066	Enum...		Direction of Movement	

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)	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.

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. 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.

5.6 USING THE DISPLAY VISUALISATION 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.

The image consists of two screenshots of the CODESYS 3.5 software interface, illustrating the steps to add visualization to a project.

Top Screenshot: Shows the 'Devices' window with the project tree expanded to 'Application'. A right-click context menu is open, and the 'Add Object...' option is selected. A secondary menu is displayed, showing 'Visualization...' as the chosen option.

Bottom Screenshot: Shows the same project tree after the 'Visualization' component has been added. The 'Visualization' folder is now visible under the 'Application' node.

Callout 1 (Top Left): Right-Click *Application*, select *Add Object...*

Callout 2 (Top Right): Then select *Visualisation*.

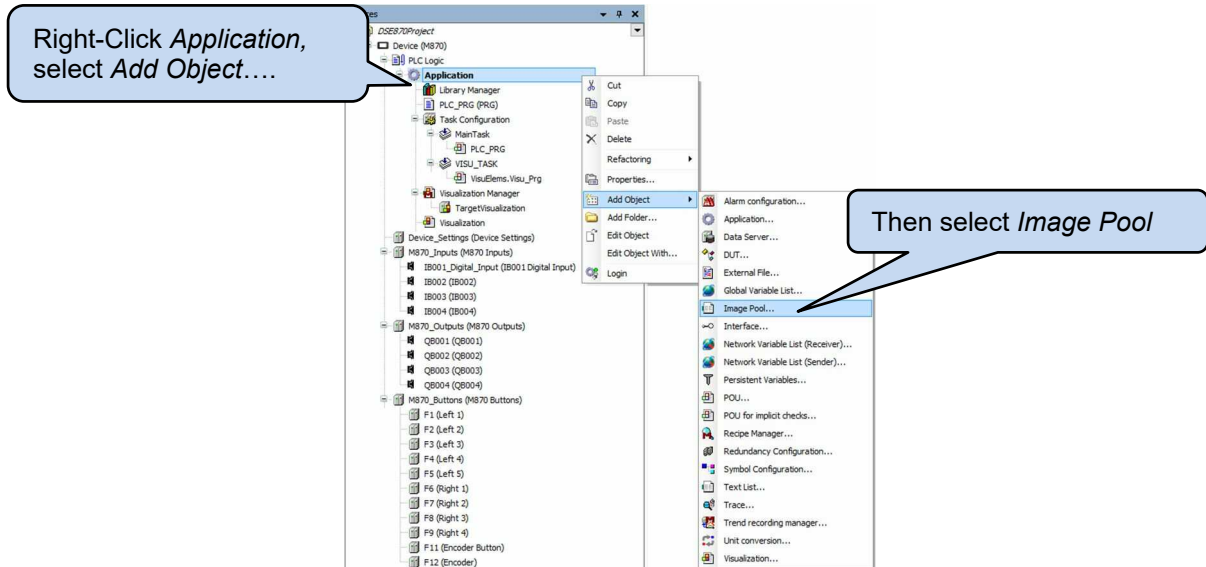
Callout 3 (Bottom Left): *Target Visualisation* shows that the *Visualisation* will be used on the *Target Device*

Callout 4 (Bottom Right): *Double-Click Visualisation* to begin editing. Refer to CODESYS online documentation for details.

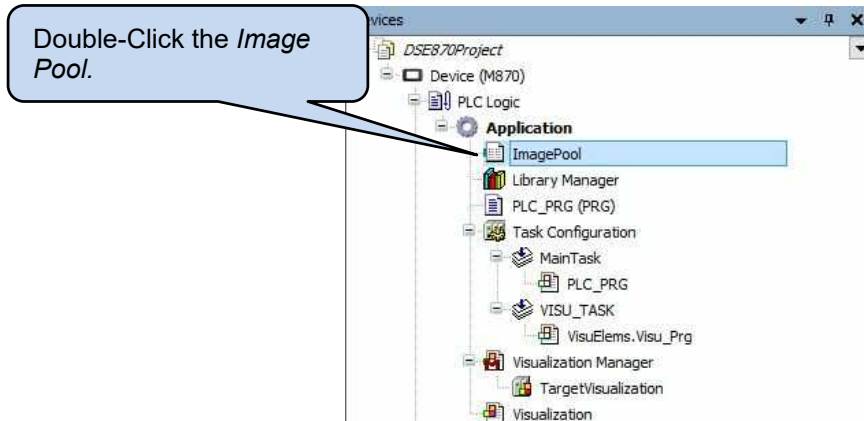
5.6.1 USING CUSTOM IMAGES ON THE DISPLAY

Many applications require custom images to be placed on the ehb SMARTdisplay 870 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...

Connecting to CODESYS

Right-Click the empty line and select *Insert Image*.

Then Double-Click the empty space under *File name* and click ...

Browse to the image on your computer...

And select how the image is stored in the project.

Click OK when done.

Example entries in the *Image Pool*.

ID	File name	Image	Link type
DSE	DSE.jpg		Embedded
CONTROL	control.PNG		Embedded

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.

Select *Image Pool* in the Visualisation Toolbox

Example entries in the *Image Pool* ready for placing on the Visualisation.

5.6.2 UTILISING THE TOUCHSCREEN AND WEBVISU®

NOTE: Touchscreen functionality is available only on ehb5496-2 and ehb5496-3. WebVisu® functionality is available only on ehb5496-3 (Only available on request).

The capacitive touchscreen of ehb5496-2 mimics the operation of a mouse within the CODESYS environment. The following examples show how to utilise this functionality within the Visualisation.

5.6.2.1 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.

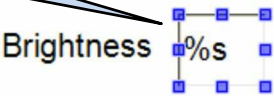
5.6.2.2 NUMBER AND TEXT ENTRY

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

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

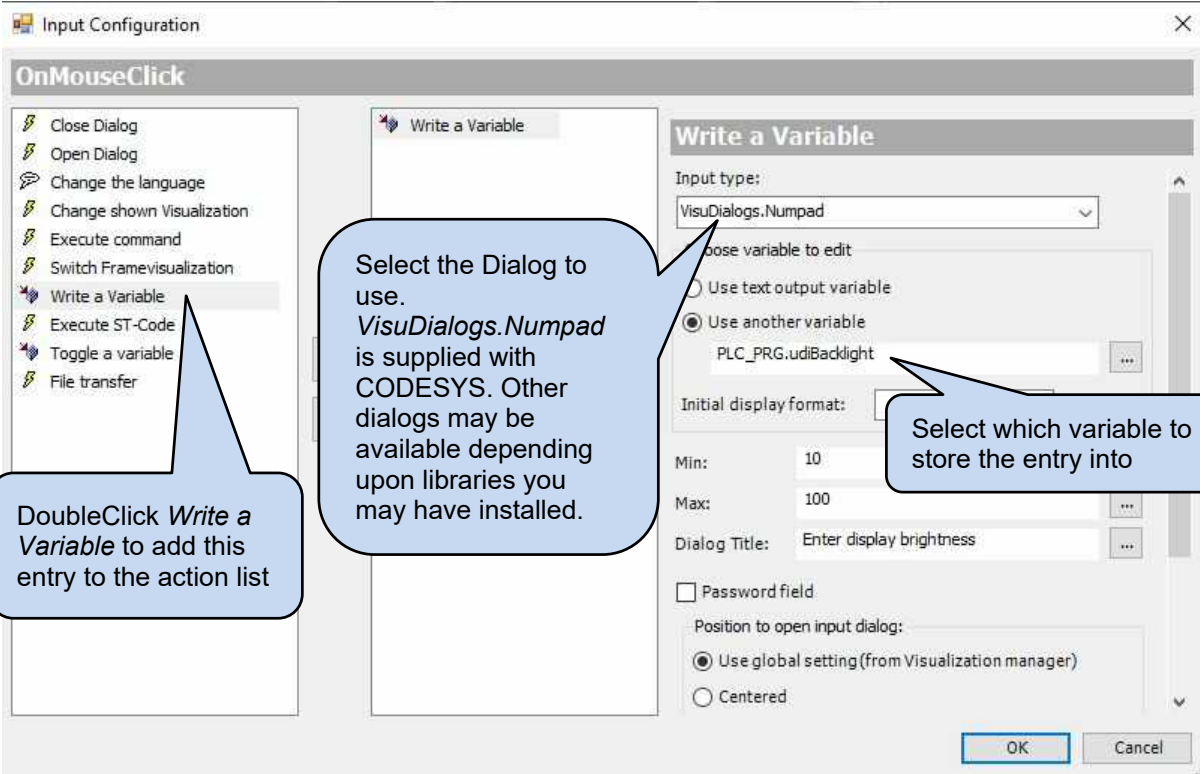
CODESYS include a simple number pad and a German layout keypad as a *Dialog* and are utilised as follows.

A *TextField* added to the Visualisation.



OnDialogClosed	Configure...
OnMouseClicked	Configure...
OnMouseDown	Configure...
OnMouseEnter	Configure...
OnMouseLeave	Configure...
OnMouseMove	Configure...

Locate *Input configuration* in the properties and click *Configure* next to *OnMouseClicked*



DoubleClick *Write a Variable* to add this entry to the action list

Select the Dialog to use. *VisuDialogs.Numpad* is supplied with CODESYS. Other dialogs may be available depending upon libraries you may have installed.

Select which variable to store the entry into

Write a Variable

Input type: VisuDialogs.Numpad

Choose variable to edit

Use text output variable

Use another variable

PLC_PRG.udlBacklight

Initial display format:

Min: 10

Max: 100

Dialog Title: Enter display brightness

Password field

Position to open input dialog:

Use global setting (from Visualization manager)


Centered

OK Cancel

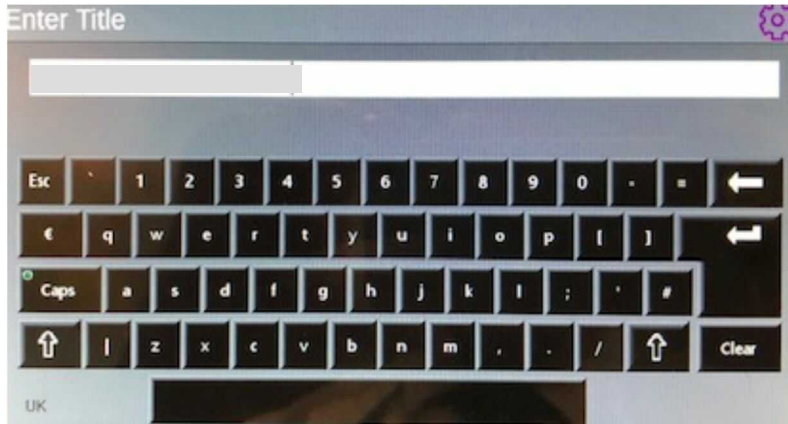
Example:

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

5.6.3 WEBVISU®

 **NOTE: WebVisu® functionality is available only on ehb SMARTdisplay 870 / Part.-No. ehb 5496-3 (only available on request)**

ehb5496-3 includes CODESYS WebVisu® functionality. This ehb SMARTdisplay 870 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 ehb SMARTdisplay 870. 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 ehb SMARTdisplay 870. For example, if the ehb SMARTdisplay IP address is 192.168.1.100 then point the web browser to <http://192.168.1.100:8080>.

5.7 USING THE CAMERA OVERLAY

▲ NOTE: ehb SMARTdisplay 870 (ehb5496-3 - only available on request) and above blends the camera overlay with CODESYS visualisation and the camera display allowing all to be visible at the same time.

Type *SD870CameraOverlaySettings*, contains options to Enable/Disable the overlay and control the transparency.

5.8 ehb SMARTdisplay 870 CAMERA OVERLAY SETTINGS

Structure used for ehb SMARTdisplay 870 camera overlay display.

Variable	Type	Description
Enable	BOOL	Turns overlay ON / OFF <input type="checkbox"/> : Camera is not displayed. <input checked="" type="checkbox"/> : Camera is displayed according to the settings of <i>Transparency</i> and <i>FileName</i> below.
Transparency	UDINT	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>▲ NOTE: This parameter is NOT applicable if <i>FileName</i> is specified.</p> </div> <p>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.</p>
FileName	STRING	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>▲ NOTE: Leave this parameter empty if an overlay image is not required. In this case, use <i>Transparency</i> to control the blending of Camera and Visualisation.</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>▲ NOTE: Ensure <i>FileName</i> is correct when used. If <i>FileName</i> does not exist, no <i>Alpha Channel</i> data is available and the camera appears at 0 % visibility (behind the CODESYS visualisation) and hence not visible.</p> </div> <p>Overlay Image Filename (png, jpg, bmp). The image should be sized to match the size of the camera display within the application. <i>Transparency</i> setting is not used, and the overlay image transparency is taken from the <i>Alpha Channel</i> value contained within the image. Some PC 'Paint' applications may call this <i>Transparency</i> or use similar wording.</p>

6 EHB SMARTDISPLAY 870 CODESYS ERROR CODES

ehb SMARTdisplay 870 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.

The screenshot shows the 'Device Settings I/O Mapping' window. A callout box points to the 'Error Code' channel, stating: "Error Code is a bit field, detailed below." The table below is a reproduction of the data shown in the screenshot.

Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value	Unit	Description
Error Code		Error Code	%IW18	UINT	120			Error Code: Check Manual for more information
Device Temperature		Device Temperature	%ID10	REAL	18.2		°C	Value of the Device Temperature
Battery Voltage		Battery Voltage	%IW22	UINT	15024		mV	Battery Voltage
Supply Voltage 1		Supply Voltage 1	%IW23	INT	247		mV	Supply Voltage 1
Supply Voltage 2		Supply Voltage 2	%IW24	INT	274		mV	Supply Voltage 2
Supply Voltage 3		Supply Voltage 3	%IW25	INT	185		mV	Supply Voltage 3
Supply Voltage 4		Supply Voltage 4	%IW26	INT	301		mV	Supply Voltage 4
Ignition Switch		Ignition Switch	%DX54.0	BIT	TRUE			Ignition Switch
Program Enable		Program Enable	%DX54.1	BIT	TRUE			Program Enable
Voltage Reference		Voltage Reference	%IW28	INT	-1217		mV	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*.

6.1 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

6.2 ANALOGUE INPUTS

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

6.3 DIGITAL INPUTS

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

6.4 DIGITAL OUTPUTS

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

7 HARNESSES

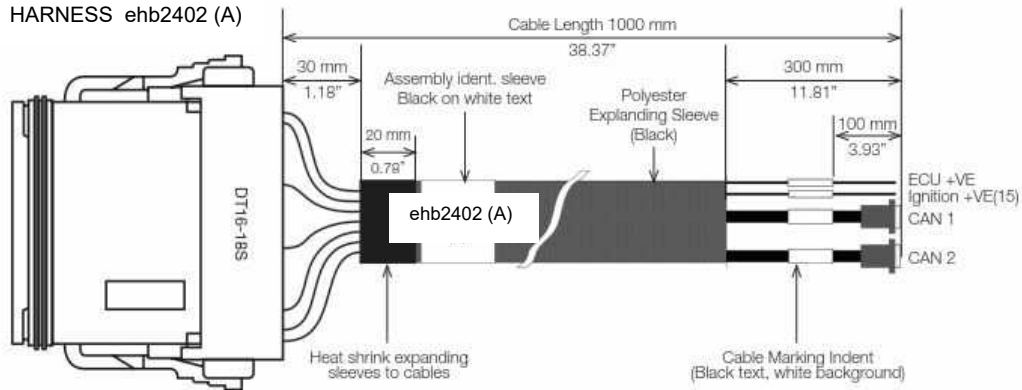
Description	ehb Part	Manufacture Part
ehb SMARTdisplay 870 harness A	ehb2402	N/A
ehb SMARTdisplay 870 harness C	ehb2403	N/A
ehb SMARTdisplay 870 Connector Harness Kit (Set of 2)	ehb5621	N/A
M12 to Ethernet Cable	M11350	N/A
M12 to USB Cable	M11351	N/A
Panel Mounting Sealing Gasket	xxxxxx	N/A

7.1 ehb SMARTdisplay 870 CONNECTOR HARNESS KIT (ehb5621)

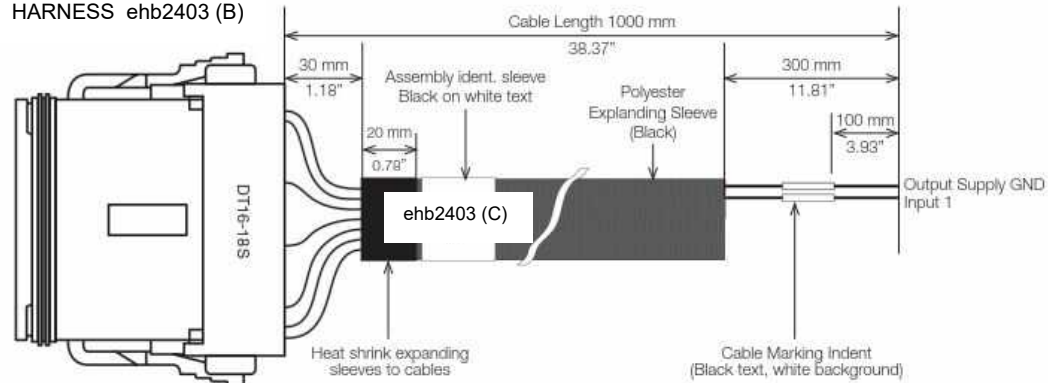
ehb Part ehb5621 consists of two cables as listed below. Connectors are fitted at one end, with cable marking to identify the wires at the other end.

	Connector A	Connector C
Assembly Ident	ZUB0004	ZUB0005
DEUTSCH Connector	DT16-18SA-K004	DT16-18SC-K004
No of Connections	18	18
Wire size	0.5 mm ² (AWG 20)	0.5 mm ² (AWG 20)
Wire Colour	Black	Black
Wire Idents	1 to 18	1 to 18

WIRING HARNESS ehb2402 (A)



WIRING HARNESS ehb2403 (B)



8 IMPORTANT NOTES FOR USE

- How to use** The device must only be operated with the supplies provided.
Use a mild cleaning agent to clean the device.
Do not insert any objects that are not designed for the specific purpose into the openings of the unit, as this may cause problems in the electrical components.
When operating the device, always observe general accident prevention regulations.
- Safety** Do not operate the ehb SMARTdisplay 870 device within range of strong electromagnetic fields. Observe the temperature specifications.
- Storage** ehb SMARTdisplay 870 devices that are not being used must be stored as described in the operating specifications.
- Installation** During the installation of the device follow the directions of the manufacturers of plugs and wire harnesses.
- Shipping** When shipping, equipment must always be shipped in the original packaging or in correspondingly sturdy packaging.
Use of unsuitable packaging constitutes negligence, hence rendering null and void any claim to repairs under warranty.
- Maintenance** The ehb SMARTdisplay 870 requires no maintenance throughout its entire service life and requires no special care.
- Opening the device** The ehb SMARTdisplay 870 contains no parts that can be serviced, replaced or repaired by customers or third-party maintenance personnel.
The ehb SMARTdisplay 870 is sealed to protect against any unauthorised opening. Please note that unauthorised opening will destroy the device.



CAUTION

Do not use high-pressure cleaning equipment to clean the device. Service personnel are to be fully instructed that high-pressure cleaners will damage the device and void the warranty.

Display



There is no warranty in case of improper operation (e.g. use of knife or screw driver on Display).

A broken display is under no circumstances covered by warranty.

9 REPAIR OF DEVICES

If a repair does become necessary, please ship the device to:

**ehb electronics gmbh
Hans-Böckler-Str. 20
30851 Langenhagen, Germany**

Please always be sure to include a written description of the problem. This will considerably simplify troubleshooting for ehb electronics gmbh service department and allow the device to be returned more quickly. Or use our online service for returning the unit: www.ehbservice.de

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



11 MISC

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 ehb Technical Support for additional information.

12 DOCUMENT INFORMATION, HISTORY

Project:	ehb SMARTdisplay 870
Document type:	Technical documentation
Version:	ISSUE: 1
Created on:	2018-10-10
Author:	Tony

Version:	Editing:	on:	by:
Issue 1	Initial release of document	2018-10-10	Tony
Issue 1.1	Changed some specification items.	./.	Tony
Issue 2.0	Changes to support ehb SMARTdisplay 870 V2 firmware.	./.	Tony
Issue 2.1	Added Misc section.	./.	Tony
Issue 3.0	Added features to support ehb SMARTdisplay 870 V3 firmware including Format options and new Camera Overlay support.	./.	Tony
Issue 4.0	Added Touchscreen to cover ehb5496-2 variant. Added WebVisu® to cover ehb5496-3 variant.	./.	Tony
Issue 4.1	Added Tightening Torque for M10 connections. Corrected USB socket pinout Added more detail on Screen Rotation	./.	Tony
Issue 4.1	Adaption Copyedit	2020-11-11 2020-11-11	Ger, Kra, Hag
Issue 4.1	Item 7.1, Plug set ZUB0004 + ZUB0005 added	2021-02-02	Kra/Hag

13 IMPRINT



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