

CAN CHECKED

MCE/CFE18 Manual



Content

| | | |
|------|--|----|
| 1 | Description and scope of delivery | 3 |
| 2 | Connection of the plugs | 5 |
| 3 | Updating with the CANchecked Updater | 7 |
| 4 | Connecting to the DSS..... | 9 |
| 4.1 | Settings/Default stream | 9 |
| 4.2 | LiveData | 12 |
| 5 | Connection Guides | 13 |
| 5.1 | Haltech | 13 |
| 5.2 | ECUmaster..... | 16 |
| 5.3 | LinkECU | 17 |
| 5.4 | Motec (BETA!) | 20 |
| 5.5 | MaxxECU and others | 20 |
| 6 | FAQ..... | 21 |
| 6.1 | Does the MCE18 come pre-configured | 21 |
| 6.2 | My inputs influence each other | 21 |
| 6.3 | Unable to connect to DSS | 21 |
| 6.4 | How to Choose the Right Offset, Multiplier, Divider and Resolution | 21 |
| 6.5 | How do I connect speed inputs?..... | 21 |
| | The MCE18 is not designed for the connection of speed inputs. However, it has 4 frequency inputs for ethanol, turbospeed or Hall sensors.How do I change the Can Bus settings? | 21 |
| 6.6 | How do I change the Can Bus settings? | 21 |
| 6.7 | Can I put 12V on the DIN | 22 |
| 6.8 | Supports the MCE18 29 bit can IDs..... | 22 |
| 6.9 | At what rate is the data recorded? | 22 |
| 6.10 | How to connect a Flexfuelsensor | 22 |
| 6.11 | Where do I connect ground switches?..... | 22 |
| 7 | Document Changelog | 23 |

1 Description and scope of delivery

Thank you for purchasing your MCE18. With the CANchecked Multifunction Can Bus Extension, you can feed additional sensors to your Can Bus and thus serve as an Input/Output Expander. The MCE18 does not have an internal mapper and places the measured sensor voltages directly on the data bus.

This manual applies equally to its sister product, the CFE18.

There are three versions of the MCE18, some of which differ in terms of functionality and pinout. The safest way to find out which version you own is to take a look at the revision number on the back of the board. To do this, loosen the four screws that hold the back plate, then remove the board and read the revision on it.

In Chapters 2 you will find the assignment of the revision number to the variant of the MCE18. For version 3 devices, this is engraved on the case (V3).

This guide explains how to operate and handle your MCE18. In addition to connecting and updating, this guide also covers the connection and operation of our "Device Setup Software" (*DSS*).

In the box you will not only find the MCE18, but also the following items are included:

- The Quickstart Guide
- one AMP Superseal connector (TE 4-1437290-0)
- 36x AMP Superseal pins for self-crimping 1.0 20AWG (TE 3-1447221-4)
- Three 2.54 mm *jumper*s

Your MCE18 itself has a status LED, an AMP Superseal connector and a MicroUSB port on the board (version 3). This is not accessible without disassembling the unit and usually does not have to be used by the customer. The MicroUSB on the board is redundant to the USB pinout of the AMP connector, which all versions have.

The digital inputs can optionally be equipped with an internal pull-up resistor (20-50 kOhm). The setting is done in the *DSS*. You can find more information about this in chapters 4.

On the back of the board you can attach three jumpers (by default they are not mounted).

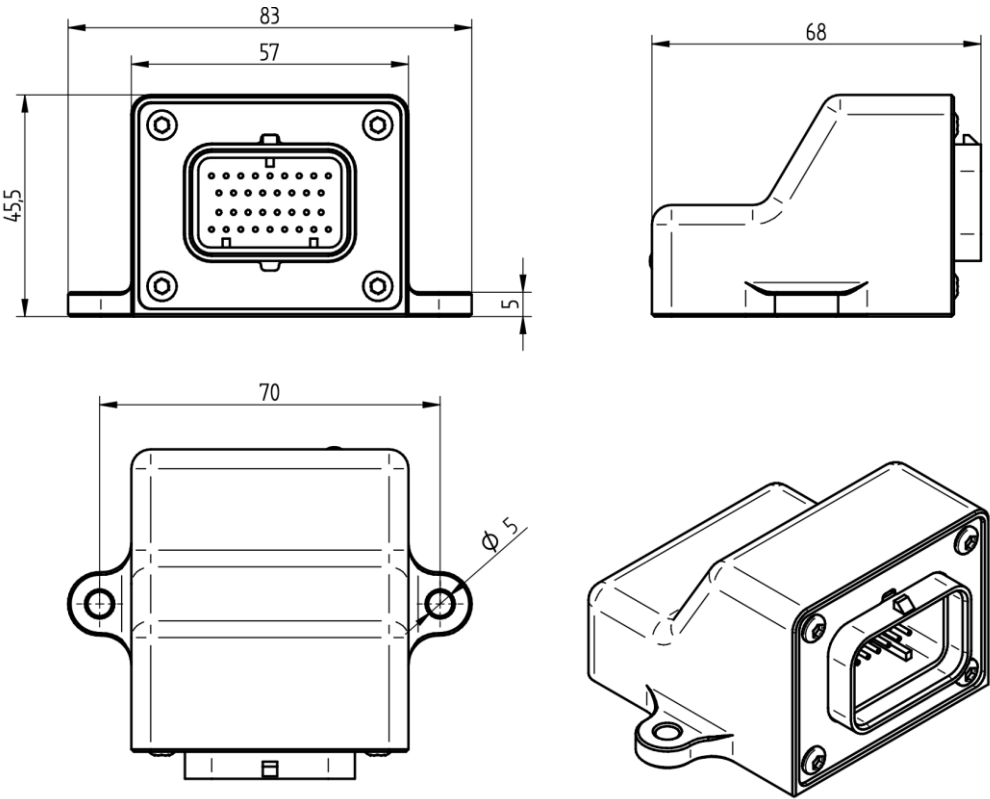
Jumper 1: Can Bus Termination 120 Ohm (all versions)

Jumper 2: AIN 1 (all versions), AIN 2 (V1 and V2 only) 1 kOhm

Jumper 3 AIN 6 (all versions), AIN 7 (V1 and V2 only) 1 kOhm

Terms associated with the MCE18 are shown in italics in this guide for better understanding.

The following illustration shows the dimensions of the MCE18.

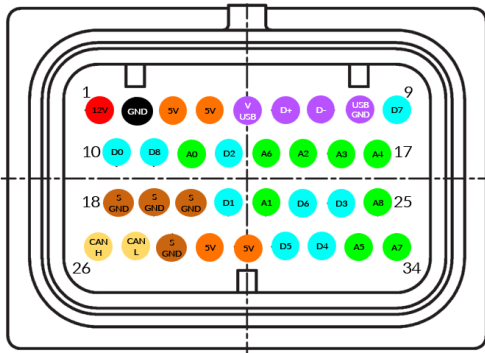
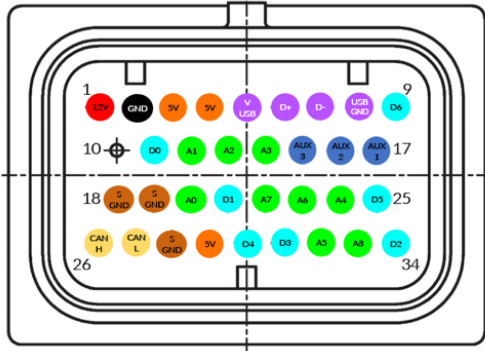
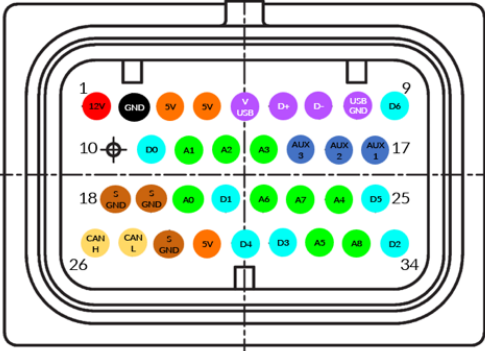


2 Connection of the plugs

To operate your MCE18, only four wires are needed:

- 12 volt on-board voltage, ideally ignition plus -> Pin 1
- Vehicle Mass -> Pin 2
- Can High (*CanH*) -> Pin 26
- Can Low (*CanL*) -> Pin 27

The wires of *CanH* and *CanL* always act as twisted wires in order to minimize interfering signals.

| Version | from revision | Pinout |
|----------|--|--|
| 1 | 0.7 – 0.7a ATTENTION: some MCE18 version 1 have mounted the connector partially twisted by 180 degrees, here the release tab points downwards. The pinout is to be read as if the tab were up. |  <ul style="list-style-type: none"> ● 12V IN ● GND ● 9 Digital Input (DIN) ● 9 Analogue Input (AIN) ● Can1 ● USB ● 5V out ● Sensor ground (SGND) |
| 2 | 0.8 – 0.8a ATTENTION: Pinout identical to V3, only A6 and A7 are swapped. Firmware: CFE18v0.8XX |  <ul style="list-style-type: none"> ● 12V IN ● GND ● 7 Digital Input (DIN) ● 9 Analogue Input (AIN) ● 3 Digital Output (AUX) ● Can1 ● USB ● 5V out ● Sensor ground (SGND) |
| 3 | 0.8b – present Firmware: MCE18v0.9XX |  <ul style="list-style-type: none"> ● 12V IN ● GND ● 7 Digital Input (DIN) ● 9 Analogue Input (AIN) ● 3 Digital Output (AUX) ● Can1 ● USB ● 5V out ● Sensor ground (SGND) |

The MCE18 has analog inputs (*AIN* – analog input), digital inputs (*DIN* – digital input) and digital outputs (*AUX* – auxiliary output). The inputs are placed on the Can bus as 0-1023 ADC values. An internal mapping of the values has not yet been implemented.

The power supply to operate the analog sensors can also be realized directly via the MCE18. During operation, 5V is applied to the corresponding pins, and you can obtain the sensor ground via the "S-GND". The maximum current of 0.5 amps should not be exceeded.

Verification and setup are done through the DSS.

The *DSS* must be downloaded and installed for use. The download is free of charge at <https://www.canchecked.de/downloads-category/dss-display-setup-software/>. The *DSS* is available for Win32, Win64 and MacOS.

The following manual only partially covers V1 devices. These can NOT be connected to the DSS. V2 and V3 devices can be connected to the DSS without any problems.

3 Updating with the CANchecked Updater

The MCE18 can be flashed with the CANchecked MFD15 Updater from our website. Before running the updater, the driver must be installed properly.

The driver can be downloaded from the Siliconlabs website:

<https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers>

The update file and updater can be downloaded from our website:

[MCE18 - Multifunction Can Bus Extension > Displays for Engine Management \(canchecked.de\)](#)

To connect the MCE18 to the PC via USB, the 4 wires of a USB cable must be pinned into the Superseal connector. As of board revision 0.8b, there is a redundant microUSB port on the board. To get to it, the MCE18 must be disassembled.

With this pinout you can pin the USB cable to the Superseal connector yourself:



Illustration 1: USB Cable Colors

- Red: USB 5V -> Pin 5
- Green: USB Data+ -> Pin 6
- White: USB Data -> Pin 7
- Black: USB GND -> Pin 8

A TTL adapter is required for flashing the CFE18.

One possible device is a "UART TTL - CP2102". It is important that this has "DTR". The adapter must be wired to the CFE18 as follows:

- 5V -> 5V
- GND -> GND
- RX -> TX
- TX -> RX
- DTR -> DTR

Once the MCE18 is properly wired and plugged in, it will appear as a COM port in Windows Device Manager as well as in the Updater. If this is not the case, please check the COM port and make sure the driver is installed successfully. For the update process, it is important that the MCE18 is only powered via USB and does not get 12V.

Once you have started the updater, the baud rate should be set to **125000**. Click on "Select Flash Hexfile" to select the previously downloaded hex file. Then, you need to click on "Start Bootloader". Now the software connects to the MCE18, as soon as the button turns green, you have to press the "Program Flash" button. Now the "Progress" bar runs through. After clicking on "Exit Bootloader" you can disconnect the device and you are done with the update.

4 Connecting to the DSS

You can configure your MCE18 via the DSS.

You can download the *DSS* free of charge from our website at www.canchecked.de/dss/. This is available for both PC and Mac. On our website you will find a quick guide on how to download and install it. You can also find the **driver** you need for **Windows 7** here. Once you have installed the *DSS*, you can run it, you should be able to see the following home screen and click on the CANchecked logo to get to the selection field of the device to be connected.



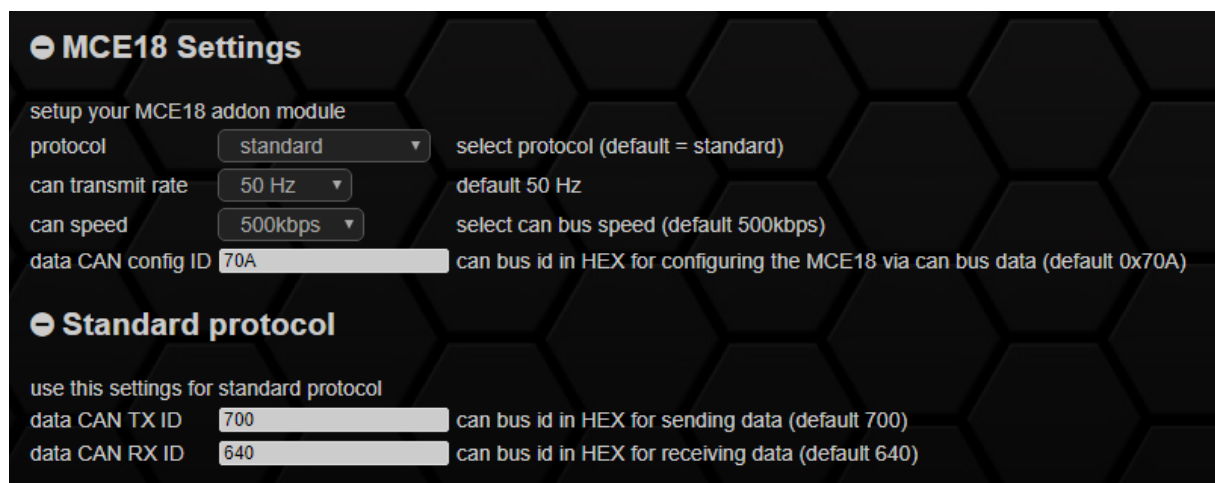
Illustration 2: DSS Startup

Here you click on the selection field for addon (below) and now you will get to the tab overview. If you are not yet connected, only the Connection tab is available. To connect, click on the corresponding COM port and then press "connect". After a successful connection, the following tabs are available:

- *Connection*
- *Settings*
- *Live Value*

4.1 Settings/Default stream

After you have connected your MCE18 to the DSS, you can configure the settings for the Can Transmit under Setup. Here you can find the MCE18 settings and the configuration of the standard protocol.

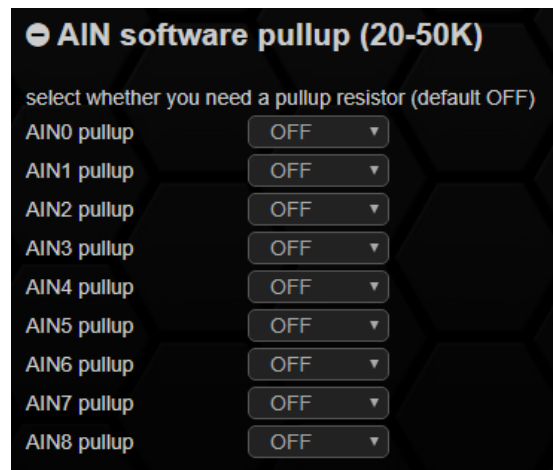
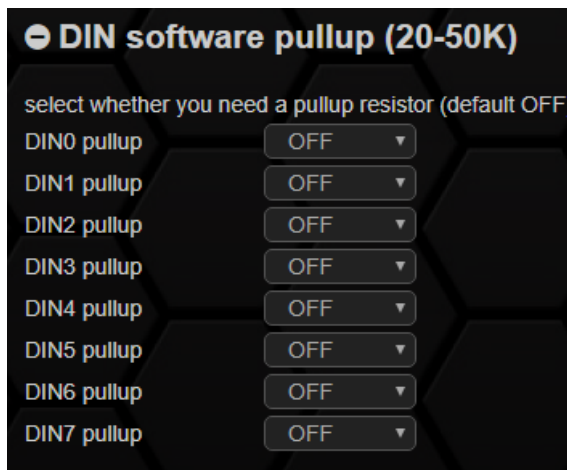


You can set the transfer rate, the Can Bus speed, and the addresses for sending and receiving the Can Bus messages. As always, the Can Bus speed is identical in ECU and MCE18. In the following table you will find the exact addresses of the individual inputs and outputs in the standard protocol.

| Byte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------------|---------|---------|-------------------|-------------------|--------------|-------------------------|---------------|---------|
| TX Base ID | AIN0 | 0-1023 | AIN1 | 0-1023 | AIN2 | 0-1023 | AIN3 | 0-1023 |
| TX Base ID +1 | AIN4 | 0-1023 | AIN5 | 0-1023 | AIN6 | 0-1023 | AIN7 | 0-1023 |
| TX Base ID +2 | AIN8 | 0-1023 | Bit masked DIN0-7 | Bit masked AUX1-3 | Ethanol Temp | Bit masked Freq Enabled | internal Temp | version |
| TX Base ID +3 | FreqIn1 | 0-60000 | FreqIn2 | 0-60000 | FreqIn3 | 0-60000 | FreqIn4 | 0-60000 |

Furthermore, you can also configure the 20-50 kOhm software pullups for the digital and analog inputs in Settings. You can switch between OFF and ACTIVE. The MCE18 has 7 DIN and the CFE18 has 8 DIN.

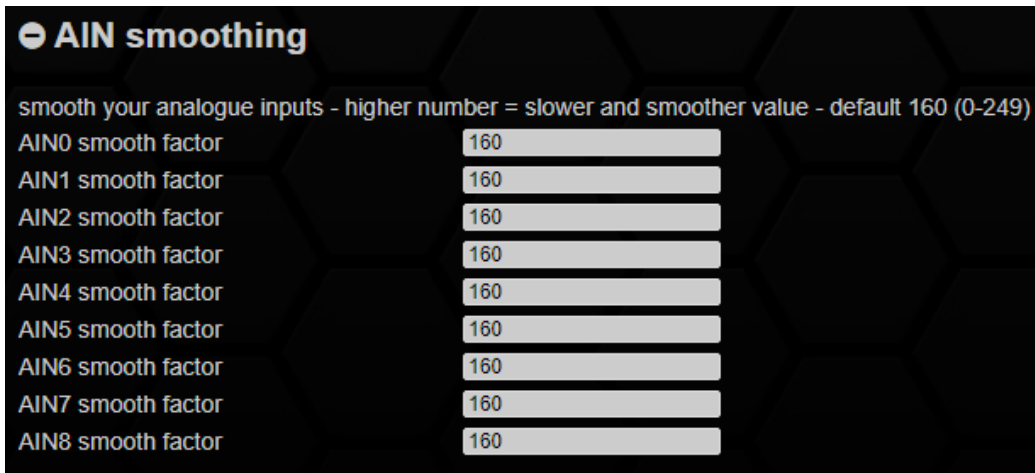
If the internal pull-up is activated, the digital input should be switched to ground. If it is not activated, the input can be switched to 5 or 12V. The "HIGH" state corresponds to a 1 on the Can bus.



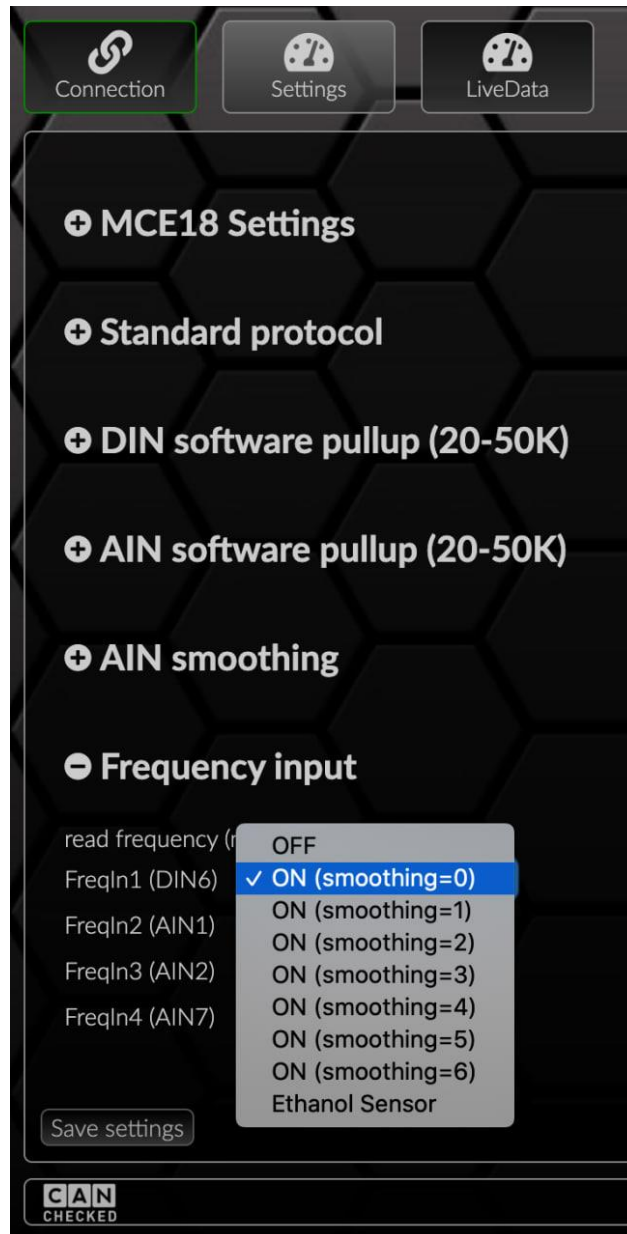
Furthermore, under the item AIN smoothing you will find the possibility to calm your analog inputs.

The switching outputs (AUX) have the following states:

- byte 0: AUX1 (0=off | 1=ON)
- byte 1: AUX1 (0=off | 1=ON)
- byte 2: AUX1 (0=off | 1=ON)



Under Frequency Input you can change some inputs to a frequency input. The maximum input frequency is 65kHz. You can adjust the damping in different levels or select the ethanol sensor (DIN6 only).



4.2 LiveData

Under the LiveData tab you will find the current measured values and statuses of your inputs and outputs. By clicking on the + icon, you can expand the individual inputs and outputs to view the values.

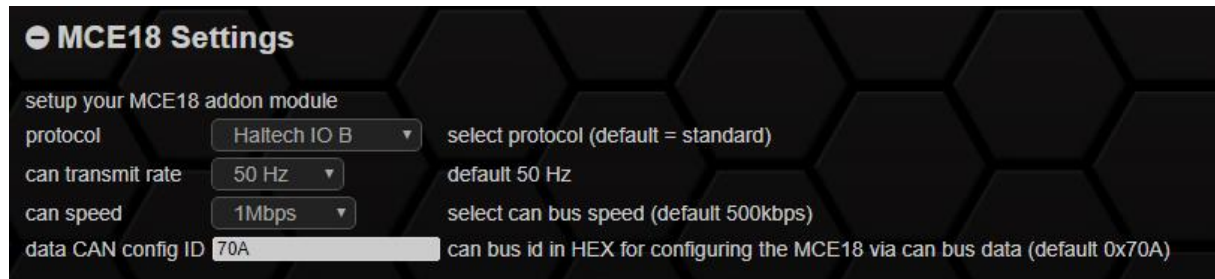
5 Connection Guides

5.1 Haltech

Please activate the Haltech Box to be emulated in the DSS:

- IO-A - 4 analog inputs, 4 switching inputs (ON/OFF), 3 switching outputs (ON/OFF)
- IO-B - 4 analog inputs, 4 switching inputs (ON/OFF), 3 switching outputs (ON/OFF)
- IO-A+B - 8 Analog Inputs, 4 Switching Inputs (ON/OFF), 3 Switching Outputs (ON/OFF)

Furthermore, you must set the CAN bus speed to 1 Mbit/s, as usual with Haltech.



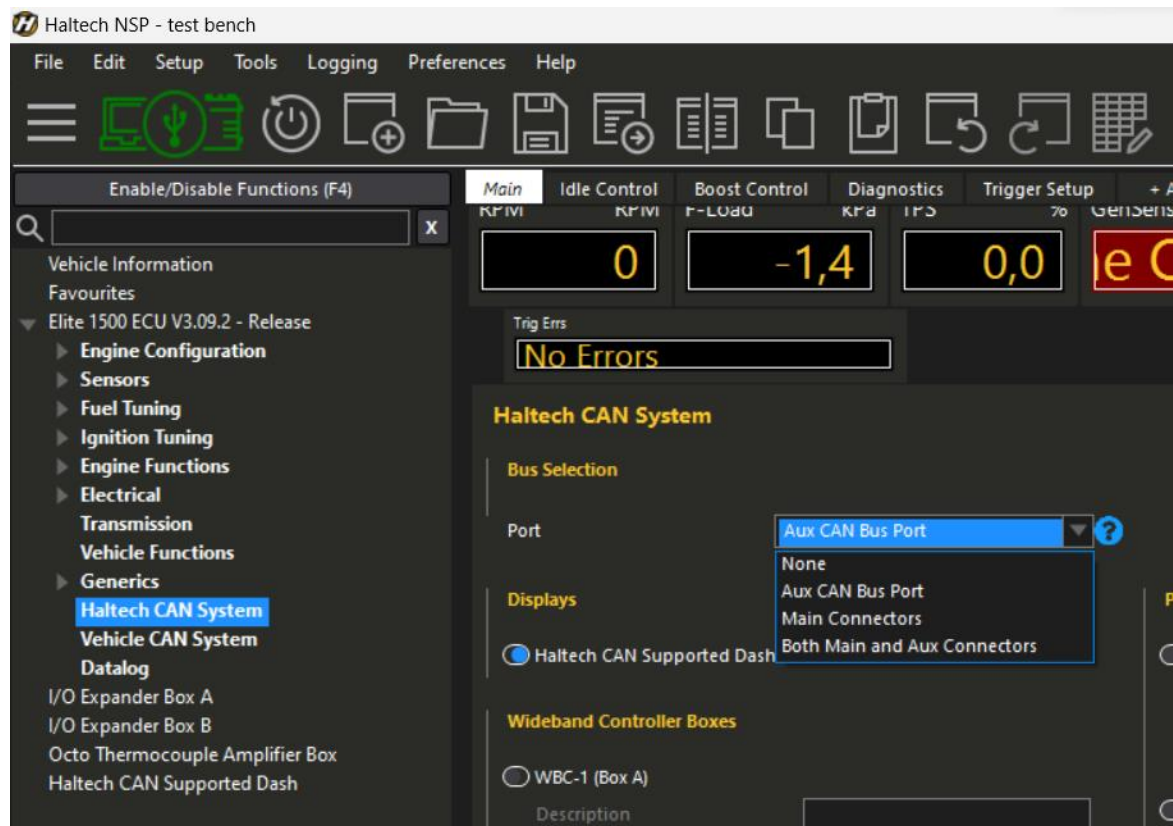
In the table below you will find an assignment of the MCE18 pins to the pins of the IO boxes.

| MCE18 Pin | IO-A | IO-B | IO-A+B |
|---------------|----------|----------|---------------|
| A0 | AV1 | AV1 | IO-A AV1 |
| A1 | AV2 | AV2 | IO-A AV2 |
| A2 | AV3 | AV3 | IO-A AV3 |
| A3 | AV4 | AV4 | IO-A AV4 |
| A4 | - | - | IO-B AV1 |
| A5 | - | - | IO-B AV2 |
| A6 | - | - | IO-B AV3 |
| A7 | - | - | IO-B AV4 |
| A8 | - | - | - |
| D0 | DP1 | DP1 | IO-A DP1 |
| D1 | DP2 | DP2 | IO-A DP2 |
| D2 | DP3 | DP3 | IO-A DP3 |
| D3 | DP4 | DP4 | IO-A DP4 |
| D4 | - | - | IO-B DP1 |
| D5 | - | - | IO-B DP2 |
| D6 | - | - | IO-B DP3 |
| D7 | - | - | IO-B DP4 |
| AUX1 | DPO1 | DPO1 | IO-A DPO1 |
| AUX2 | DPO2 | DPO2 | IO-A DPO2 |
| AUX3 | DPO3 | DPO3 | IO-A DPO3 |
| D6 Frequency* | DP1 freq | DP1 freq | IO-A DP1 freq |

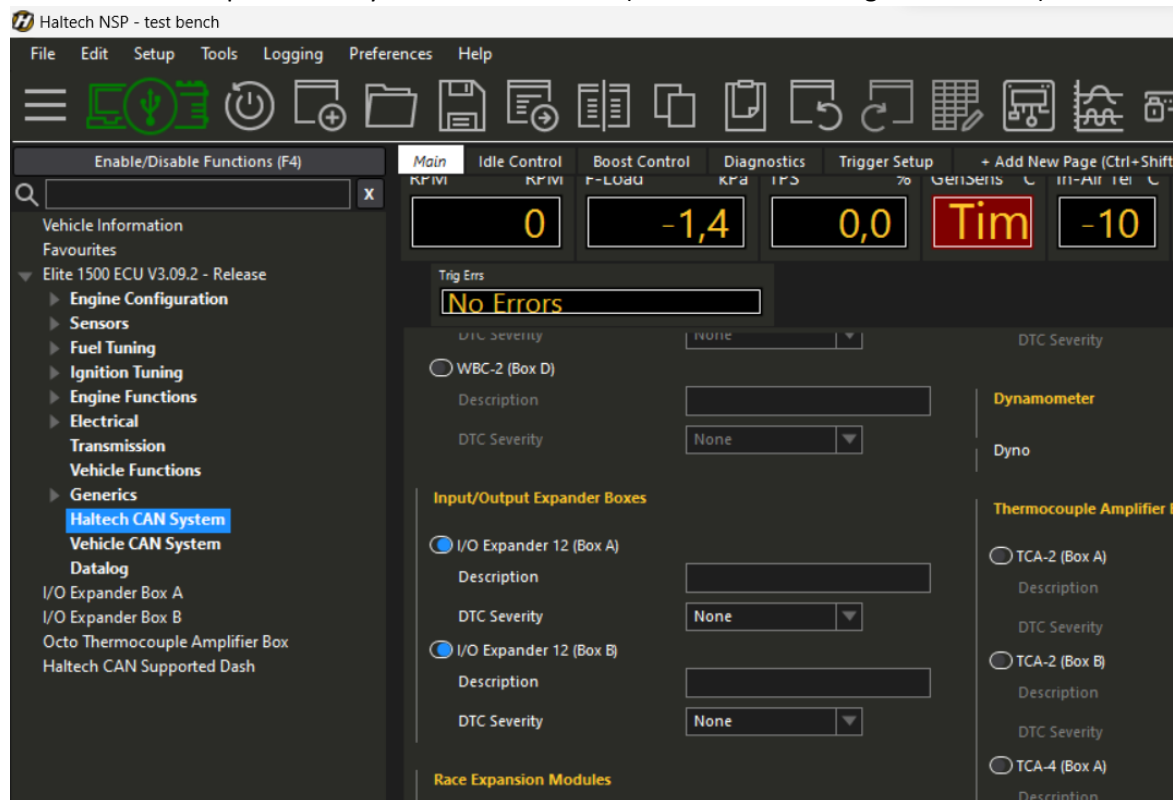
*D6 Frequency: The duty cycle is still determined by the digital input (ON/OFF)

Then it continues in the Haltech NSP software. Here are the steps to be taken:

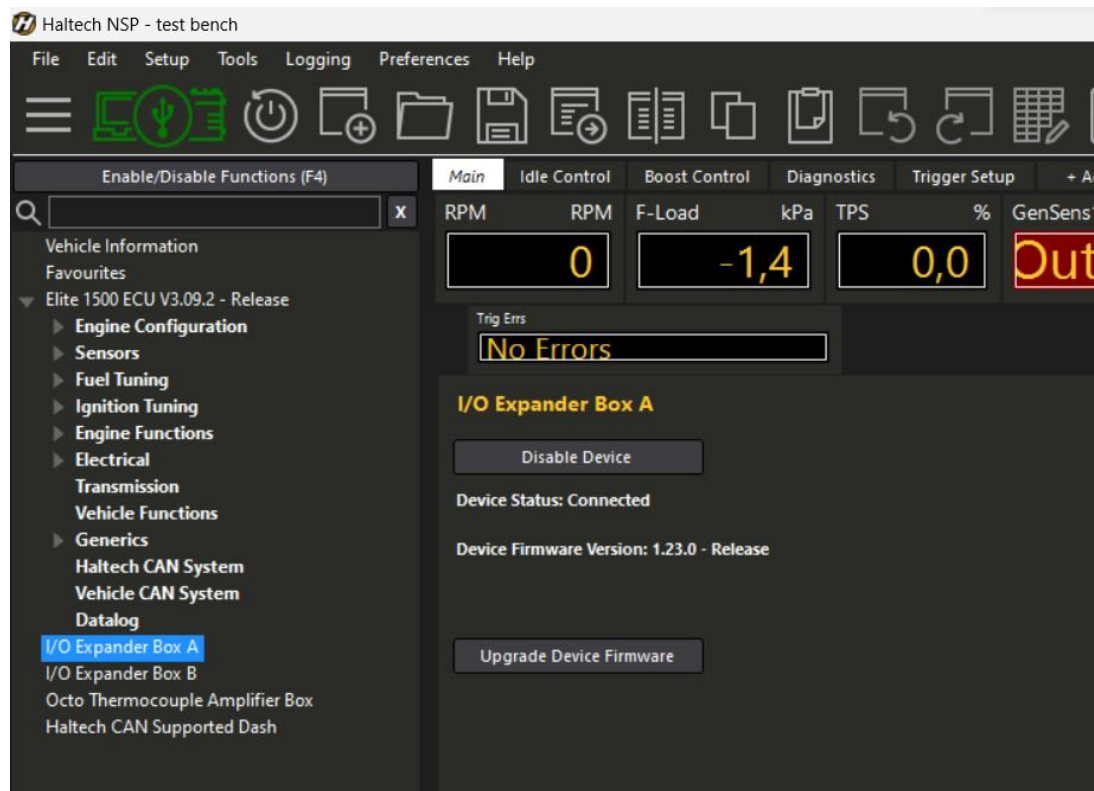
In the drop-down menu, activate the port to which the IO box will be connected.



Then select the expander box you want to emulate (use the same setting as in the DSS).



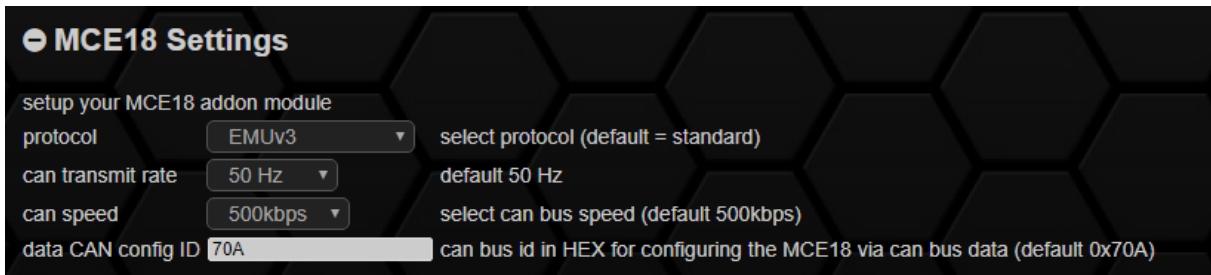
Then all you have to do is check whether your Haltech ECU correctly recognizes the MCE18 as an expander (Status: connected, Firmware: 1.23.0).



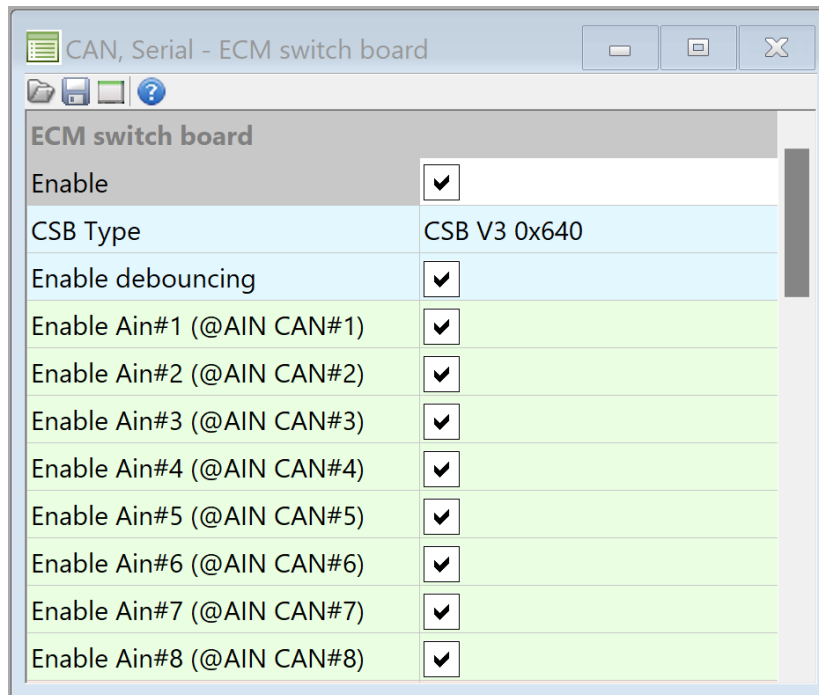
The „Active State“ is ignored for the output configuration. The output will only be switched to ground, when it's active.

5.2 ECUmaster

Please activate the Can Switchboard V3 in the DSS. As always, the Can Bus speed is identical in ECU and MCE.



With the Can Bus Data Format version 3, the EMU supports more analog inputs via Can Bus. Up to 8 analogue inputs can be sent to the control unit. To do this, please activate the ECM switch board in the EMU software under "CAN, Serial". To do this, please tick the box and select "CSB V3 0x640" as the CSB type. Furthermore, the checkmarks for the individual AINs must be set. As usual, all changes are written to the ECU using the "make permanent" button.

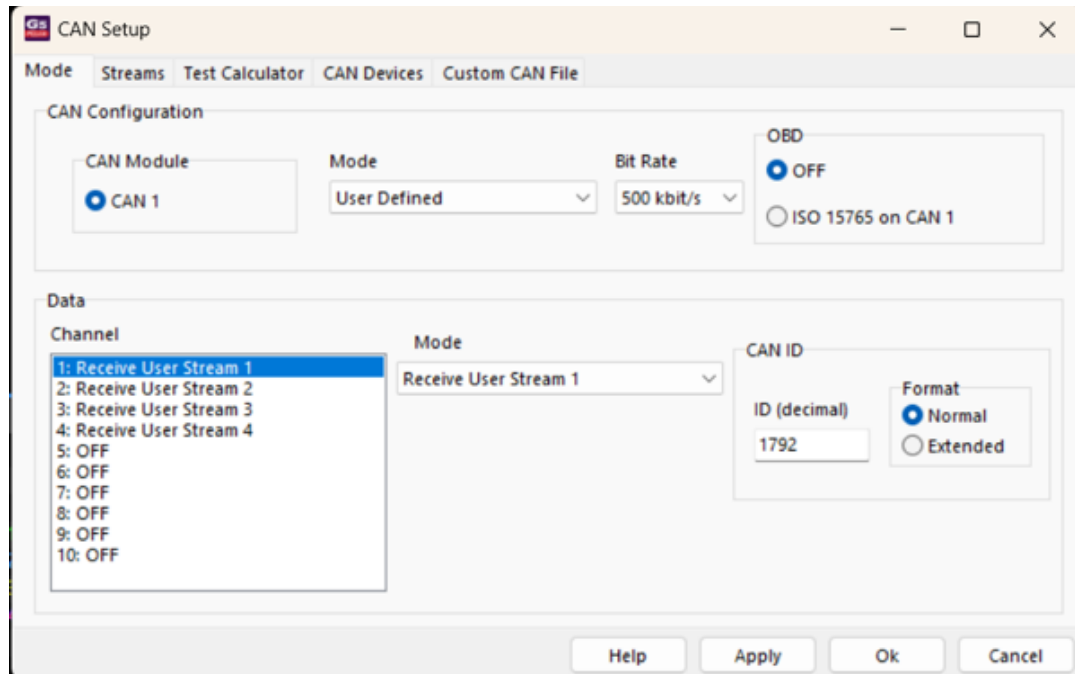


| MCE18 Pin | ECM switch board |
|-----------|------------------|
| A0 | CAN Analog In #1 |
| A1 | CAN Analog In #2 |
| A2 | CAN Analog In #3 |
| A3 | CAN Analog In #4 |
| A4 | CAN Analog In #5 |
| A5 | CAN Analog In #6 |
| A6 | CAN Analog In #7 |
| A7 | CAN Analog In #8 |
| A8 | unused |

5.3 LinkECU

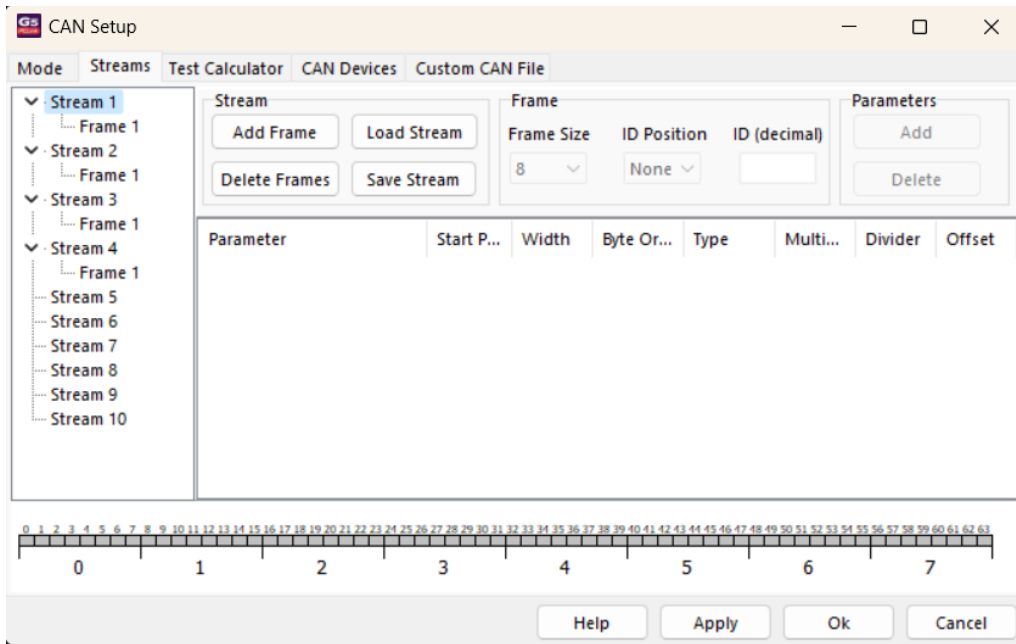
Please activate the standard protocol in the DSS. As always, the Can Bus speed must be set identically in the ECU and MCE. The CAN TX ID remains set to 0x700 by default.

In the Link software under "ECU Controls" => "CAN Setup" activate four "Receive User Streams" with different CAN IDs:



- Stream 1: 1792
- Stream 2: 1793
- Stream 3: 1794
- Stream 4: 1795

In the "Streams" tab, import the .lcs files provided by us for the respective streams via "Load Stream":



You can find the streams here:

<https://www.canchecked.de/downloads/mce18-multifunction-can-bus-extension/>

If you want to connect the ethanol sensor to the MCE18, activate the ethanol option on frequency input 1. You will find the temperature as "Can Freq 8" and the ethanol content as "Can Freq 1" Make sure to subtract 50 from the ethanol content (Streams => Stream 4 => Frame 1 => "Can Freq 1" => Offset = -50).

| Channel Name | Value |
|-----------------|----------|
| CAN An 1 | 0.000 |
| CAN An 2 | 0.000 |
| CAN An 3 | 0.000 |
| CAN An 4 | 0.000 |
| CAN An 5 | 0.000 |
| CAN An 6 | 0.000 |
| CAN An 7 | 0.000 |
| CAN An 8 | 0.000 |
| CAN DI 1 | Inactive |
| CAN DI 2 | Inactive |
| CAN DI 3 | Inactive |
| CAN DI 4 | Inactive |
| CAN DI 5 | Inactive |
| CAN DI 6 | Inactive |
| CAN DI 7 | Inactive |
| CAN Freq 1 (Hz) | 50.0 |
| CAN Freq 2 (Hz) | 0.0 |
| CAN Freq 3 (Hz) | 0.0 |
| CAN Freq 4 (Hz) | 0.0 |
| CAN Freq 8 (Hz) | 24.0 |

To calibrate an analog input for your sensor, use "Multiplier", "Divider" and "Offset".

The CANchecked fuel/oil pressure sensor (0 to 10bar/1000kpa) is used as an example - a value in kpa is generated here:

- Multiplier: 1250
- Divider: 1023
- Offset: -125

5.4 Motec (BETA!)

Change the protocol to "Motec E888". By default, the Can Bus data is transmitted with 0xF0. If you want to connect two MCE18 in the Can Bus, change the "data CAN TX ID" of the second device to 0xF8 and you can use both devices in parallel.

Change the transmission speed to 200Hz.

Follow the Motec E888 instructions for setup. Here is the pinout:

| MCE18 Pin | E888 |
|------------------|---------------------|
| A0 | AV1 |
| A1 | AV2 |
| A2 | AV3 |
| A3 | AV4 |
| A4 | AV5 |
| A5 | AV6 |
| A6 | AV7 |
| A7 | AV8 |
| A8 | TC1 (0.001 scaling) |
| Freq1 (D6) | Freq1 |
| Freq2 (AIN1) | Freq2 |
| Freq3 (AIN2) | Freq3 |
| Freq4 (AIN7) | Freq4 |
| EthanolTemp | TC8 |
| D0 | Dig1 |
| D1 | Dig2 |
| D2 | Dig3 |
| D3 | Dig4 |
| D4 | Dig5 |
| D5 | Dig6 |

5.5 MaxxECU and others

Please enable the standard protocol in the DSS. As always, the Can Bus speed is identical in ECU and MCE.

All further steps to use the MCE18 with your MaxxECU can be found in the MaxxECU Help:

https://www.maxxecu.com/webhelp/can-external_devices-canchecked_mce18.html.

6 FAQ

In this chapter, recurring questions are collected, and solutions are offered.

6.1 Does the MCE18 come pre-configured

The MCE18 comes with our standard configuration. This is described in chapters 4.1 described. It is possible to change these default values with the DSS.

6.2 My inputs influence each other

With versions 1 and 2, it can happen that unused analog inputs change with changes to adjacent inputs. This behavior is normal. If this is not desired, it can be avoided by wiring the unused inputs to ground.

6.3 Unable to connect to DSS

If you can't connect your MCE to the DSS despite wiring the USB correctly, there could be two other reasons. The first cause is the lack of the appropriate driver. You can find the information about this in chapters 4. If the driver is up-to-date and the COM port is correctly detected, the cause is probably different. Cause two: The firmware on your MCE18 is outdated and does not yet support a DSS connection. In this case, an update of your firmware is necessary. The corresponding steps are described in chapter 4 described.

6.4 How to Choose the Right Offset, Multiplier, Divider and Resolution

The analog inputs provide 10bit resolution and thus values from 0 to 1023. The value must be converted in the control unit. All values are "unsigned little endian"

Example 1:

Value to display: AIN1 Voltage 0-5V

Can ID: 0x700 Byte0+1 Multiplier: 5; Divisor: 1023; Offset: 0

or

Multiplier: $(5/1023=)$ 0.004887585533; Divisor: 1; Offset 0

Example 2:

Value to be displayed: AIN7 TCC01 Thermocouple Converter Type K 0-1250 Degree Celsius

Can ID: 0x702 Byte6+7 Multiplier: 1250; Divisor: 1023; Offset: 0

or

Multiplier: $(1250/1023=)$ 1.2218963832; Divisor: 1; Offset: 0

You are also welcome to download and use our tool: <https://www.canchecked.de/updater/maxxecu-sensor-calculation.xlsx>

6.5 How do I connect speed inputs?

The MCE18 is not designed for the connection of speed inputs. However, it has 4 frequency inputs for ethanol, turbospeed or Hall sensors. How do I change the Can Bus settings?

Changing the Can Bus settings is done via the DSS. The detailed process is described in chapter 4.1.

6.6 How do I change the Can Bus settings?

The Can Bus settings are changed via the DSS. The detailed process is described in chapter 4.1.

6.7 Can I put 12V on the DIN

On CFE18 and MCE18, no 12V may be added to the digital inputs.

6.8 Supports the MCE18 29 bit can IDs

An integration of 29 bit Can IDs has not yet taken place.

6.9 At what rate is the data recorded?

Different sampling rates are possible on the MCE18. You can adjust the frequency from 5 to 250 Hz. A sampling rate of 50 Hz is recommended to minimize the Can Bus load.

6.10 How to connect a Flexfuelsensor

Connect the flex fuel sensor with the signal to DIN 6. Ground and 5V can be taken directly from the MCE18. An external resistor is not necessary, it is sufficient to activate the internal pull-up under Settings. A frequency of 50 Hz corresponds to 0% ethanol. A frequency of 150Hz is 100% ethanol. The multiplier for the conversion is 1 and the offset is -50. The temperature read out from the Flex Fuel sensor is also supported, transmitted via Can Bus and visible in the DSS.

6.11 Where do I connect ground switches?

Groundswitches can be connected to the digital inputs. To do this, please activate the internal pull-up in the DSS.

7 Document Changelog

Rev 1.0 – initial Version for Firmware 0.9

Rev 1.1 – FreqIn added

Rev 1.2 – Updated EMU and FAQ

Rev 1.3 – Updated FlexFuel FAQ