Operator Manual

ehb SMARTdisplay 835

ehb Version 1.0

ehb SMARTdisplay 835 Operator Manual

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1 INTRODUCTION

This document details the operation and setup requirements of the ehb SMARTdisplay 835.

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 operators and machinery.

A robust moulded case designed for fascia (panel) mounting houses the module. Connections are via locking plug and socket.

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 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 835 to control the machine it is connected to. The Application within the ehb SMARTdisplay 835 is designed and provided by the manufacturer of the complete machine (OEM).
Bootloader	The Bootloader is the program within the ehb SMARTdisplay 835 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	Integrated Development Environment for programming controller applications according to the international industrial standard IEC 61131-3. ehb SMARTdisplay 835 supports CODESYS V3.5
ehb	ehb electronics gmbh, www.ehb-electronics gmbh
ECU	Electronic Control Unit. For example, the ehb SMARTdisplay 835 device.
EMC	Electromagnetic Compatibility. Part of the CE compliance testing for the device and is measure of the level of electromagnetic disturbance the device causes to other nearby electrical devices.
Firmware	The Firmware of the ehb SMARTdisplay 835 is the Operating System of the ehb SMARTdisplay 835 that reads and executes the Application program.
FSD	Full Scale Deflection. For example, 0 mA to 20 mA is the Full Scale Deflection of a current sink input.
I/O	Input / Output. For example, "The I/O is taken out to an external terminal strip in the user panel".
IDE	Integrated Development Environment. For example, the CODESYS V3.5 application that runs on the host PC is an IDE.
Ixyyy	An Input, where x is the connector and yyy is the input number. For example, IA003 means Input 3 on Connector A.
J1939	High Level CAN specification dictated by SAE and used by many Engine ECUs and other CAN devices.
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.
OEM	Original Equipment Manufacturer. The manufacturer of the overall machine that the ehb series device is a part of. The OEM is also responsible for programming the device though they may subcontract this to System Integrators or Programming Houses.

Term	Description
PCAN-USB	USB to CAN converter interface for Windows™ PCs. See section entitled *Maintenance, Spares, Repair and Servicing* elsewhere in this document for part number details.
PLC	Programmable Logic Controller. Industrial computer used primarily for the automation of electromechanical machinery.
Pin	A male or female pin connection in a housing (plug or socket).
Qxyyy	An Output, where x is the connector and yyy is the output number. For example, QA002 means Output 2 on Connector C.
SAE	Society of Automotive Engineers (USA)

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 835 Datasheet
./.	ehb SMARTdisplay 835 Installation Instructions

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 customer is responsible for performing risk analysis of the mobile working machine and determining the possible safety related functions. The user is responsible for the safe function of the application programs created. If necessary, they must additionally carry out an approval test by corresponding supervisory and test organisations according to the national regulations.

- All connectors must be unplugged from the electronics during electrical welding and painting operations.

1.4.2   INSTALLATION NOTES

- Follow the instructions of the connector manufacturer, specifically with respect to preventing water from entering the device. See Section entitled *Cables, Connectors, Harnesses and Spare Parts* for details of ehb Part Numbers.

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

2 SPECIFICATIONS

2.1 PROCESSOR

Description	Specification
Type	STM32h743
Speed	400 MHz

2.2 MEMORY

Description	Specification
Flash	8 MB available for user CODESYS application
RAM	1 MB total 288 kB for application variables.
Non-Volatile FRAM	16 kB for device settings and application persistent variables

2.3 DC SUPPLY

Description	Specification
Operating Voltage (Pin A7)	8 V to 32 V
Maximum Current (Full Backlight, no External Loads)	<80 mA at 24 V <150 mA at 12 V

2.3.1 FUSING

Description	Specification
DC Supply (Pin A7) Supplies ehb SMARTdisplay835 and High Current Outputs Fuse as Required by Output Loads (Pins A14, A15, A16)	3 A Min (to supply SMARTdisplay835)

2.4 ENVIRONMENTAL

Description	Specification
Operating Temperature	-40 ºC to +85 ºC (-40 ºF to 185 ºF)
Storage Temperature	-40 ºC to +85 ºC (-40 ºF to 185 ºF)
Degrees of Protection Provided by Enclosure (With All Mating Connectors Fitted)	IP67 (NEMA 6)

2.5 USER INTERFACE

2.5.1 CONTROLS

Description	Specification
Push Buttons	5

2.5.2 DISPLAY

Description	Specification
Size (Across Diagonal)	88.9 mm (3.5")
Size (W x H)	320 px X 240 px
Type	Optically Bonded TFT
Lifetime	> 30,000 hours
Colour	24 bit

2.6   INPUTS

2.6.1   DIGITAL INPUTS

2.6.1.1   DIGITAL

Description	Specification
Applicable Pins	Pins A5, A6, A12, A18
Minimum Voltage For High Level	Configurable
Maximum Voltage For Low Level	Configurable

2.6.2   ANALOGUE INPUTS

2.6.2.1   VOLTAGE

Description	Specification
Applicable Pins	Pins A5, A6, A12, A18
Range	0 V to 10 V
Input Resistance	>=7.5 kΩ
Sampling Rate	200 Hz

Voltage Measurement resolution and accuracy

Configured Range	Resolution (10 bits)	Accuracy (±1%) FSD
0 V to 10 V	0.003 V	±0.1 V

2.6.2.2 CURRENT

Description	Specification
Applicable Pins	Pins A5, A6, A12, A18
Configurable Ranges	0 mA to 20 mA
	4 mA to 20 mA
Input Type	Current sink only
Input Sink Resistance	150 Ω ± 1%
Sampling Rate	200 Hz
Resolution	12 bits
Accuracy (± 1 % Full Scale Deflection)	0.2 mA

2.6.2.3 RESISTIVE

Description	Specification
Applicable Pins	Pins A5, A6, A12, A18
Measurement Range	0 Ω to 3400 Ω
Measurement Source Voltage	12 V maximum
Measurement Source Current	3 mA
Sampling Rate	200 Hz
Resolution	12 bits
Accuracy (± 1 % Full Scale Deflection)	34 Ω

2.7 OUTPUTS

2.7.1 POSITIVE SWITCHING

Description	Specification
Applicable Pins	Pins A14, A15, A16
Maximum Current	1 A
Digital Output Active Low 'ON' State Maximum Voltage at Rated Current	<100 mV
Digital Output Active Low 'OFF' State Leakage Current	<10 µA at 24 V output supply

2.7.2 VREF OUTPUT

Description	Specification
Applicable Pins	Pin A17
Voltage	5 V / 10 V selectable
Maximum Current	100 mA
Voltage Accuracy	±5 %

2.8   COMMUNICATIONS

2.8.1   CAN

⚠NOTE: Software configurable termination resistor is internally fitted. 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	1
Supported Protocols	J1939 Raw CAN
Supported Baud Rates (Factory Setting is 250 kbit/s)	50 kbit/s, 100 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s
Internal Termination Resistor (Factory Setting is OFF)	Configurable between *On* and *Off* using *Device Settings* from within CODESYS or by user application code using *DSE Standard* library (namespace DSE).

3   INSTALLATION

3.1   DIMENSIONS AND MOUNTING

3.1.1   DIMENSIONS
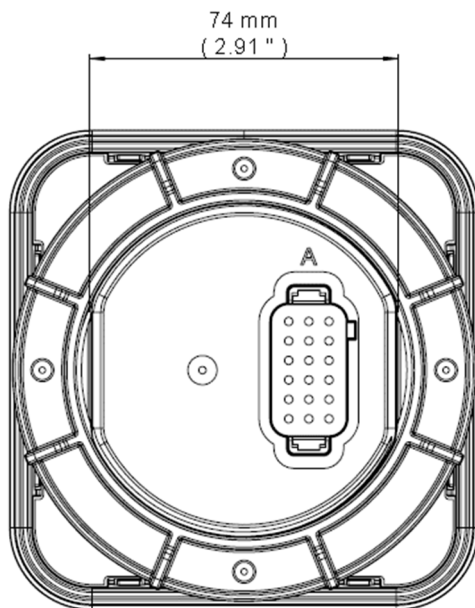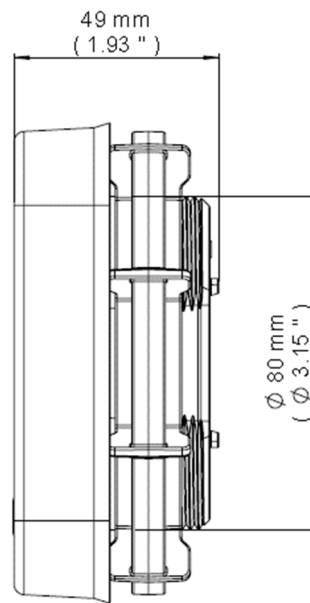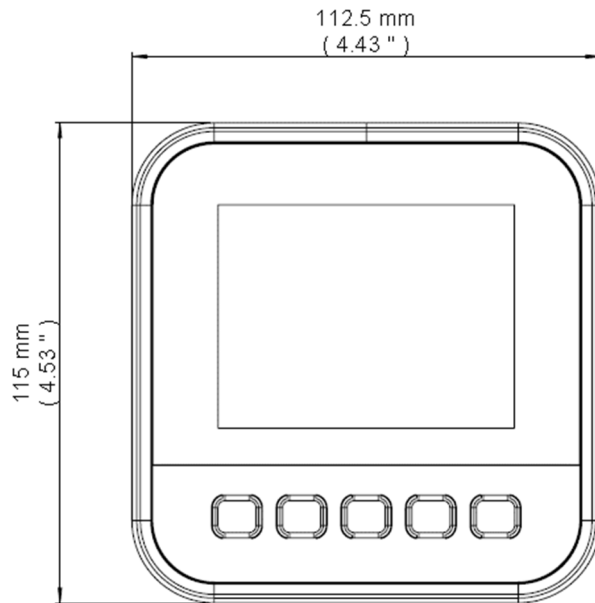
3.1.2   PANEL CUTOUT

82 mm (3.23 ") hole is suitable. Maximum Panel Thickness: 6 mm (0.24 ")
If a punch or milling machine is available, adding 'flats' at 74 mm (2.91 ") spacing serves to prevent rotation of the device in the panel cutout.
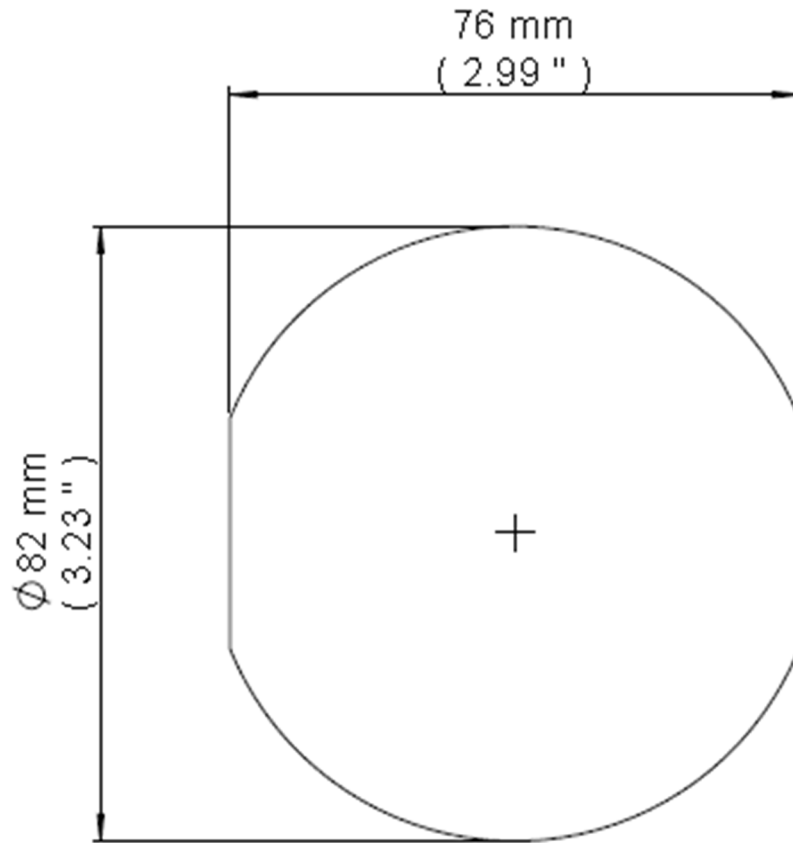
3.1.3   WEIGHT

<1 kg   (<35.3 oz)

3.1.4   FIXING

> ⚠ **NOTE: In conditions of excessive vibration, mount the housing on suitable anti-vibration mountings.**

The device is held into the panel fascia using the large nut provided.
- Place the controller into the panel aperture.
- Attached the supplied fixing nut and hand tighten to provide adequate fixing (see below).
- Attach the connector plug (Plug A) and push home to click into place.

3.1.4.1   TORQUE SETTING OF FIXING NUT

8 Nm   (5.9 ft-lb)

3.2   APPLICABLE STANDARDS

Standard	Description
EN 60068-2-1 (Minimum temperature)	-40 °C (-40 °F)
EN 60068-2-2 (Maximum temperature)	+85 °C (185 °F)
EN 61010	Safety requirements for electrical equipment for measurement, control, and laboratory use
EN 61000-6-2	EMC Generic Immunity Standard (Industrial)
EN 61000-6-4	EMC Generic Emission Standard (Industrial)
EN 60529 (Degrees of protection provided by enclosures)	IP67 front and rear (with mating connectors)

In line with our policy of continual development, ehb reserve the right to change specification without notice.

3.2.1 ENCLOSURE CLASSIFICATIONS

3.2.1.1 IP CLASSIFICATIONS

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

The modules specification under *EN 60529 Degrees of protection provided by enclosures* is IP67 as below.

First Digit		**Second Digit**	
Protection against contact and ingress of solid objects		**Protection against ingress of water**	
0	No protection	0	No protection
1	Protected against ingress solid objects with a diameter of more than 50 mm. No protection against deliberate access, e.g. with a hand, but large surfaces of the body are prevented from approach.	1	Protection against dripping water falling vertically. No harmful effect must be produced (vertically falling drops).
2	Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach.	2	Protection against dripping water falling vertically. There must be no harmful effect when the equipment (enclosure) is tilted at an angle up to 15° from its normal position (drops falling at an angle).
3	Protected against ingress of solid objects with a diameter of more than 2.5 mm. Tools, wires etc. with a thickness of more than 2.5 mm are prevented from approach.	3	Protection against water falling at any angle up to 60° from the vertical. There must be no harmful effect (spray water).
4	Protected against ingress of solid objects with a diameter of more than 1 mm. Tools, wires etc. with a thickness of more than 1 mm are prevented from approach.	4	Protection against water splashed against the equipment (enclosure) from any direction. There must be no harmful effect (splashing water).
5	Protected against harmful dust deposits. Ingress of dust is not totally prevented but the dust must not enter in sufficient quantity to interface with satisfactory operation of the equipment. Complete protection against contact.	5	Protection against water projected from a nozzle against the equipment (enclosure) from any direction. There must be no harmful effect (water jet).
6	**Protection against ingress of dust (dust tight). Complete protection against contact.**	6	Protection against heavy seas or powerful water jets. Water must not enter the equipment (enclosure) in harmful quantities (splashing over).
		7	**No ingress of water in harmful quantity when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 m of submersion)**

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.

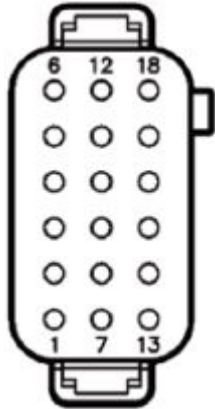| Pin	Description	Comments	Recommended Fuse Size
A7	ECU Supply	Supplies ehb SMARTdisplay 835 CPU and Outputs	3 A to 10 A Max

3.4   USER CONNECTIONS

⚠️**NOTE: For suitable connection looms from ehb, see sections entitled ehb SMARTdisplay 835 *Connector Harness* and ehb SMARTdisplay 835 *Configuration Harness*.**

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

⚠️**NOTE: Terminals A11, and A13 are internally connected to A1.**

	Pin	Description	Notes
	A1	DC Plant Supply Input (Negative)	Battery negative supply for the device.
	A2	CAN SCR	Connect to Engine ECU CAN SCR
	A3	CAN L (in)	Connect to Engine ECU CAN L
	A4	CAN H (in)	Connect to Engine ECU CAN L
	A5	Input D	Analogue / Digital input D
	A6	Input A	Analogue / Digital input A
	A7	DC Plant Supply input (Positive)	Battery positive supply for the device.
	A8	CAN SCR	Optional to connect to additional CAN devices. Internally connected to A2
	A9	CAN L (out)	Optional to connect to additional CAN devices. Internally connected to A3
	A10	CAN H (out)	Optional to connect to additional CAN devices. Internally connected to A4
	A11	Input Common GND	Provides ground reference to all inputs (A5, A6, A12, A18)
	A12	Input B	Analogue / Digital input B
	A13	VREF Negative	Negative connection for the VREF Output voltage.
	A14	Output A	Max 1 A at the voltage applied to A1
	A15	Output B	Max 1 A at the voltage applied to A1
	A16	Output C	Max 1 A at the voltage applied to A1
	A17	VREF Positive OUT	Positive connection for the VREF Output voltage.
	A18	Input C	Analogue / Digital input C

3.5 TYPICAL WIRING DIAGRAM

⚠️**NOTE: As systems have differing requirements, these diagrams show only a typical system and do not intend to show a complete system.**

⚠️**NOTE: This diagram shows connection to a Negative Earth system. For Positive Earth and Floating Earth systems, see section entitled *Earth Systems* elsewhere in this document.**

⚠️**NOTE: Screened 120 Ω impedance cable specified for use with CAN must be used for the CAN links.**
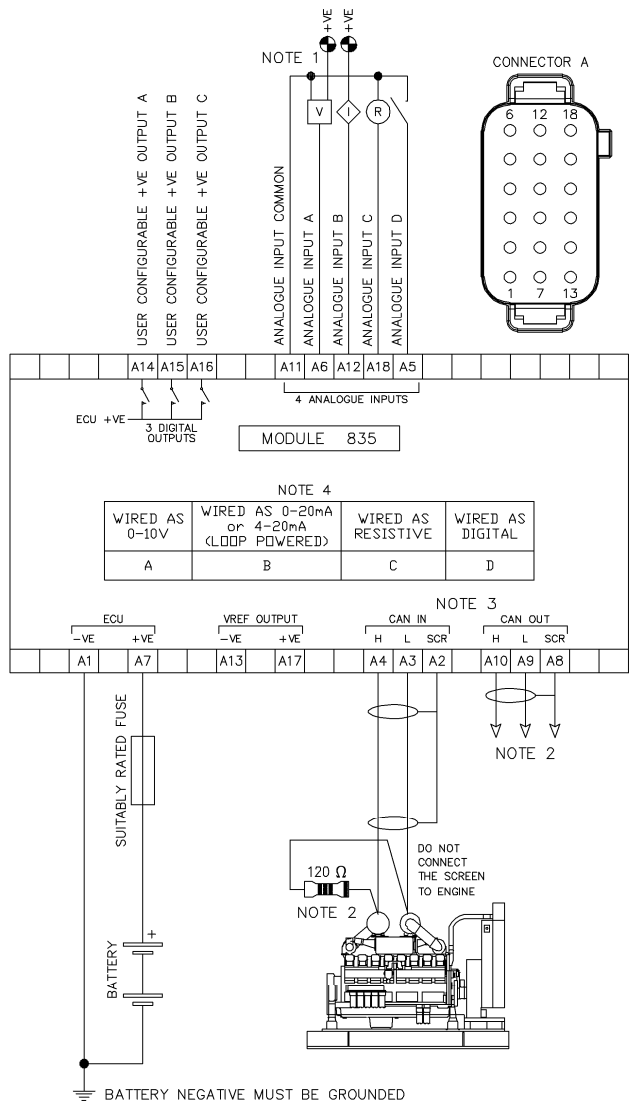
NOTE 1. ANALOGUE INPUT COMMON MUST NOT BE GROUNDED, IT IS LINKED INTERNALLY TO TERMINAL A1.

NOTE 2. 120 Ω TERMINATING RESISTOR MAY BE REQUIRED EXTERNALLY, SEE EXTERNAL EQUIPMENT MANUFACTURERS LITERATURE FOR FURTHER DETAILS.

NOTE 3. CAN IN AND CAN OUT ARE LINKED INTERNALLY.

NOTE 4. ANALOGUE INPUTS CAN BE CONFIGURED AS EITHER A DIGITAL INPUT, RESISTIVE INPUT, 0-10V INPUT, 0-20mA, 4-20mA INPUT, OR ANY COMBINATION OF THE ABOVE.

3.5.1   EARTH SYSTEMS

3.5.1.1   NEGATIVE EARTH

The typical wiring diagrams located within this document show connections for a negative earth system (the battery negative connects to Earth).

3.5.1.2   POSITIVE EARTH

When using a DSE module with a Positive Earth System (the battery positive connects to Earth), the following points must be followed:

Follow the typical wiring diagram as normal for all sections *except* the earth points.
All points shown as Earth on the typical wiring diagram should connect to *battery negative* (not earth).

3.5.1.3   FLOATING EARTH

Where neither the battery positive or battery negative terminals are connected to earth the following points must to be followed:

Follow the typical wiring diagram as normal for all sections *except* the earth points.
All points shown as Earth on the typical wiring diagram should connect to *battery negative* (not earth).

3.5.2 TYPICAL ARRANGEMENT OF CAN LINK

⚠️**NOTE: As systems have differing requirements, these diagrams show only a typical system and do not intend to show a complete system.**

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

⚠️**NOTE: A termination resistor MUST be fitted to the first and last unit on the CAN link. An internal 120 Ω termination resistor is fitted. This is configurable within CODESYS** *Device Settings.*

The following image shows a typical connection between the ehb SMARTdisplay 835 and an engine ECU. Additionally, an *Engine Controller* is included to show how to connect another device on the same CAN.

While many applications require connection to an engine ECU or other CAN device this is not a requirement for use of the ehb SMARTdisplay 835 and is included as an example of one typical use only.
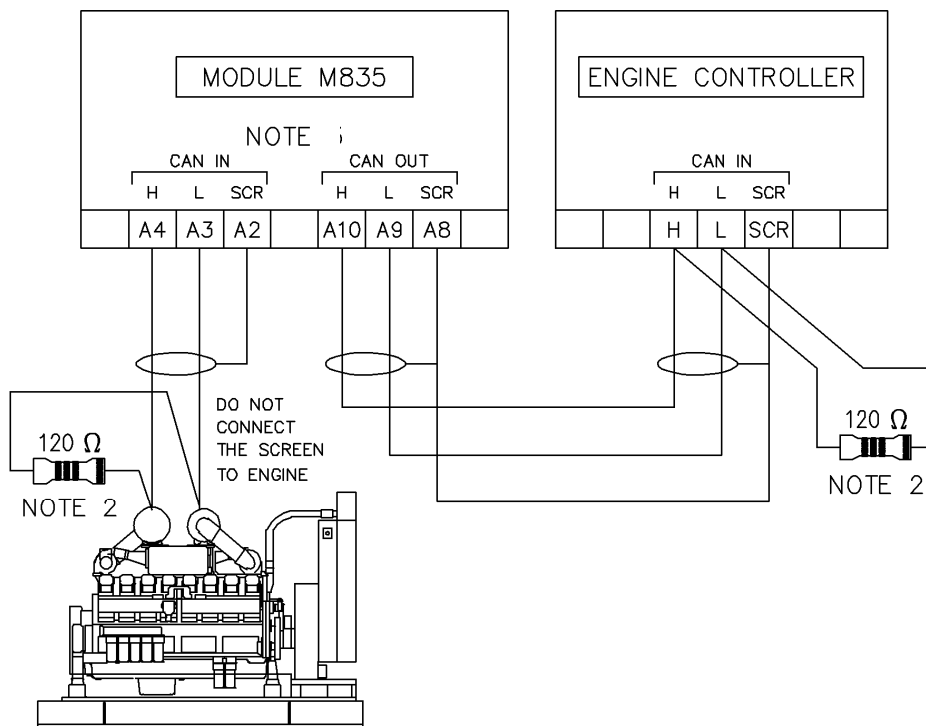
NOTE 2. 120 Ω TERMINATING RESISTOR MAY BE REQUIRED EXTERNALLY, SEE EXTERNAL EQUIPMENT MANUFACTURERS LITERATURE FOR FURTHER DETAILS.

NOTE 3. CAN IN AND CAN OUT ARE LINKED INTERNALLY.

4 CONNECTING TO CODESYS

⚠️**NOTE: ehb SMARTdisplay 835 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: For programming and configuration supply PCAN-USB IPEH-002021 and a 120 Ω termination resistor for PCAN MiniTerm IPEK-003002-Mini from Peak Systems (https://www.peak-system.com). Contact info@ehb-electronics.de**

ehb SMARTdisplay 835 communicates with, and is programmed by, the CODESYS V3.5 Integrated Development Environment (IDE).

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

4.1 INSTALL THE PCAN DRIVER

Before proceeding you must install the PCAN Driver supplied with the PCAN Interface, or downloaded from https://www.peak-system.com/
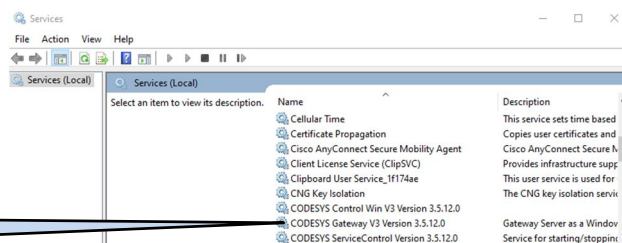
4.2 SETUP THE CODESYS GATEWAY

CODESYS Gateway requires configuration to add CAN support.
ehb electronics gmbh provide the necessary configuration within *Gateway.cfg,* that is available at http://www.ehb-electronics.de. This file must be downloaded and used to replace the existing file already in use on the PC where CODESSYS is installed.
The location of the file varies depending upon your PC setup. Where only one version CODESYS IDE is installed, this is within the *GatewayPLC* folder of that installation. For PCs that have multiple CODESYS IDE versions installed, use the below method to locate the file.

4.2.1 LOCATING WHERE TO STORE THE GATEWAY CONFIGURATION FILE

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

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

  CODESYS Gateway

Continued Overleaf…

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

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

Right-Click the CODESYS Gateway icon to Stop and Start the gateway.
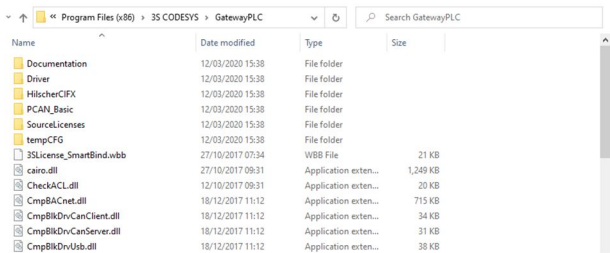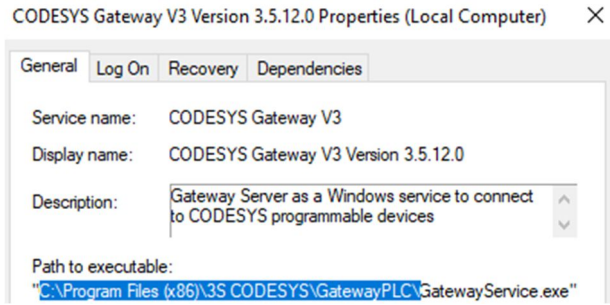
Click the UP arrow at the bottom right of Windows™ to access the system tray icons.
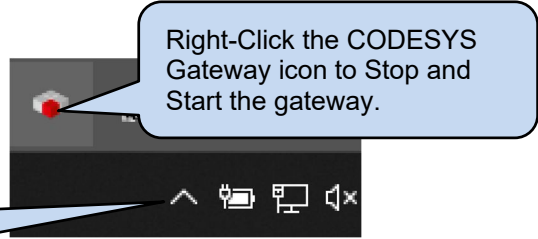
4.3 START NEW PROJECT

To begin, start a new project as shown.

Within CODESYS V3.5, select File | New Project

Select Standard Project

Then click OK

Choose M835

And your preferred language for PLC_PRG

Then click OK

4.4   CAN CONNECTION

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

⚠️**NOTE: For programming and configuration supply PCAN-USB IPEH-002021 and a 120 Ω termination resistor for PCAN MiniTerm IPEK-003002-Mini from Peak Systems (https://www.peak-system.com). Contact info@ehb-electronics.de**

⚠️**NOTE: Ensure the Gateway is set to operate the CAN port at the same rate that the ehb SMARTdisplay 835 is set to. Factory Setting is 250 kbit/s though this may have been changed by the OEM or system programmer.**

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

Double-Click *Device…*

…then click *Communication Settings*

Click *Gateway* and then Configured the Local Gateway to check the CAN settings of the Gateway.

…then click *Scan Network*
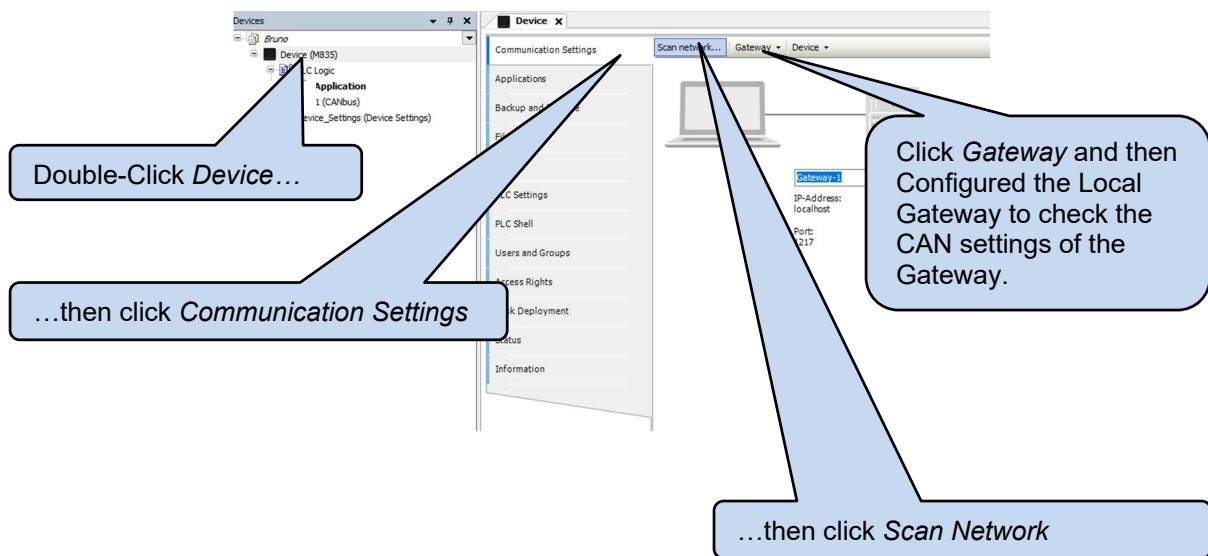
4.4.1 CONFIGURE THE LOCAL GATEWAY

⚠️**NOTE: If *CAN Client* is not visible within the *Gateway Configuration* then CODESYS is not correctly setup for use with the CAN device. Ensure the latest SD 835 *CODESYS PACKAGE* is installed. For additional support, contact info@ehb-electronics.de**

⚠️**NOTE: Where the baud rate of the device is not known, try all available options. Where no connection is made, use Servicetool PC Software to set the device back to factory settings (250 kbit/s). Contact info@ehb-electronics.de**

⚠️**NOTE: After changing *Gateway Configuration* settings, the gateway must be stopped and restarted before changes take effect.**
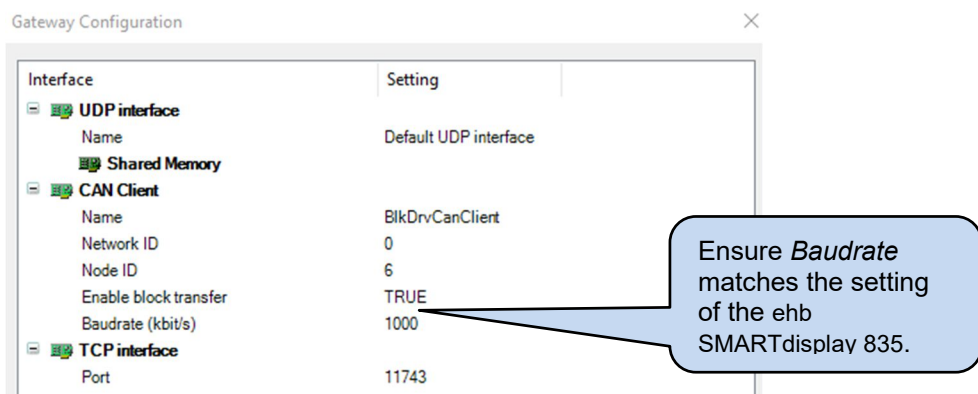
4.4.1.1 STOPPING AND STARTING THE GATEWAY

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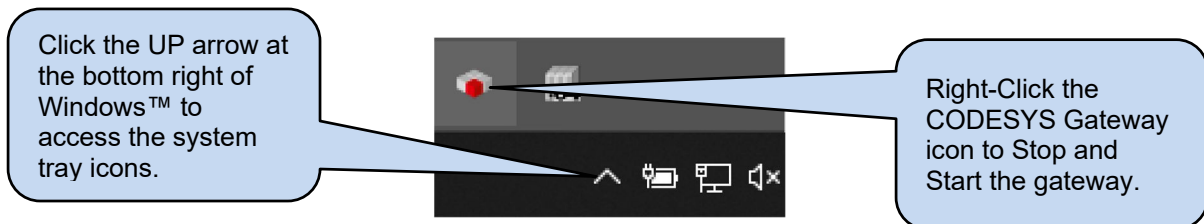
4.4.2 SCAN NETWORK

Select Device ✕

Select the network path to the controller:

⊟ Gateway-1
     M835-01 [0366.9008]

> **Devices found on the CAN network.**

> **Details about the selected device.**

Device Name:
M835-01

Device Address:
0366.9008

Block driver:
CAN Server

Number of channels:
1

Target ID:
1102 0005

Target Name:
M835-01 (Build 3)

Target Type:
4096

Target Vendor:
Deep Sea Electronics

Target Version:
1.0.0.0

Scan network

Wink

> ***Wink*** **is not supported by ehb SMARTdisplay 835.**

OK   Cancel

> **Successful connection is shown by the green icon.**

Scan network... | Gateway ▾ | Device ▾

Gateway

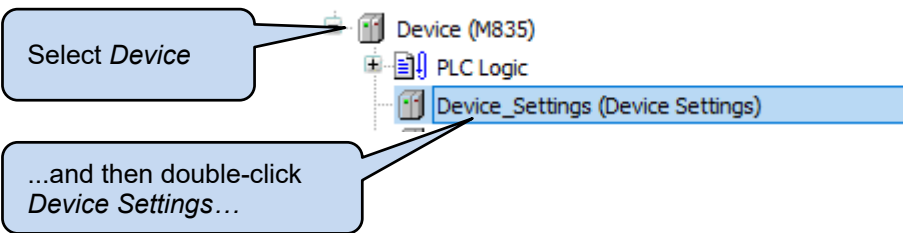| Gateway-1 ▾ | | [0366.9008] (active) ▾ |

IP-Address:
localhost

Port:
1217

Device Name:
M835-01

Device Address:
0366.9008

Target ID:
1102 0005

Target Type:
4096

Target Vendor:
ehb electronics

Target Version:
1.0.0.0

4.5 DEVICE SETTINGS

Select *Device*

...and then double-click *Device Settings…*

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

4.5.1 DEVICE SETTINGS PARAMETERS

...and then select *Device Settings Parameters…*
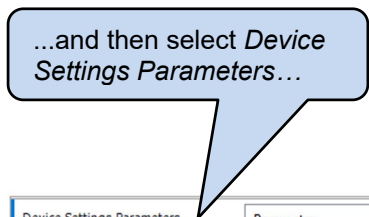
Parameter	Type	Value	Default Value	Unit	Description
Voltage Reference	Enumeration of USINT	Disabled	Disabled		
Persistance Settings					Data Persistance Settings
Active	BOOL	TRUE	0		Activate automatic saving of persistent variables
Time	DWORD	1000	5000	ms	Time in ms for automatic saving of persistent variables
CAN [1]					Configuration of CAN 1
Save Config	Enumeration of USINT	Yes	No		Save Config
ID	USINT	8	8		CAN ID - Must be less than 128
Baudrate	Enumeration of UINT	1000000	500000		Baudrate Value
Terminator Resistor	Enumeration of USINT	Yes	No		Internal 120 Ohm Terminator Resistor
Transparency					Sets the Transparency Color
Active	BOOL	TRUE	0		Activate the Transparency in all images
Colour	DWORD	16#8000FF	8388863	Hex RGB	RGB Colour in Hex

Device Settings Parameters
Device Settings I/O Mapping
Status
Information

4.5.1.1 VOLTAGE REFERENCE

Parameter	Description
Voltage Reference	Selects the level of the Voltage Reference output. This may be used to supply external sensors or other auxiliary devices. ***Disabled:* Vref is disabled** *5V:* Output is 5 V DC. *10V:* Output is 10 V DC.

4.5.1.2 PERSISTANCE SETTINGS

Parameter	Description
Active	*FALSE:* Persistant Variables are not saved. *TRUE:* Persistant 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 Persistant 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.

4.5.1.3 CAN [1]

Parameter	Description
Save Config	⚠ **NOTE: After changing *CAN* settings, the device must be power cycled before changes take effect.** ***No:*** Changes to the CAN are not applied when the application is sent to the device. ***Yes:*** Changes to CAN settings are saved to the device. Powercycle the device after the application is sent to apply the new settings.
ID	ID of the device on the CAN network used during application transfer.
Baudrate	Baudrate of the device on the CAN network used during application transfer and application communcation with CAN (ie Engine ECUs and other external devices).
Terminator Resistor	***No:*** Disabled. ***Yes:*** Internal 120 Ω termination resistor is enabled on the CAN port.

4.5.1.4 TRANSPARENCY

Parameter	Description
Active	***TRUE:*** Visualisation transparency for images is disabled. ***FALSE:*** Visualisation transparency for images is enabled.
Colour	Enter the RGB value of the colour to be used as the transparent part of images in the Visualisation.

4.5.2 DEVICE SETTINGS I/O MAPPING

Allows mapping of the following parameters to program variables,

Parameter	Description
Error Code	Displays internal Error Code when available. For details, see section entitled *ehb SMARTdisplay 835 CODESYS Error Codes*.
Battery Voltage	ECU supply of the ehb SMARTdisplay 835 device.
Voltage Reference	Configuration of the Vref voltage output.
Backlight	Configuration of the LCD backlight.
Keyboard Backlight	Configuration of the backlight of the fascia button surround.

4.6 ADD INPUTS, OUTPUTS AND BUTTONS TO THE PROJECT

⚠️**NOTE: Many programmers prefer to use the Inputs, Outputs and Buttons programmatically (using code). This is achieved using the library *DSE Standard* (Namespace: DSE). Additionally, *M835_Buttons* function is available within the library *DSE Utils* (Namespace: DSE_UTILS. Both libraries are available within the *SD 835 CODESYS Package*.**

Right-Click *Device*…

And select *Add Device*.

Select *Deep Sea Electronics*
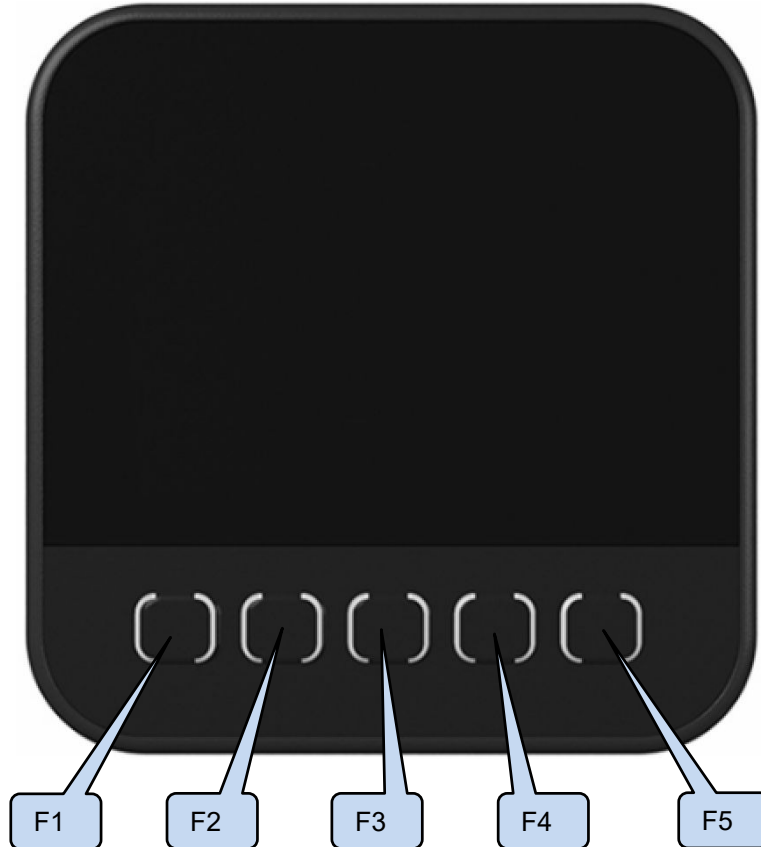
Select the device to add…

And click *Add Device.*

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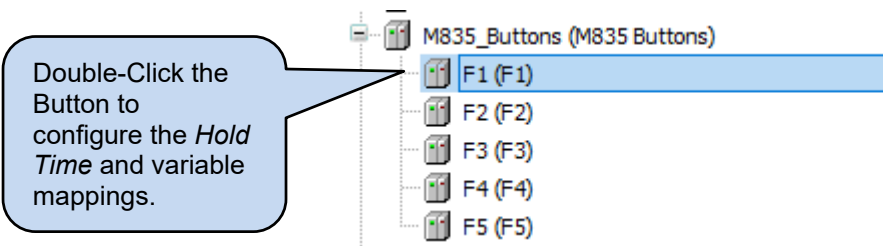
4.7   BUTTONS

4.7.1   BUTTON LOCATION

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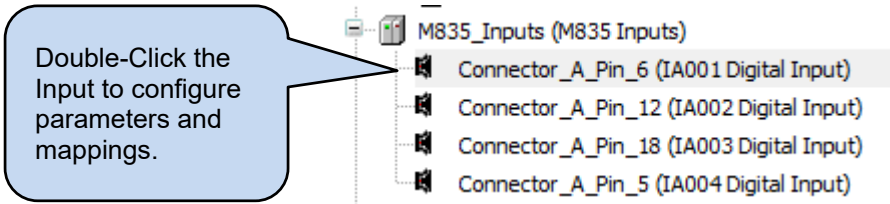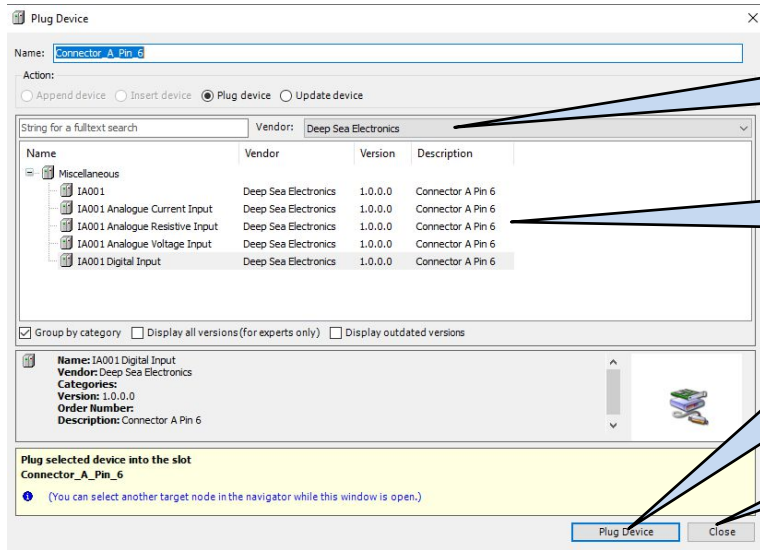
4.7.2 BUTTON SETTINGS

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

M835_Buttons (M835 Buttons)
- F1 (F1)
- F2 (F2)
- F3 (F3)
- F4 (F4)
- F5 (F5)

4.7.2.1 PARAMETERS

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

4.7.2.2 I/O MAPPING

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

4.8 INPUTS

To select between the different input types (digital or analogue), we must *Plug* a device into the input slot.

> Right-Click the Input to configure and select *Plug Device.*

> Select *Deep Sea Electronics*

> Select the type of input required.

> *Plug* the input into the device.

> Close Window.

> Double-Click the Input to configure parameters and mappings.
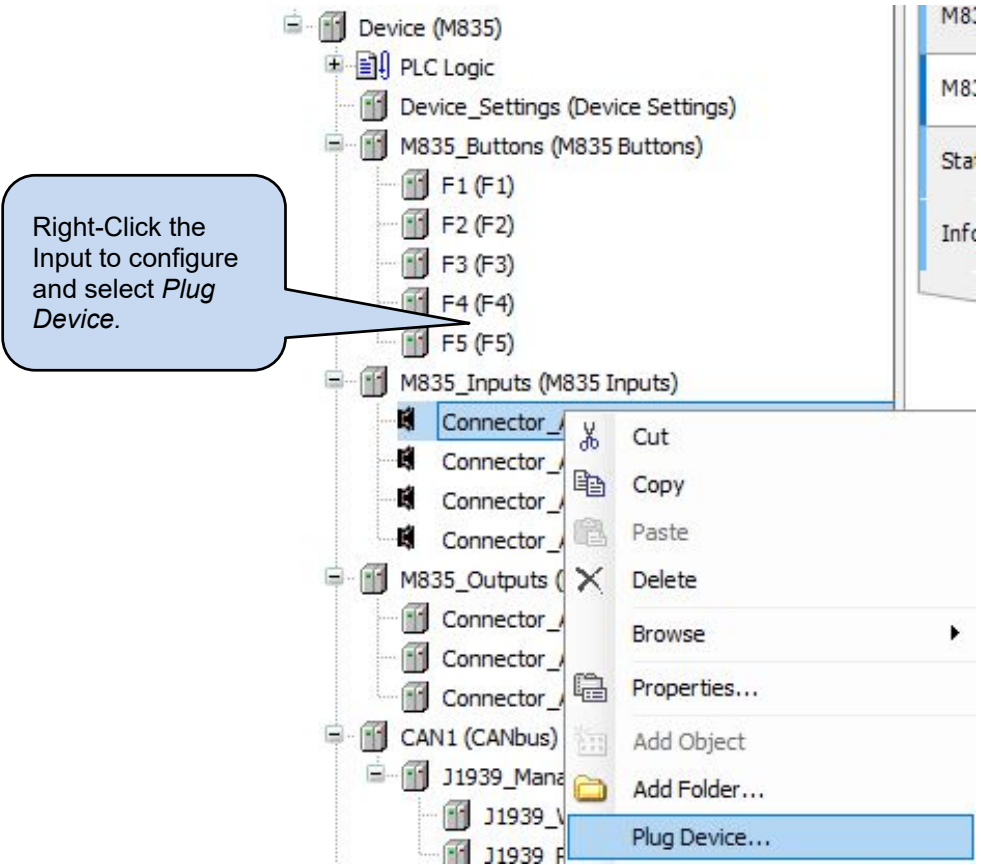
4.8.1 DIGITAL INPUTS

4.8.1.1 PARAMETERS

Parameter	Description
Resistor	***Float***: The input is floating when no connection is made. Used where the external sensor (NPN Sinking or PNP Sourcing type) has an integrated pull-up or pull-down resistor. ***Pull Up***: An internal pull up resistor biases the input to the positive supply rail when no connection is made. Commonly used with NPN (Sinking) type switched sensors and volt-free contacts. ***Pull Down***: An internal pull-down resistor biases the input to the negative supply rail when no connection is made. Commonly used with PNP (Sourcing) type switched sensors and volt-free contacts.
Higher Threshold	The input is detected as being inactive when above this threshold with respect to the negative supply rail.
Lower Threshold	The input is detected as being active when below this threshold with respect to the negative supply rail.

4.8.2 ANALOGUE INPUTS

4.8.2.1 CURRENT

Parameter	Description
Current Range	***0..20 mA***: The input is 0 mA to 20 mA. ***4..20 mA***: The input is 4 mA to 20 mA.

I/O Mapping	Description
Value	The current value of the input (µA, microamps) is mapped to the selected program variable.
Error Code	The current error state of the input is mapped to the selected program variable.

4.8.2.2 RESISTIVE

I/O Mapping	Description
Value	The current value of the input (Ω) is mapped to the selected program variable.
Error Code	The current error state of the input is mapped to the selected program variable.

4.8.2.3 VOLTAGE

| I/O Mapping	Description
Value	The current value of the input (mV, milli Volts) is mapped to the selected program variable.
Error Code	The current error state of the input is mapped to the selected program variable.

4.9   OUTPUTS

I/O Mapping	Description
Enable	*FALSE:* The output is inactive. *TRUE:* The output is active.

4.10   USING THE DISPLAY IN THE PROJECT (VISUALISATION)

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. ehb SMARTdisplay 835 visualisation options differ with some of DSE's other displays as it uses *TargetVisuLight* (CODESYS TVL) Library to economise resources.
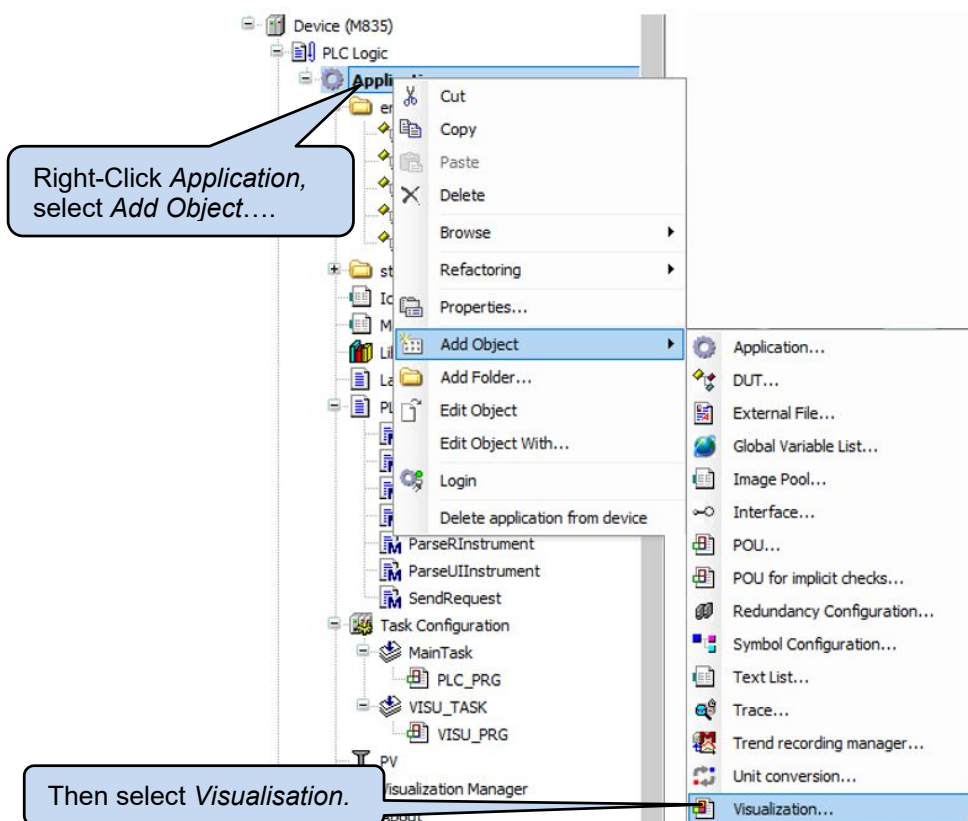
4.10.1 VISUALISATION ELEMENTS

The following Visualisation Elements are available for ehb SMARTdisplay 835. Select the element required and place them in the Visualisation.

The following subsections provides insights as to how to meet most common requirements of a device Visualisation.
Advice regarding the suggested solutions is available from support@deepseaelectronics.com.

4.10.2 TEXT (FIXED OR DYNAMIC)

> ⚠️**NOTE: Text *Fonts* occupy a large amount of system memory. To save resources, ensure to follow the instructions in the subsection entitled *Using Fonts*.**

Use the flexible *Rectangle* element which provides the functionality of a rectangle (with optional border and fill), and an integral Text Field that may be fixed, or programmatically altered using the Text Variable property.

Border and Fill settings are disabled by setting the *Fill Attributes* and *Line Style* properties to *Hollow*.

Use the *Rectangle* element.

Set to *Hollow* to disable these items if required.

Property	Value
Text ID	1644
Type of element	Rectangle
⊞ Position	
⊞ Center	
⊞ Colors	
⊟ Element look	
Line width	1
Fill attributes	Hollow
Line style	Hollow
⊞ Texts	
⊞ Text properties	
⊞ Absolute movement	
⊞ Relative movement	
⊞ Text variables	
⊞ Font variables	
⊞ Color variables	
⊟ State variables	
Invisible	

4.10.2.1 TEXT SIZE

When selecting Text (font) size, only *Integer* font sizes are possible. Where other sizes are mistakenly used, the font appears on the M835 display in a default (small sized) font.

CODESYS allows selection of font sizes that are not appropriate for ehb SMARTdisplay 835. For example, it is possible to select Arial 7. After closing the font selector, it appears correctly set as

`Arial; 7` in the *Property* window. However, when selecting it with the mouse, the font size is actually

not an integer: `Arial, 6.75pt`. The font selector and property window 'round up' the font size until selected with the mouse.

To minimise occurrences of this error it is recommended to select Text Size from the following options (all multiples of 3: *6, 9, 12, 15, 18, 21, 24…* etc.

4.10.2.2 TEXT COLOUR

Fixed Colour

> Within *Colors* select the colour required for the *Normal* and *Alarm* state. *Alarm* state is used when *Color Variable | Toggle Color* is *TRUE*.
> Note that a setting in *Color Variables* overrides this selection.

> Within *Text Properties* select the colour required for the text.
> Note that a setting in *Font Variables* overrides this selection.

Property	Value
Text ID	1644
Type of element	Rectangle
⊞ Position	
⊞ Center	
⊟ Colors	
⊟ Normal state	
Frame color	⬛ Baseelementframecolor
Fill color	⬜ Baseelementfillcolor
⊟ Alarmstate	
Frame color	🟥 Baseelementalarmframecolor
Fill color	▫ Baseelementalarmfillcolor
⊞ Element look	
⊞ Texts	
⊟ Text properties	
Horizontal alignment	Left
Vertical alignment	Centered
Font	**Arial; 9**
Font color	⬛ Fontcolor

Programmatically Change Colour

If required to change the text colour during application runtime, *Font Variables* is used as follows:

> Within *Font Variables* select the variable containing the colour required for the element.

Flags	
⊟ Font variables	
Color	PLC_PRG.ColourWhite

Colour is defined as a DINT variable containing the RGB values for the colour (ie 16#RRGGBB)

Example to define the colours :

```
ColourWhite     :     DINT:=16#FFFFFF;
ColourBlack     :     DINT:=16#000000;
ColourRed       :     DINT:=16#FF0000;
ColourGreen     :     DINT:=16#00FF00;
ColourBlue      :     DINT:=16#0000FF;
```

Text colour in the PC Visualisation Editor remains as the colour selected in *Text Properties*.

4.10.2.3 STRING ESCAPE CHARACTER $

Strings can include 'special' characters as well as the common alphanumeric characters. For example, a string can include the single quote (') character. However, this character is used as the STRING start and end. Therefore, a special character known as the escape character is used to inform CODESYS that the 'character should be displayed and not considered as a string start/end. This character is the dollar sign ($).
In the event we need to display a dollar sign we again prefix it with the escape character ($).
While the CODESYS inbuilt help file contains a comprehensive list of escape codes, the following details the most common.

String	Displayed as
$'	'
$$	$
$t or ST	Control Character TAB

Examples:

```
VAR
     MyString    :      STRING:='This $'fee$' is $$50';
END_VAR
```
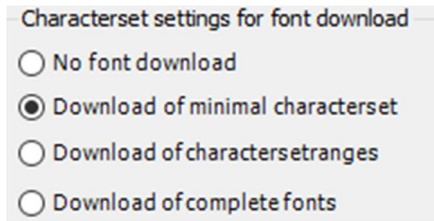
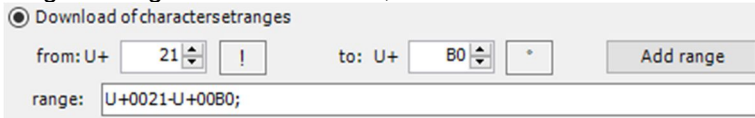The string contains the message: **This 'fee' is $50**

4.10.2.4 USING FONTS

⚠️**NOTE: If the *Font Settings* tab is not visible within the Visualization Manager, close the tab, then again double click Visualization Manager to open it again and view the settings.**

Text fonts are resource hungry. They occupy large parts of the system memory. To make efficient use of the memory, CODESYS allows us to choose how the font is sent to the device:

Double Click 🔳 Visualization Manager   in the project tree and select the 📄 Font settings tab:

Characterset settings for font download
- ○ No font download
- ◉ Download of minimal characterset
- ○ Download of charactersetranges
- ○ Download of complete fonts

Parameter	Description
Character Settings for Font Download	**No Font Download:** (Not Recommended) No font is sent to the device. **Download of Minimal Character Set:** (Recommended). All characters used in the visualisation are downloaded to the device. However, any characters not used in the visualisation but used in variables (ie Strings) are NOT sent to the device. To 'force' characters to be sent to the device: • Use a hidden visualisation page containing all the font/character selection required for the application. • Use *Download of Character Set Ranges.* **Download of Character Set Ranges:** (Advanced). The user selects which character range or ranges to send to the device. Windows Character Map is a useful tool for identifying the range(s) of characters you may need. Adding the range *U+0021-U+00B0;* ◉ Download of charactersetranges from: U+ [21] ! to: U+ [B0] ° [Add range] range: U+0021-U+00B0; ensures that most used characters are sent to the device (a to z, A to Z, 0 to 9 and many punctuation characters): ! " # \$ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\ ] ^ _ ` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ - ® ¯ ° **Download of Complete Fonts:** (Not Recommended). The complete character set of all used fonts is sent to the device occupying a large amount of memory in the device.

4.10.3 LINE CHART

The *Polyline* element can be added, using *Dynamic Points* to allow the line to be manipulated using an array of points

Property	Value
Type of element	Polyline
⊟ Position	
⊞ Points	
⊞ Center	
⊟ Element look	
Line width	1
Fill attributes	Filled
Line style	Solid
⊞ Texts	
⊞ Text properties	
⊞ Absolute movement	
⊟ Dynamic points	
Array of points	PLC_PRG.ChartPoints
Number of points	10

Use the *Polyline* element.

Map the array of points containing the coordinates of the line points.

4.10.4 LAMP OR LED

Use the *Ellipse* element to add a circular shape. Use either the *Color* property to change the fill colour or use the *Toggle Color* property to select between the *Normal State* and *Alarm State* colour configurations.

Use the *Ellipse* element.

Map a BOOL used to change the state of the LED/Lamp indicator. This selects between *Normal* and *Alarm State.*

Map to the variables that define which colours to use (RGB colour)

ie
Red : DWORD:= 16#FF0000

Property	Value
Type of element	Ellipse
⊟ Position	
X	272
Y	64
Width	25
Height	25
⊞ Center	
⊞ Element look	
⊞ Texts	
⊞ Text properties	
⊞ Absolute movement	
⊞ Relative movement	
⊟ Text variables	
Text variable	
⊞ Font variables	
⊟ Color variables	
Toggle color	PLC_PRG.LED1
⊟ Normal state	
Frame color	PLC_PRG.Black
Fill color	PLC_PRG.DarkGrey
⊟ Alarmstate	
Frame color	PLC_PRG.Black
Fill color	PLC_PRG.Red

4.10.5 ALTERNATIVE TO TEXTLISTS

CODESYS TargetVisuLight does not include support for TextLists provided in devices with the full CODESYS VisuElems library. However, some functions are still available utilising alternative methods.
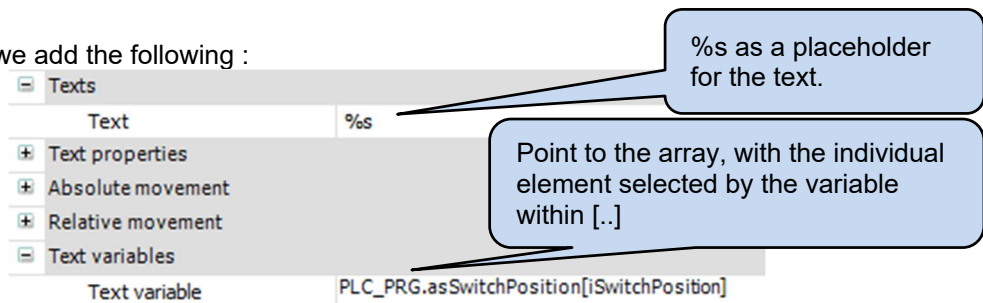
4.10.5.1 DYNAMIC TEXT

Dynamic Text is using a Visualisation element to display text that changes depending upon some condition within the application. For example, this could be indication the position of a control switch. Alternative methods exist, this being the recommended option having the advantage of the text being easily located at the top of the POU in the VAR area.

In this example iSwitchPosition is the physical position of the switch. We use this to index into an array to show the position in text, rather than a number.

```
VAR
        asSwitchPosition        :ARRAY[0..3] of STRING:=['Off', 'Manual', 'Auto', 'Test'];
        iSwitchPosition         :INT:=0;
END_VAR
```

Then in the Visu, we add the following :

⊟	Texts	
	Text	%s
⊞	Text properties	
⊞	Absolute movement	
⊞	Relative movement	
⊟	Text variables	
	Text variable	PLC_PRG.asSwitchPosition[iSwitchPosition]

%s as a placeholder for the text.

Point to the array, with the individual element selected by the variable within [..]

4.10.6 USING CUSTOM IMAGES ON THE DISPLAY

Many applications require custom images to be placed on the ehb SMARTdisplay 835 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.

4.10.6.1 ADDING AN IMAGE POOL

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

Then select *Image Pool*
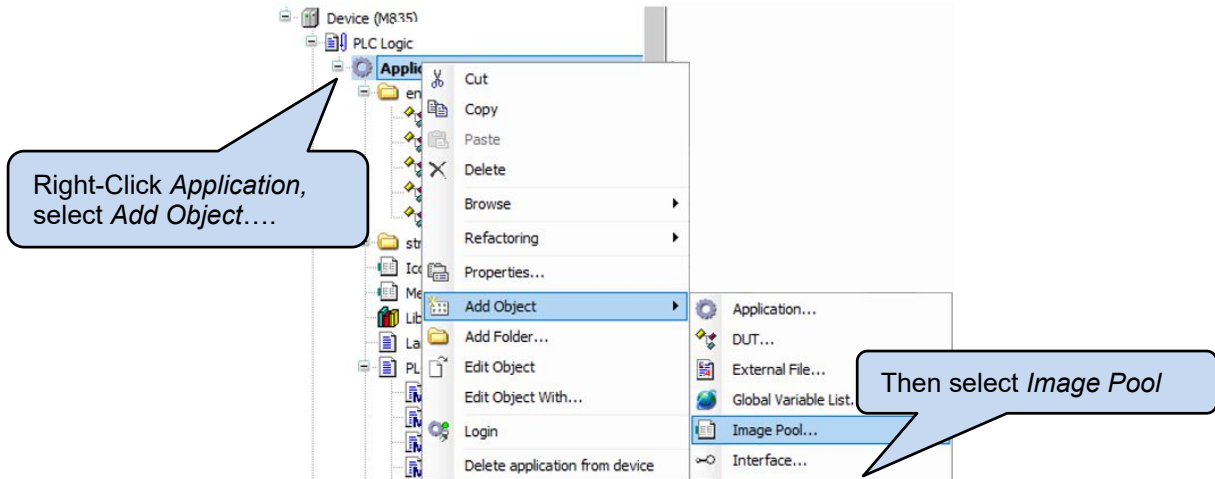
4.10.6.2 ADDING IMAGES TO THE IMAGE POOL

⚠ **NOTE: Images must be Windows Bitmap (.bmp) type with 8-bit, 16-bit or 24-bit colour depth. Other image types are not supported.**

⚠ **NOTE: Images MUST be scaled externally before being imported to the image pool.**

⚠ **NOTE: For image transparency see section entitled *Device Settings | Transparency.***

⚠ **NOTE: Multiple Image Pools may be used to keep images of similar type or usage together.**

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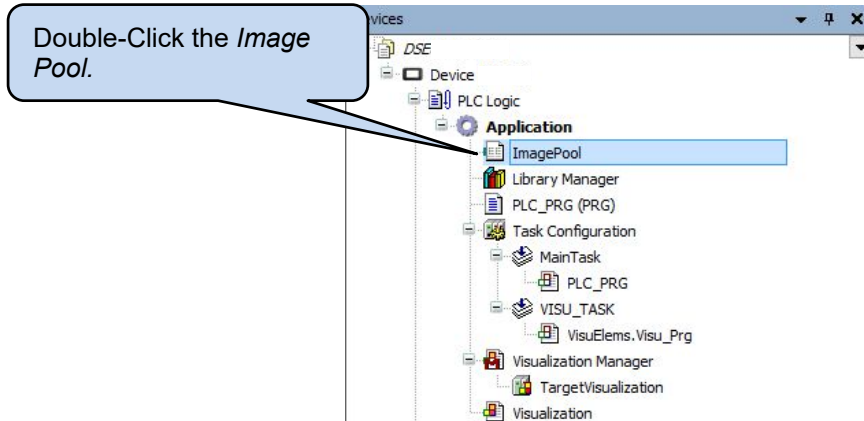
Right-Click the empty line and select *Insert Image.*

	File name	Image	Link type

Cut
Copy
Paste
Delete
Insert Image
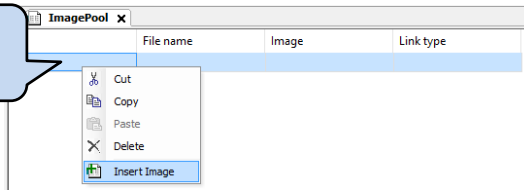
Then Double-Click the empty space under *File name* and click …

ImagePool

ID	File name	Image	Link type
0			

Select Image

Image File:

Browse to the image on your computer…

What do you want to do with the image file?
○ Remember the link.
○ Remember the link and embed into project.
◉ Embed into project.

And select how the image is stored in the project.

When the image file changes, then
◉ reload the file automatically.
○ prompt whether to reload the file.
○ do nothing.

Click *OK* when done.

OK   Cancel

Visualization   PLC_PRG   ImagePool

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

Example entries in the *Image Pool*.

4.10.6.3 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.
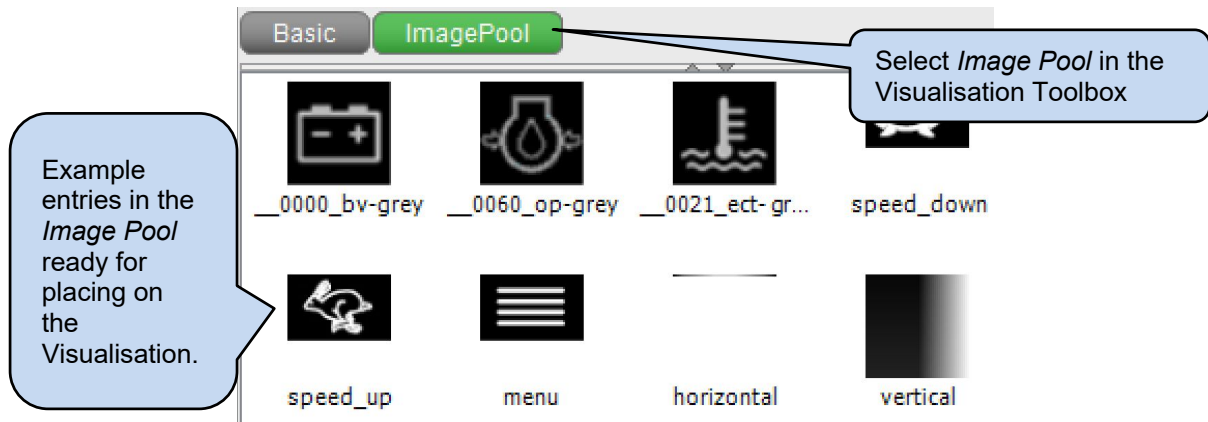
You MUST select *Scaling Type: FIXED.*
Scaling within CODESYS is not supported.
After pressing *ENTER* this property is no longer displayed.

Property	Value
Type of ele...	Image
Static ID	ImagePool.HOME
Show frame	☐
Scaling type	Fixed

4.10.6.4 GRAPHICAL GAUGES OR IMAGE SWITCHING

Multiple Images

Multiple images may be used to provide animation. This method has a number of images, each one different to the others. Swapping between images gives the illusion of animation.

Use the Image Pool to load in the required images. Add an *Image* to the visualisation and change the image reference using the *DynamicBitmap* property.

Use the *Image* element.

Map a STRING that matches the *ID* of an image within the image pool. The POU code should select the image based upon the value that is to be displayed.

Property	Value
Type of element	Image
Static ID	MeterImages.M835_Large_1
Show frame	
⊞ Position	
⊞ Center	
⊞ Element look	
⊞ Texts	
⊞ Text properties	
⊟ Bitmap ID variable	
Bitmap ID	PLC_PRG.EngineSpeed.MeterImage.Large

Element Rotation

> ⚠ **NOTE:** *Interior Rotation* **is available only with the** *Polyline* **Visualisation element.**

Visualisation Element *Polyline* may be rotated at application runtime. For example, this technique can be used to give motion to a meter needle, or to show a valve opening/closing.

Select the variable containing the angle of rotation and map to the *Interior rotation* property.

⊟ Absolute movement	
⊟ Movement	
X	
Y	
Rotation	
Scaling	
Interior rotation	PLC_PRG.Angle

4.11 CAN

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

> ⚠NOTE: CAN compiled library, supplied as part of the SD 835 CODESYS Package available from info@ehb-electronics.de.

CAN interface is used to configure the device (using CODESYS) and to connect to external CAN devices such as engine ECUs.

CAN Protocol	Options
SAE J1939	• CODESYS J1939 (see section entitled *CODESYS J1939)* • CAN compiled library
Raw CAN (custom protocols)	• CAN compiled library
Other CAN protocols	Contact Info@ehb-electronics.de

4.11.1 CAN

CAN compiled library, supplied as part of the *SD 835 CODESYS Package* available from www.ehb-electronics.de allows standard CAN messages to be sent and received. This may be used (with customer application code) to interface with J1939, custom protocols and other CAN protocols as required.

Contact info@ehb-electroncis.com for advice on the CAN compiled library.

4.11.2 CODESYS J1939

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

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

First add the CAN device to the project:

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

Select *3S – Smart Software Solutions GmbH*

Select *CANbus*

Add CAN to the project.

DO NOT close the window yet…...

Keep the *Add Device* window open.

Select the CANbus device in the project tree

And add to it the *J1939_Manager* from the *add Device* window.

Add J1939 Manager to the project.

DO NOT close the window yet…...

Keep the *Add Device* window open.

Select the J1939_Manager device in the project tree
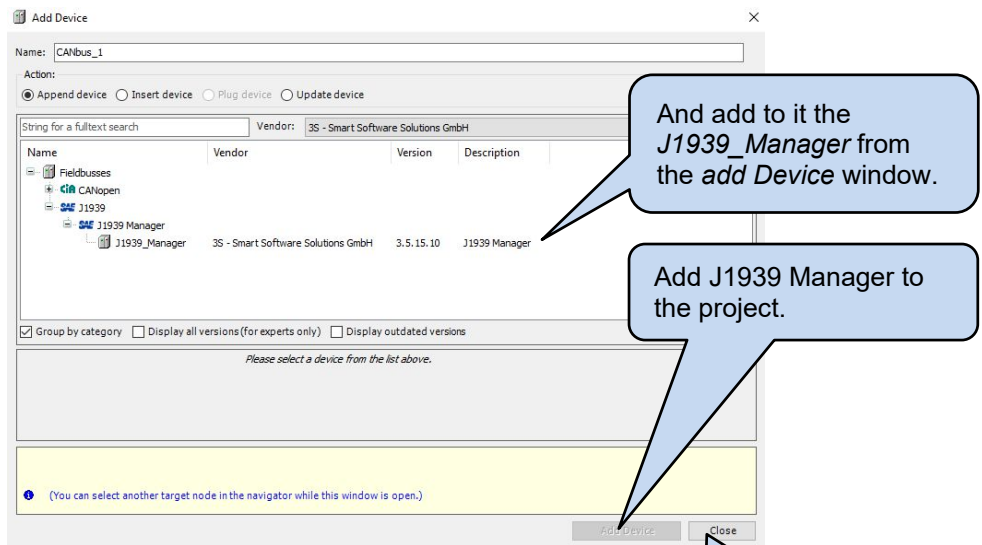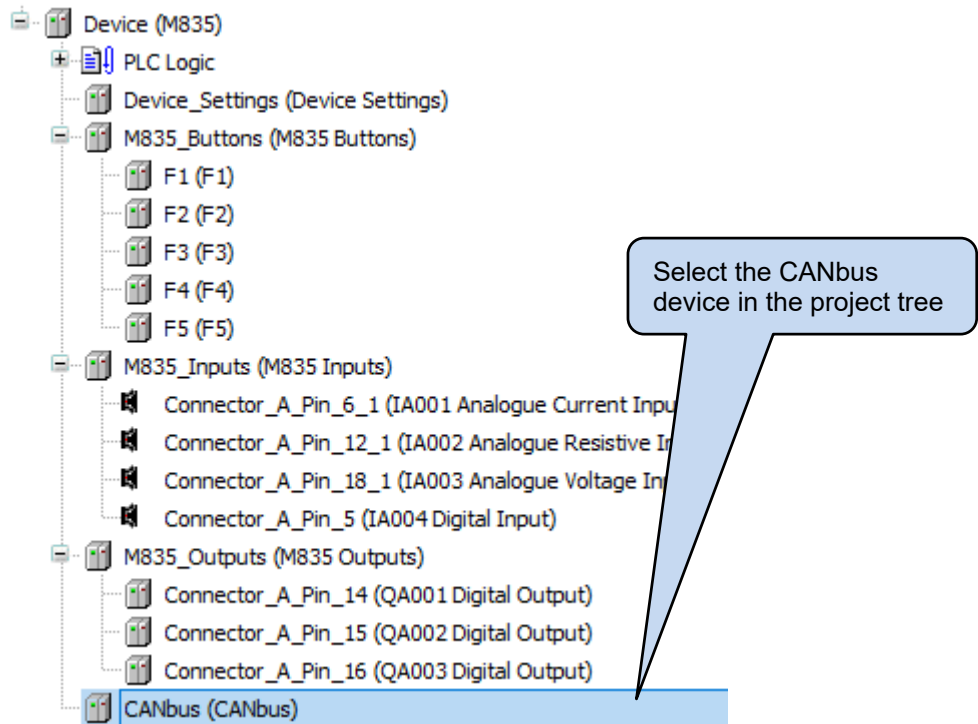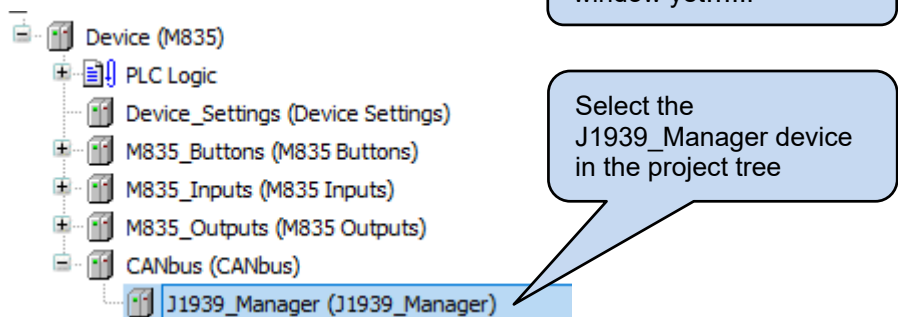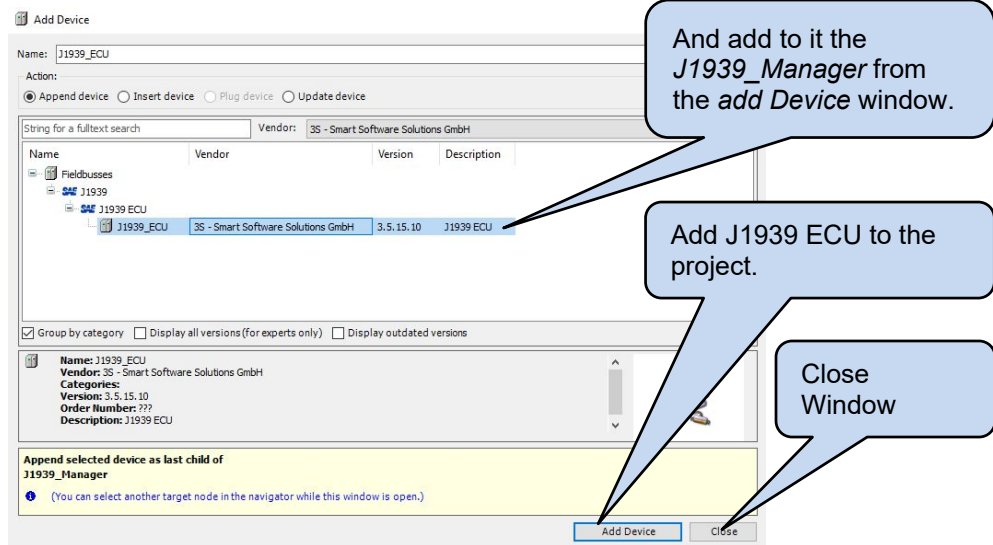
The project is now able to communicate with one J1939 ECU. Other devices may be added as required to allow communication with other J1939 ECUs on the same CAN.

For further information, please contact info@ehb-electronics.de

5   EHB SMARTDISPLAY 835 CODESYS ERROR CODES

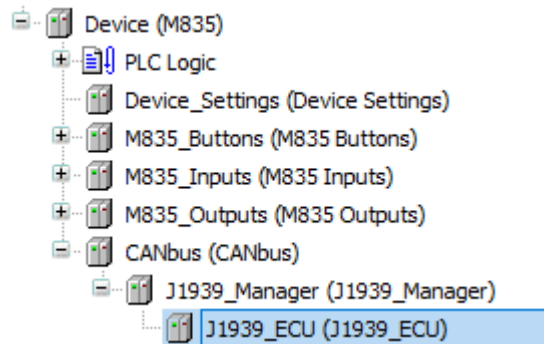ehb SMARTdisplay 835 returns error codes to CODESYS when appropriate. Individual bits are set within the returned value to indicate one or more error conditions. This can be mapped to a variable if required and is available to view within CODESYS under the *Device Settings I/O Mapping*.

Example:

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

5.1   DEVICE

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

5.2   DIGITAL INPUTS

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

5.3   DIGITAL OUTPUTS

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

6   HARNESSES

Description	ehb Part	Manufacturer Part	
ehb SMARTdisplay 835 Connector Harness Kit	ehb2399	N/A	ehb
ehb SMARTdisplay 835 Connector Configuration Harness.	ehb2400	N/A	ehb
Deutsch Connector A,18-pin complete with pins / Plug set for self-assembly	ZUB0004		ehb

6.1   EHB SMARTDISPLAY 835 CONNECTOR HARNESS (EHB2399)

ehb Part ehb2399 consists of a cable with connector fitted at one end, with cable marking to identify the wires at the other end.

	Connector A
Assembly Ident	ehb2399
DEUTSCH Connector	DT16-18SA-K004
No of Connections	18
Wire size	1 mm^2 (AWG 20)
Wire Colour	Black
Wire Idents	1 to 18

Clearly marked free end wire connections

CAN OUT

CAN IN

ehb2399

Connector A Deutsch DT16-18SA-K004

Cable Ident. Length 3 m
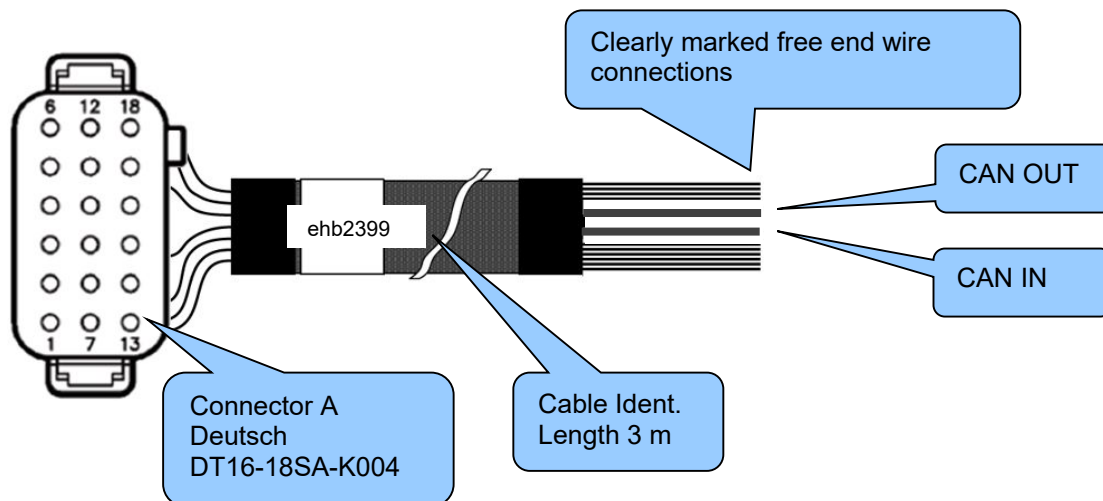
PIN	DESCRIPTION	COLOR
1	GND	Blue
2	CAN Screen	Screen
3	CAN L In	Brown
4	CAN H In	White
5	Input 4	Green
6	Input 1	Pink
7	VDC Batt +	Brown
8	CAN Screen	Screen
9	CAN L Out	Brown
10	CAN H Out	White
11	GND	Black
12	Input 2	Orange
13	GND Batt	Grey
14	Output 1	Yellow
15	Output 2	Violet
16	Output 3	White
17	VREF-Out	Red
18	Input 3	Grey

6.2   EHB SMARTDISPLAY 835 CONFIGURATION HARNESS (EHB2400)

> ⚠**NOTE: ehb SMARTdisplay 835 Configuration Harness ehb2400 must be used in conjunction with Peak Systems USB CAN interface IPEH-002021 or IPEH-002022 and a 120 Ω termination resistor for PCAN MiniTerm IPEK-003002-Mini from https://www.peak-system.com**

ehb Part ehb2400 consists of a minimal cable with connector fitted at one end with DC supply wires and DE9 CAN connector at the other end. This is designed to connect to the DE9 connector of the USB CAN interface.
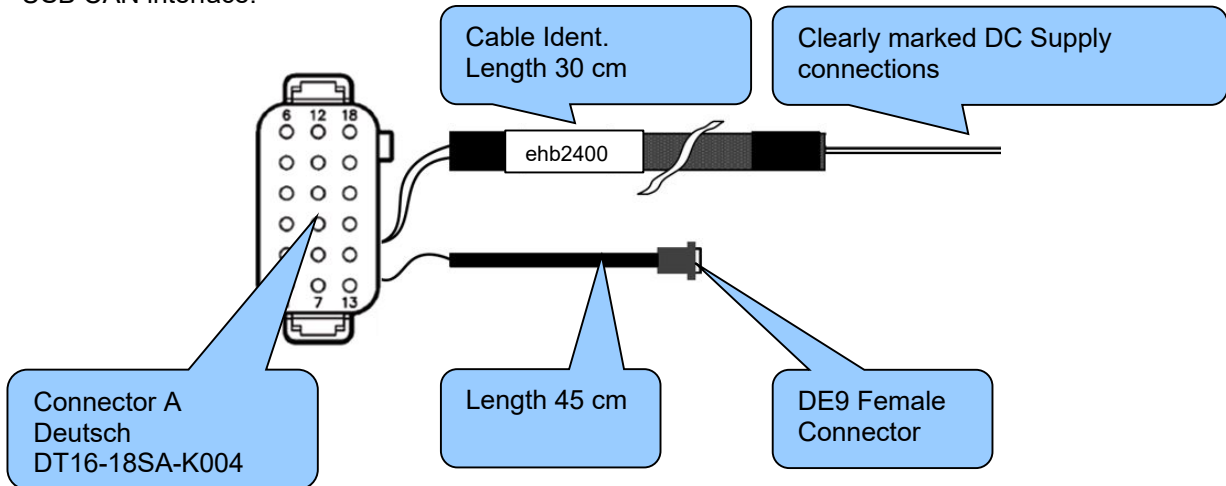

Description	Connector A	Termination
DC Positive	7	Single wire
DC Negative	1	Single wire
CAN SCR	2	DE9 Pin 5
CAN L	3	DE9 Pin 2
CAN H	4	DE9 Pin 7

6.3   PCAN-USB CONNECTION DETAILS

> ⚠**NOTE: Where a ehb Configuration or Connection Harness is not used, connection details for PCAN-USB are shown below. PCAN-USB supplier details are given in the section entitled** *Maintenance Spares, Repair and Servicing* **elsewhere in this document.**

Connect PCAN-USB to ehb SMARTdisplay 835 using connections for CAN H, CAN L and GND. For suitable connection looms from ehb, see sections entitled ehb SMARTdisplay *835 Connector Harness* and ehb SMARTdisplay *835 Configuration Harness*.
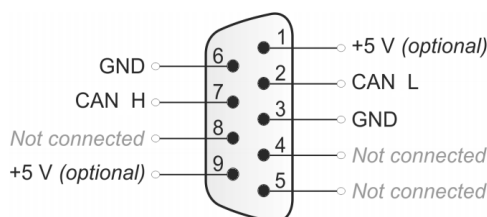
Shown looking at the PCAN-USB interface from the 'outside'

7   IMPORTANT NOTES FOR THE 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 835** device within range of strong electromagnetic fields. Observe the temperature specifications.

Storage

ehb SMARTdisplay 835 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 835** requires no maintenance throughout its entire service life and requires no special care.

Opening the device

The **ehb SMARTdisplay 835** contains no parts that can be serviced, replaced or repaired by customers or third-party maintenance personnel.
The **ehb SMARTdisplay 835** 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.

8   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**

9   DISPOSAL OF DEVICES

At the end of its service life, dispose of the product in accordance with legal requirements.

10 DOCUMENT INFORMATION, HISTORY

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Author:	Tony

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11 IMPRINT

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