CAN CHECKED

MCE/CFE18 Manual

Content

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 four 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 and 4 devices, this is engraved on the case (V3/V4).

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 *jumpers*

Your MCE18 itself has a status LED, an AMP Superseal connector and a MicroUSB port on the board (version 3 and 4). 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.

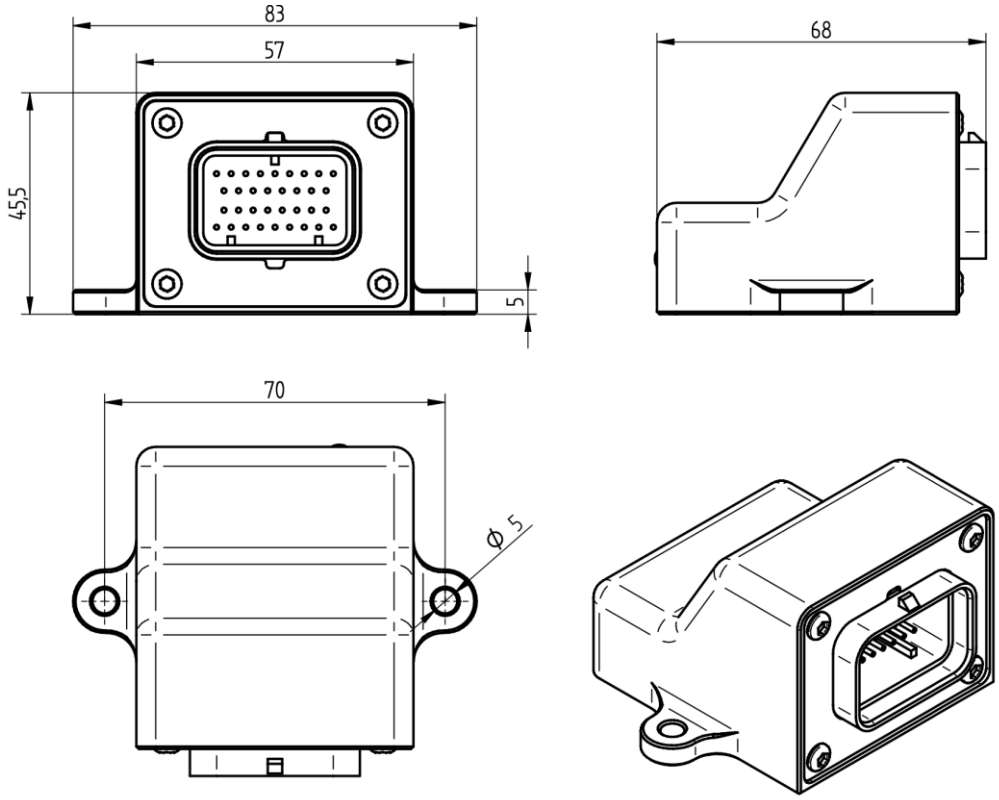
The digital inputs can optionally be equipped with an internal pull-up resistor (20-50 kOhm). The setting is done in the DSS. You can find more information about this in chapters 4.

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

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

JP 1:
Can Bus Termination 120 Ohm (all versions)
JP 2:
AIN 1 (all versions), AIN 2 (V1 and V2 only) 1 kOhm
JP 3:
AIN 7 (all versions) 1 kOhm

The following illustration shows the dimensions of the MCE18 V1-V3.

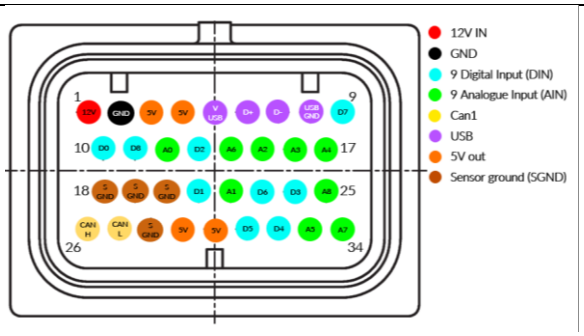
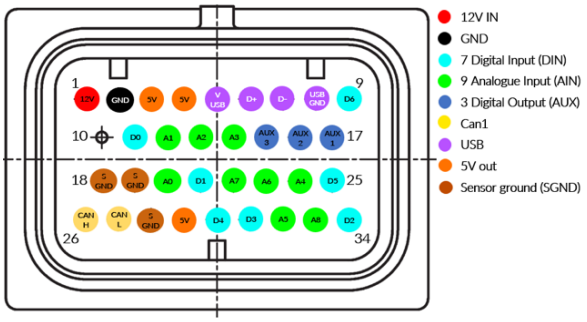
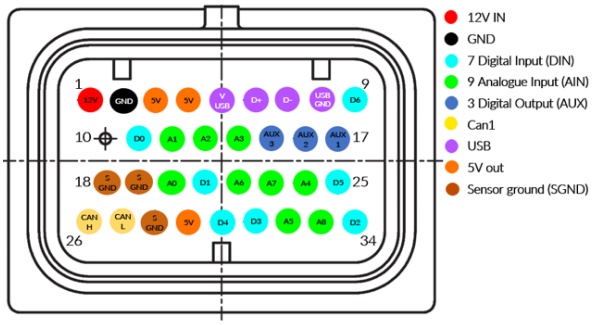


2 Connection of the plugs

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	v0.7 – v0.7a 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.	
2	v0.8 – v0.8a ATTENTION: Pinout identical to V3, only A6 and A7 are swapped. Firmware: CFE18v0.8xx MCE18_v2	
3	v0.8b – today Firmware: CFE18v0.9xx MCE18_v3	

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.

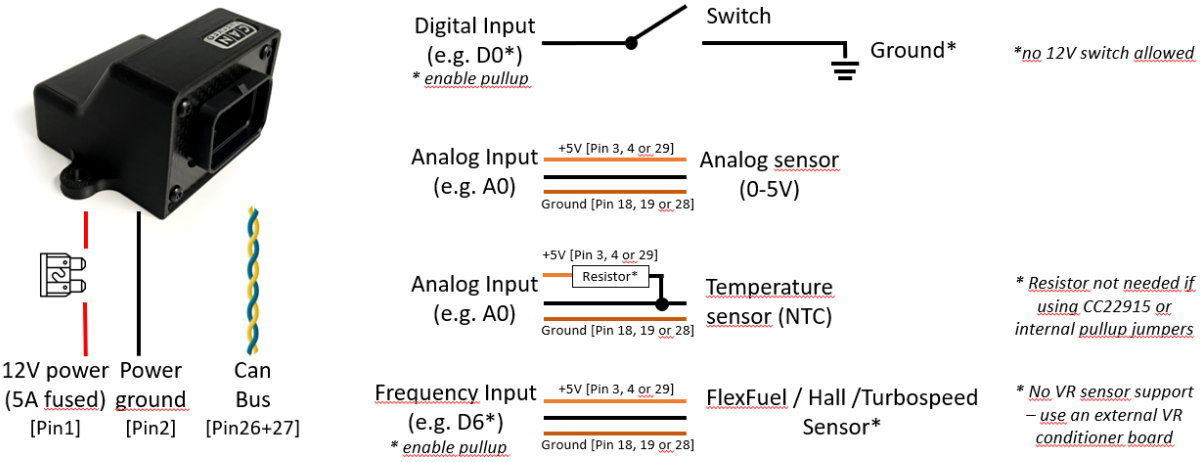
The power supply to operate the analog sensors can also be realized directly via the MCE18. During operation, 5V is applied to the corresponding pins, and you can obtain the sensor ground via the "S-GND". The maximum current of 0.5 amps should not be exceeded.

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. All the other devices can be connected to the DSS without any problems.

In the following image you will find a brief overview of how to connect various sensors to your MCE18. For more detailed information on the connection, please refer to this manual.



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.

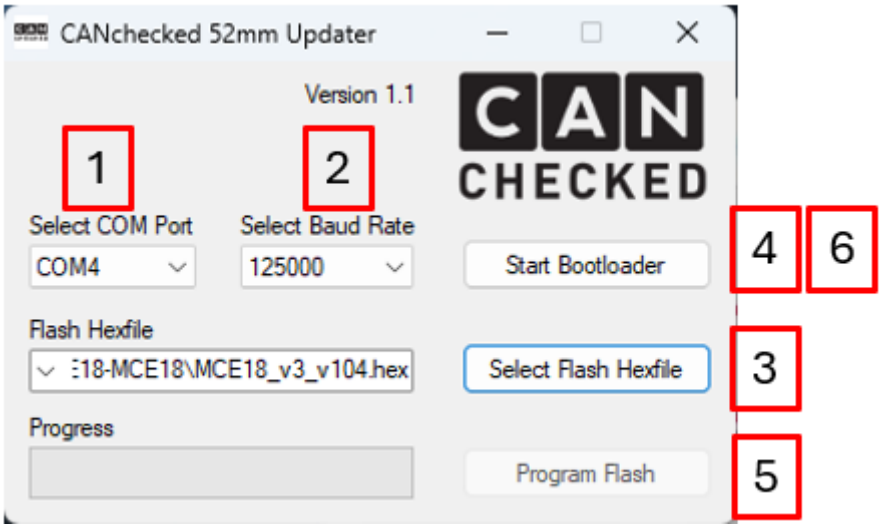


Illustration 2: interface of the Updater

1.) Once you have started the updater, select the appropriate COM port.

2.) Set the baud rate to 125000.

3.) Select the previously downloaded hex file via “Select Flash Hexfile.”

4.) Then click on “Start Bootloader.” The software will now connect to the MCE18.

5.) As soon as the button turns green, press the “Program Flash” button. The “Progress” bar will now run through.

6.) After clicking on “Exit Bootloader,” you can disconnect the device and the update is complete.

4 Configuring via 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** (https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers) you need for **Windows** 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.

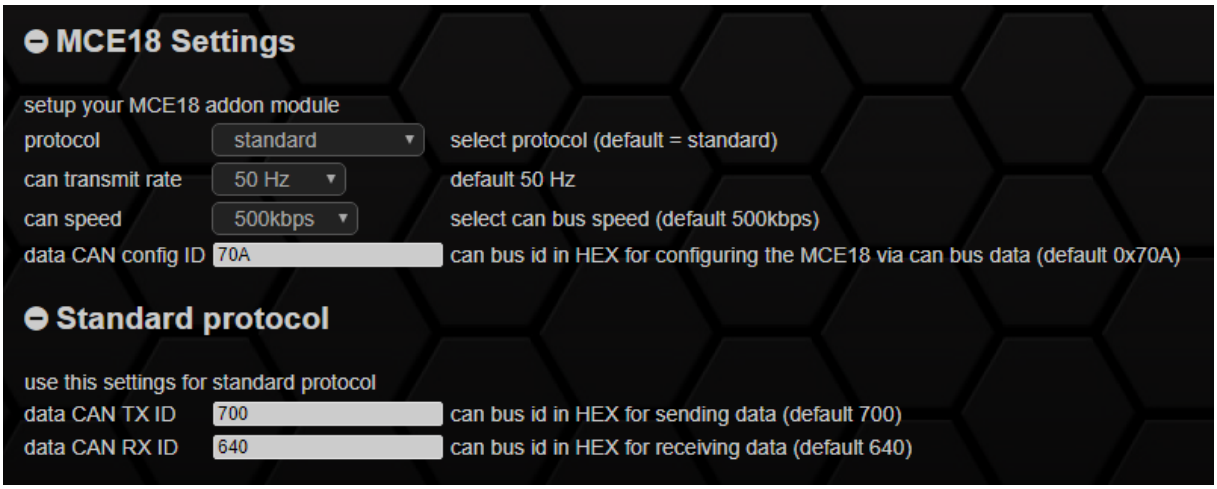
Illustration 2: DSS Startup

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. By default, the transmit base ID is 0x700.

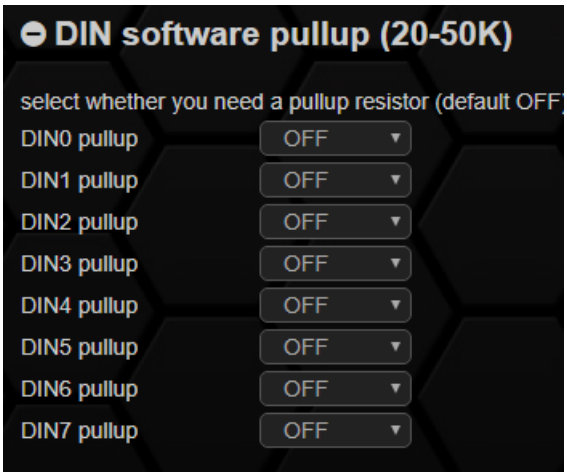
Byte	0	1	2	3	4	5	6	7
TX Base ID	AIN0	0-1023/ 0-5000mV	AIN1	0-1023/ 0-5000mV	AIN2	0-1023/ 0-5000mV	AIN3	0-1023/ 0-5000mV
TX Base ID +1	AIN4	0-1023/ 0-5000mV	AIN5	0-1023/ 0-5000mV	AIN6	0-1023/ 0-5000mV	AIN7	0-1023/ 0-5000mV
TX Base ID +2	AIN8	0-1023/ 0-5000mV	Bit masked DIN0-7	Bit masked AUX1-3	Ethanol Temp	Bit masked Freq Enabled	Inter-nal Temp	version
TX Base ID +3	Freq-In1	0-60000	FreqIn2	0-60000	FreqIn3	0-60000	FreqIn 4	0-60000

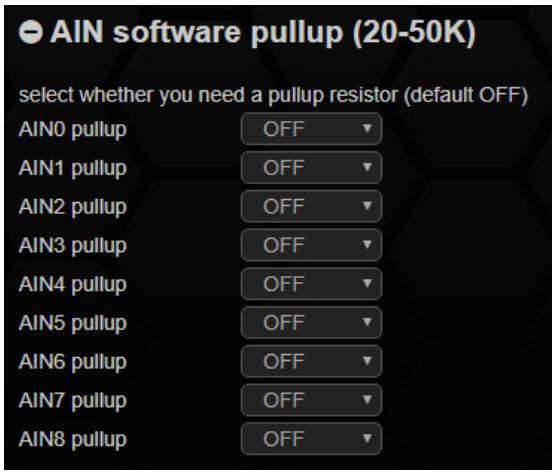
By default, the receive base ID is 0x640, with 0=OFF and 1=ON.

Byte	0	1	2	3	4	5	6	7
RX Base ID	AUX1	AUX2	AUX3	unused	unused	unused	unused	unused

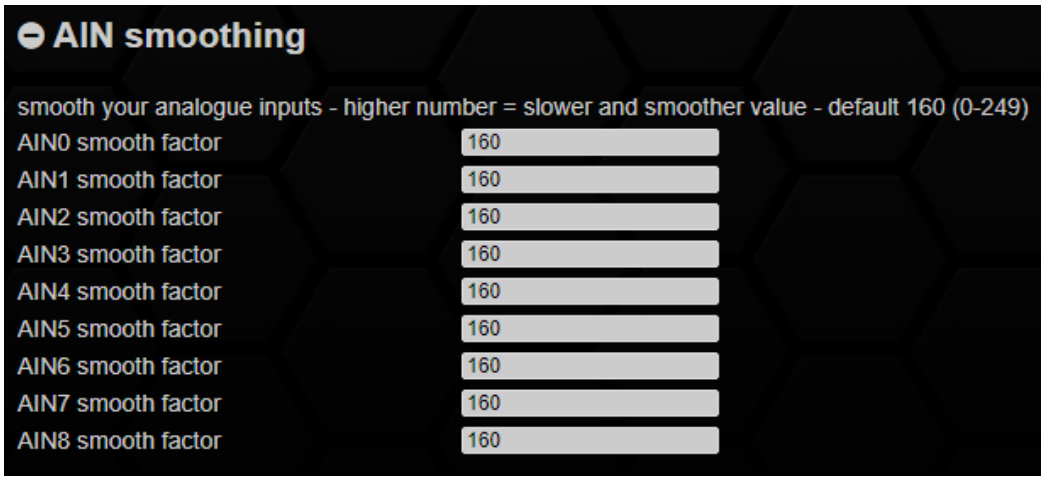
Furthermore, you can also configure the 20-50 kOhm software pullups for the digital and analog inputs in Settings. You can switch between OFF and ACTIVE. The MCE18 has 7 DIN and the CFE18 has 8 DIN.

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 5V. The "HIGH" state corresponds to a 1 on the Can bus.

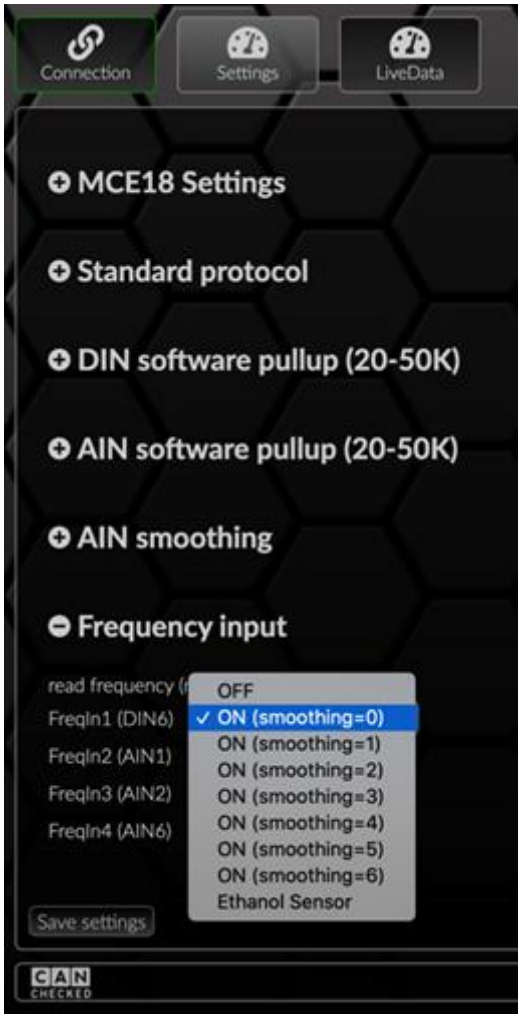




Furthermore, under the item AIN smoothing you will find the possibility to calm your analog inputs.



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 Configuration via CAN bus frames

You can configure the MCE18/CFE18 not only with our DSS, but also directly via Can Bus frames.

The following values can be adjusted via Can Bus:

Data CAN ID:	with which Can ID the data is sent	Default: 0x700
Config CAN ID:	with which CAN ID the board can be configured **RESTART required**	Default: 0x70A
Frequency:	with which the data is sent via the CAN bus in milliseconds	Default: 10ms = 100Hz
Can Bus Speed:	1=125kbps 2=250kbps 3=500kbps 4=1Mbit **RESTART required**	Default: 3 = 500kbps
Mode:	0=CANchecked Legacy 0-1023 1=ECUmaster EMUv3 2=Haltech IOB 3=Haltech IOAB 4=Motec Legacy 5=Haltech IOA, 6=Motec E816, 0x0F0 7=Motec E816, 0x0F4 8=Motec E816, 0x0F8 9=Motec E816, 0x0FC 10=CANchecked (0-5000mV)	Default: 0
***Smoothing:**	Smoothing of analogue inputs, configurable per input (0-249)	Default: 160 249 = maximum smoothing
****Frequency Input:**	Smoothing and activation of the frequency input	Default: 0 = OFF (no frequency input) 249 = maximum smoothing
****Pullup:**	Activation of an internal pull-up resistor (20K-50K) on analogue and digital inputs	Default: 1 = resistor active (0 = resistor inactive)

**from software version 3*
***from software 0.8a*

When sending messages for reconfiguration, byte 0 must always start with 0x0C, byte 1 with 0x0A and byte 2 (feature) with 0x0A -> see examples

After successful reconfiguration, the CFE18/MCE18 sends back the same frame with ID+1 as confirmation.

Features configurable via Can Bus:
CAN ID: 0x0A (high byte) + 0x0B (low byte)
Config CAN ID: 0x0C (high byte) + 0x0D (low byte)
Frequency: 0x0E
Can Bus Speed: 0x0F
Mode: 0x10
Receive ID (RX): 0x12 (high byte) + 0x13 (low byte) **supported from CFE18 v0.8 onwards**

Example 1: Change Transmit ID to 0x600

Can ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x70A	0x0C	0x0A	0x0A	0x06	unused			
0x70A	0x0C	0x0A	0x0B	0x00	unused			

Example 2: Change frequency to 50Hz (20ms = 0x14 in hex)

Can ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x70A	0x0C	0x0A	0x0E	0x14	unused			

Example 3: Change Can Bus speed to 1Mbit

Can ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x70A	0x0C	0x0A	0x0F	0x04	unused			

Example 4: Change to EMUv3 protocol

Can ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x70A	0x0C	0x0A	0x10	0x01	unused			

Example 5: Change smoothing of AIN1 to 4 (=160)

Can ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x70A	0x0C	0x0A	0x14	0xA0	unused			

Addresses of the AINs: 0x14 = AIN1, 0x15 = AIN2, 0x16 = AIN3, 0x17 = AIN4, 0x18 = AIN5, 0x19 = AIN6, 0x1A = AIN7, 0x2B=AIN8

Examplel 6: Activate freuency input for DIN6 and smoothing to 230

Can ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x70A	0x0C	0x0A	0x11	0xE6	unused			

Addresses of the DINs: 0x11 = FreqIn1 DIN6, 0x06 = FreqIn2 AIN1, 0x07 = FreqIn3 AIN2, 0x08 = FreqIn4 AIN7

Example 7: Activate pullup resistor =20K-50K of DIN6

Can ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x70A	0x0C	0x0A	0x2E	0x01	unused			

Addressen of the pins: 0x1E = AIN1, 0x1F = AIN2, 0x20 = AIN3, 0x21 = AIN4, 0x22 = AIN5, 0x23 = AIN6, 0x24 = AIN7, 0x25=AIN8, 0x28=DIN0, 0x29=DIN1, 0x2A=DIN2, 0x2B=DIN3, 0x2C=DIN4, 0x2D=DIN5, 0x2E=DIN6, 0x2F=DIN7

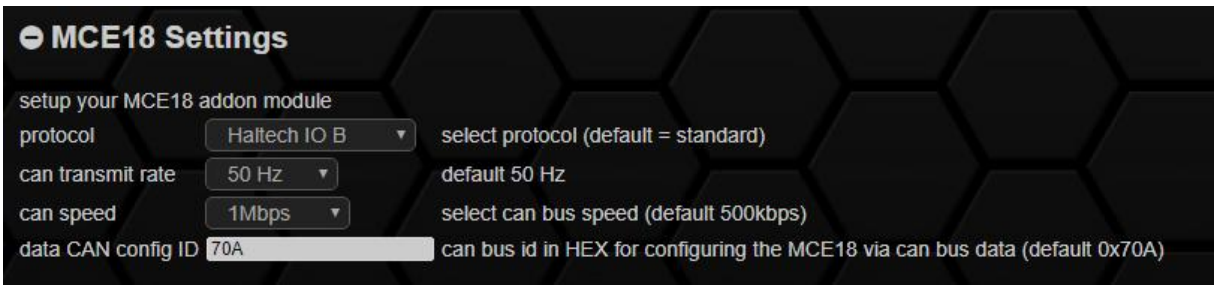
6 Connection Guides

6.1 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.

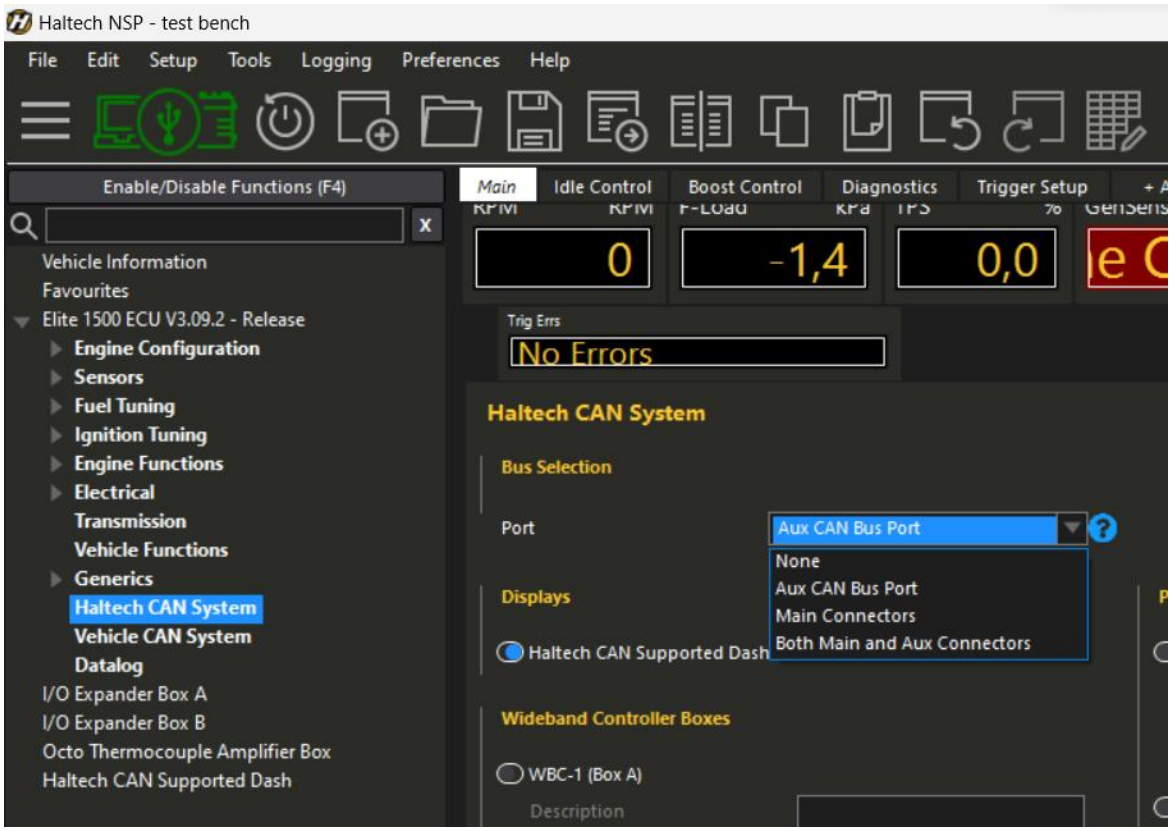
MCE18 Pin	**IO-A**	**IO-B**	**IO-A+B**
A0	AV1	AV1	IO-A AV1
A1	AV2	AV2	IO-A AV2
A2	AV3	AV3	IO-A AV3
A3	AV4	AV4	IO-A AV4
A4	-	-	IO-B AV1
A5	-	-	IO-B AV2
A6	-	-	IO-B AV3
A7	-	-	IO-B AV4
A8	-	-	-
D0	DP1	DP1	IO-A DP1

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

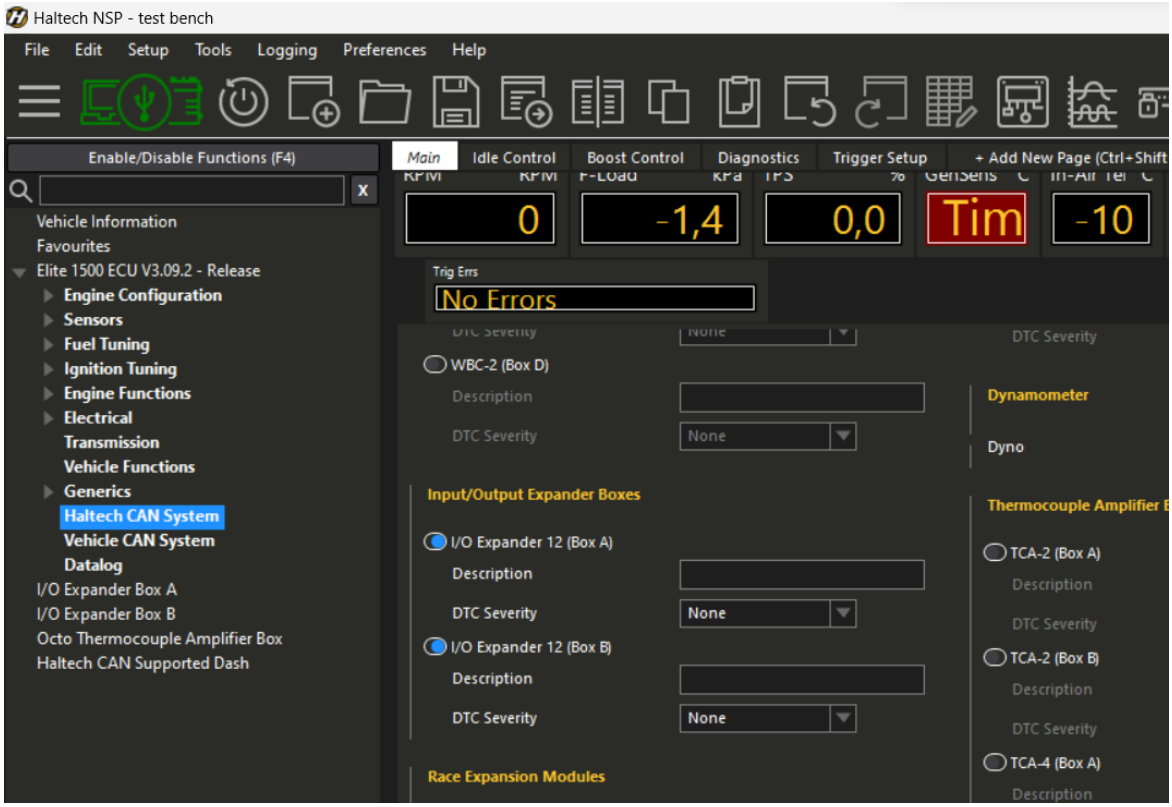
*D6 Frequency: The duty cycle is still determined by the digital input (ON/OFF)

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

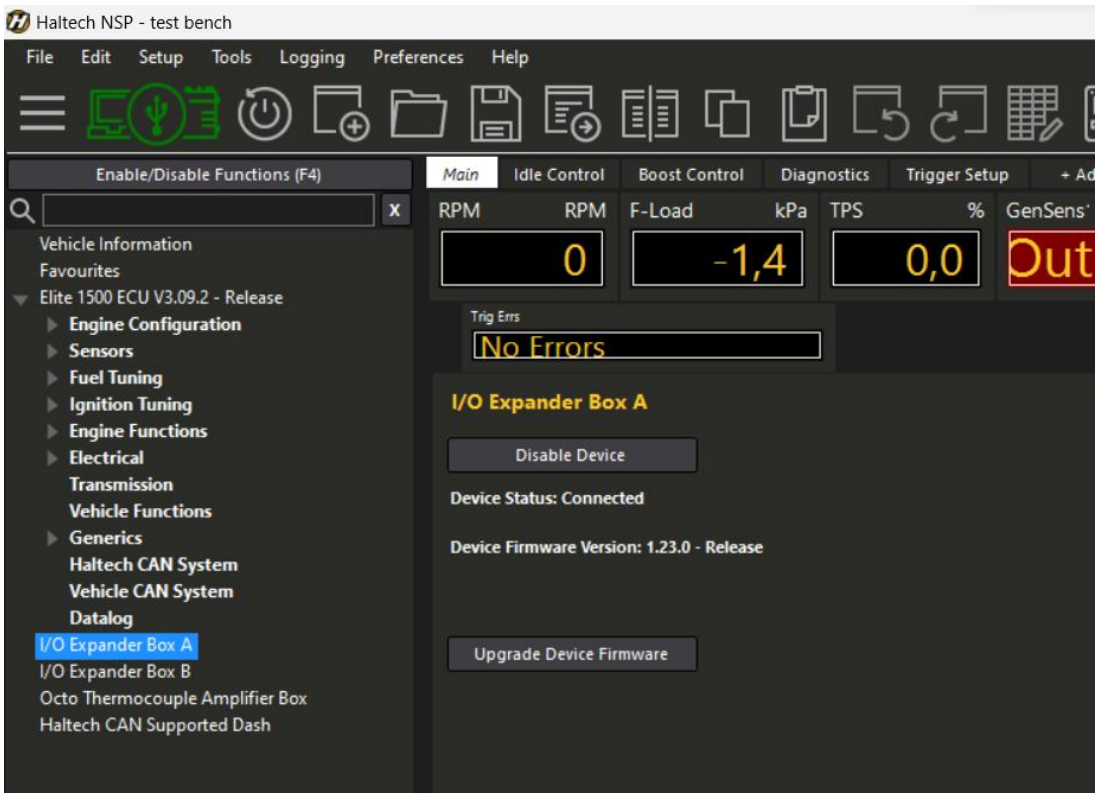
In the drop-down menu, activate the port to which the IO box will be connected.



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



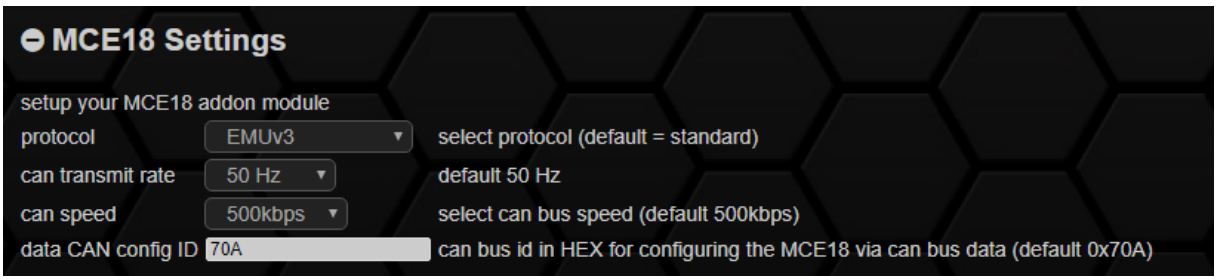
Then all you have to do is check whether your Haltech ECU correctly recognizes the MCE18 as an expander (Status: connected, Firmware: 1.23.0).



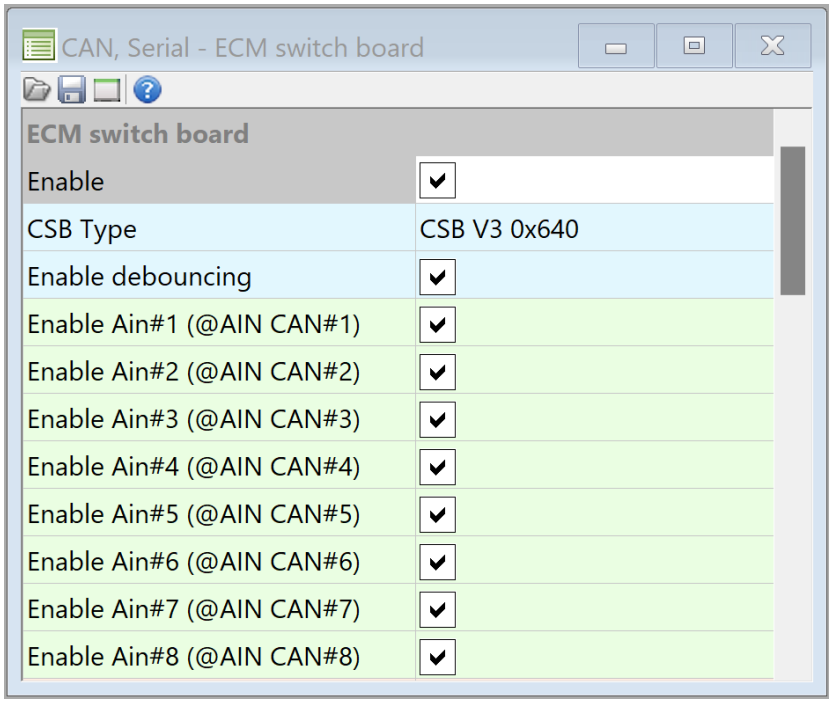
The „Active State“ is ignored fort he output configuration. The output will only be switched to ground, when it’s active.

6.2 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.

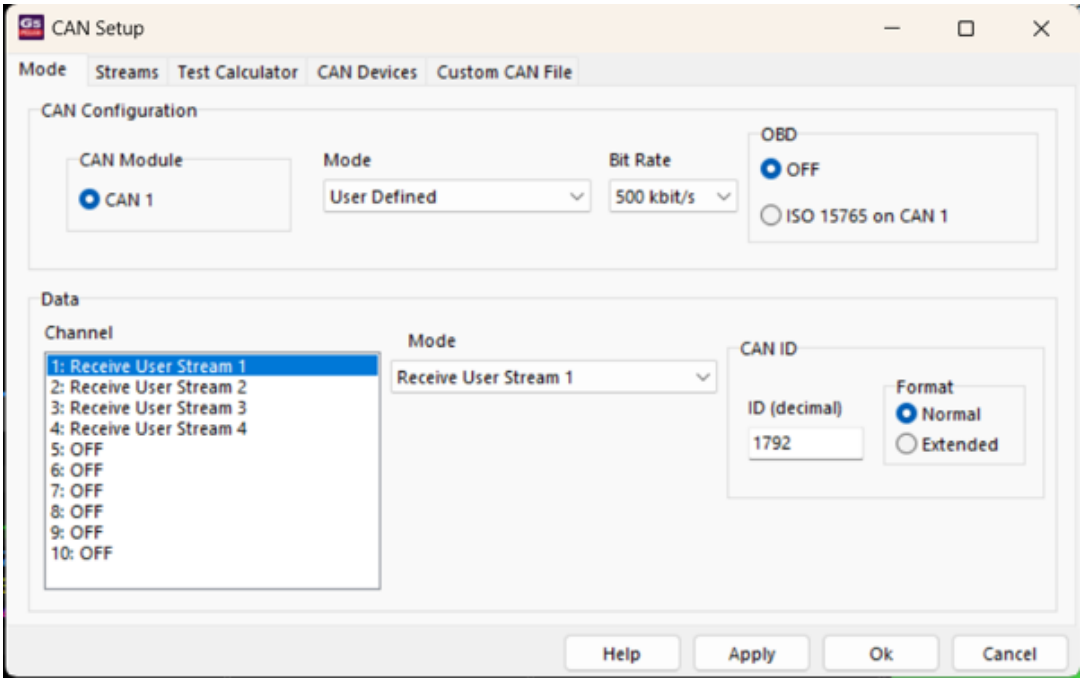


MCE18 Pin	ECM switch board
A0	CAN Analog In #1
A1	CAN Analog In #2
A2	CAN Analog In #3
A3	CAN Analog In #4
A4	CAN Analog In #5
A5	CAN Analog In #6
A6	CAN Analog In #7
A7	CAN Analog In #8
A8	unused

6.3 LinkECU

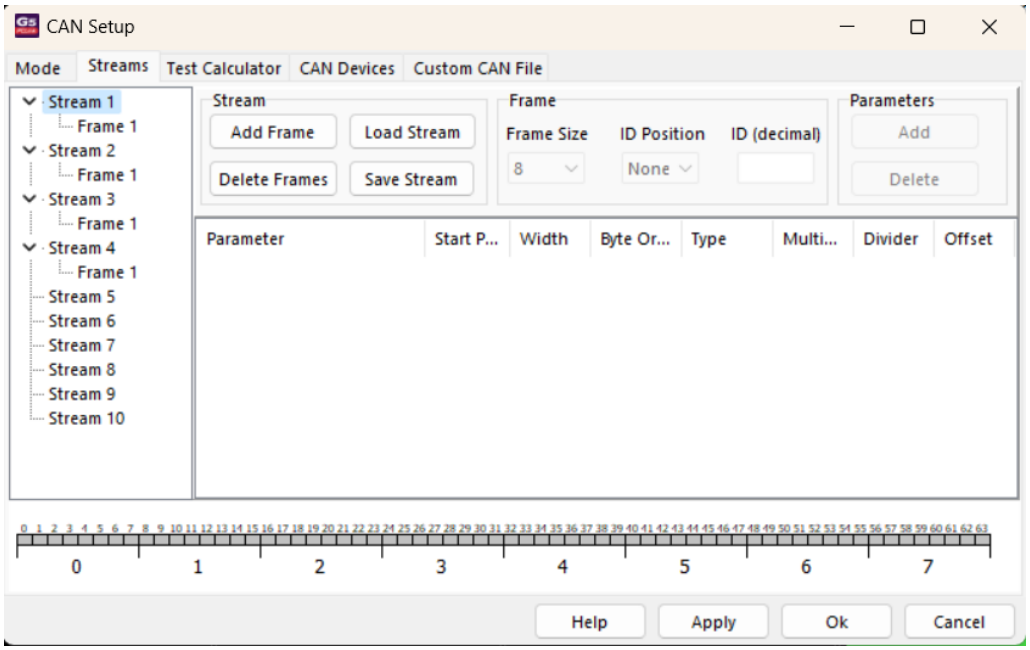
Please activate the standard protocol in the DSS. As always, the Can Bus speed must be set identically in the ECU and MCE. The CAN TX ID remains set to 0x700 by default.

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":

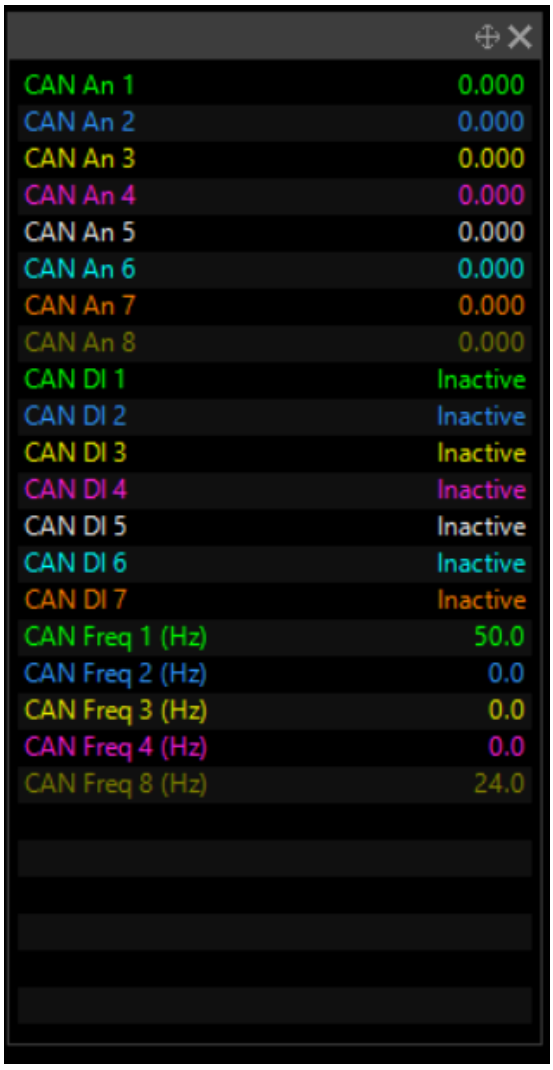


You can find the streams here:

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).

ATTENTION: According to LINKEcu, the ethanol content is a critical value, which is why it can only be displayed via the MCE18 and does not act as an input for the fuel table in the ECU. If this is required, the ethanol sensor must be connected to the ECU.



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

6.4 Motec

Set the protocol to 'Motec E888'. By default, the Can Bus data is transmitted with 0xF0. If you want to connect two CFE18/MCE18 devices to the Can Bus or if there are overlaps in the Can Bus identifiers, change the 'data CAN TX ID' of the second device 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
Ethanol Content	AV15 (0.5V = 0%, 4.5V = 100%)
Ethanol Temperature	TC8 (0V=0°C, 5V=150°C)
D0	Dig1
D1	Dig2
D2	Dig3
D3	Dig4
D4	Dig5
D5	Dig6
AUX1	Output1
AUX2	Output2
AUX3	Output3

6.5 MaxxECU

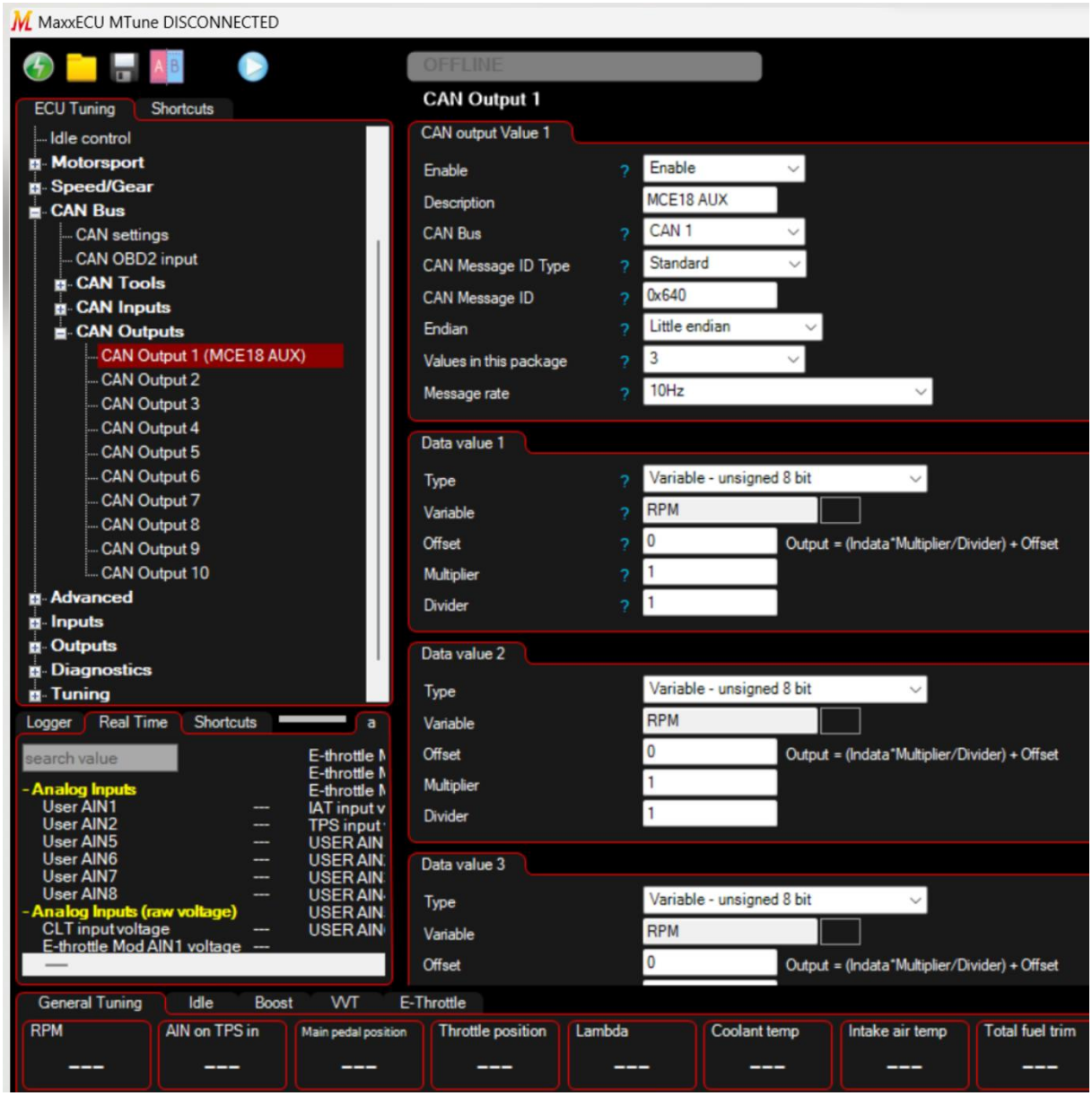
Please enable the standard protocol in the DSS. As always, the Can Bus speed is identical in ECU and MCE.

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.

Easiest way to get everything going is to use our preset .save file and just assign the functions in there: https://www.canchecked.de/downloads/mce18-multifunction-can-bus-extension/

When you want to use the outputs of the MCE18, define a "Can Output" under "CAN Bus" => "CAN Outputs". You might need your own variables. When the variable is 1, the output is active. When 0, the outputs is inactive. Set all variables to "unsigned 8 bit"



6.6 Others

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

6.7 CANchecked Data Display

To connect the MCE18 to one of our displays, the MCE18_v3.TRI must be loaded on the display or added to your active TRI/TRX. The MCE18 only sends the 0-1023 ADC values to the Can Bus, these must be mapped to the actual measured values in the data display accordingly. Initcalc and Initoffset are used for linear sensors (BST01, FLP01, TCC01 etc.):

$$Initcalc = \frac{(value\ at\ 5\ Volt) - (value\ at\ 0\ Volt)}{1023}$$

$$Initoffset = -(1023 * Initcalc - (value\ at\ 5\ Volt))$$

Non-linear sensors such as our NTC01 must be mapped by using usertables. To do this, a usertable must first be created as a sensor in the TRI Editor and then filled in the DSS settings. The usertable for our NTC01 looks like this:

For non-brand sensors, these values must be measured by the customer. A pot of boiling water and an external thermometer are best suited for this purpose. It should be noted that both the X and Y axes must be ascending.

7 FAQ

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

7.1 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.

7.2 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.

7.3 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.

7.4 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

7.5 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.

7.6 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.

7.7 Can I put 12V on the DIN

On CFE18 and MCE18 V1-V3, no 12V may be added to the digital inputs.

7.8 Supports the MCE18 29 bit can IDs

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

7.9 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.

7.10 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.

7.11 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.

7.12 At which voltages do the DINs change their state

With Pull-Up active:	Without Pull-Up:
LOW => HIGH 2.36V	LOW => HIGH 2.48V
HIGH => LOW 2.14V	HIGH => LOW 2.18V

7.13 Which pins are to be used for the frequency inputs

The following pins are the Freq-In:

Freq1=DIN6

Freq2=AIN1

Freq3=AIN2

Freq4=AIN6

This leaves 6 DIN, 6 AIN and 3 AUX when using the four frequency inputs.

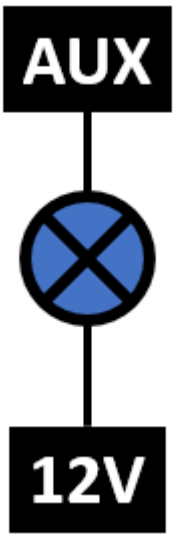
7.14 There has been a change to the standard stream

Since firmware 0.98, the output of the analogue inputs has changed. The MCE18 does not send 0-1023 ADC values, but 0-5000 mV values to the Can Bus. The firmware and the corresponding TRI can be found in the MCE18 Help section. The DIN sends the following statuses: 1=active, 0=inactive.

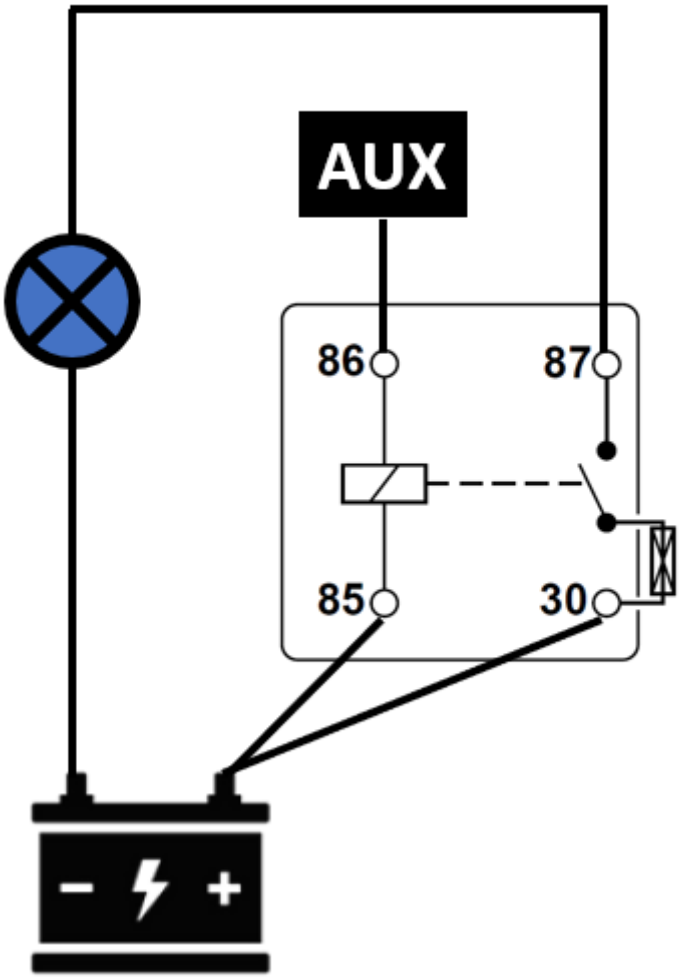
7.15 How do I connect loads to the AUX?

The AUXs allow loads with less than 0.5 amps to be connected directly to the pin, loads with more than 0.5 amps must be connected via a relay.

Less than 0,5 amps



More than 3 amps



8 Document Changelog

Rev 1.0 – initial Version for Firmware 0.9

Rev 1.1 – Added FreqIn

Rev 1.2 – Updated EMU und FAQ

Rev 1.3 – Updated FlexFuel FAQ

Rev 1.4 - Added Display Mapping

Rev 1.5– Changed wrong Initcalc formula

Rev 1.6 – Added more infos to Motec E888 protocol (ethanol)

Rev 1.7 – General Overhaul

Rev 1.8 – Added Can Bus Config