

K-Box: Product Manual

Introduction

The K-Box is Influx's stackable instrumentation compatible with the [ReXgen](#) and [Rebel](#) range of data loggers. It can also be integrated with any device configured via DBC files, other logger systems, or output signals CAN to the [Rebel Dash](#) display.

The K-Box is an ideal solution for applications that require a large number of thermocouples and analog inputs. The K-Box's accurate sensor data is transmitted periodically on the CAN bus, enabling multiple devices to be connected. The K-Box CAN bus settings, calibration, and sampling rates are all easily configurable, and these settings are stored within the K-Box even when the device is not powered.



Advantages:

- Wide switchable software voltage input ranges $\pm 80V$, $\pm 40V$, $\pm 20V$ or $\pm 10V$.
- Accuracy: - Analog $\pm 0.0015\%$, Thermocouples $\pm 0.08\%$.
- High input impedance.
- They have isolated Differential Inputs to prevent earthing problems.

Key features:

- Stackable enclosure.
- Simple signal configuration using a DBC file.
- Each unit enables up to 8 K-type connections at a 20Hz sampling rate and 8 analog inputs at a 1kHz sampling rate.
- Pulse Width Measurement: 3 inputs frequency measurements or pulse measurements.
- Regulated +5V and +12V output power supply for external sensors.
- Instrumentation data time is synchronised with the recorded vehicle network data.
- Analog inputs and thermocouple inputs are galvanically isolated.
- Connect and measure data from up to 4 IEPE sensors using the K-IEPE addon.
- Measure temperature using RTDs with K-PT100/1000 addon.

Technical Specification:

Technical Data	Description
Power supply	6V to 36V DC.
Interfaces	CAN Bus
PC interfaces	None
Enclosure	Dimension (L115xH79xW105) / Weight 450g / IP65 / ABS
Environmental	-40°C to +85°C Humidity max 90%
Output voltages	5V and 24V (Max current drawn 80 mA combined)

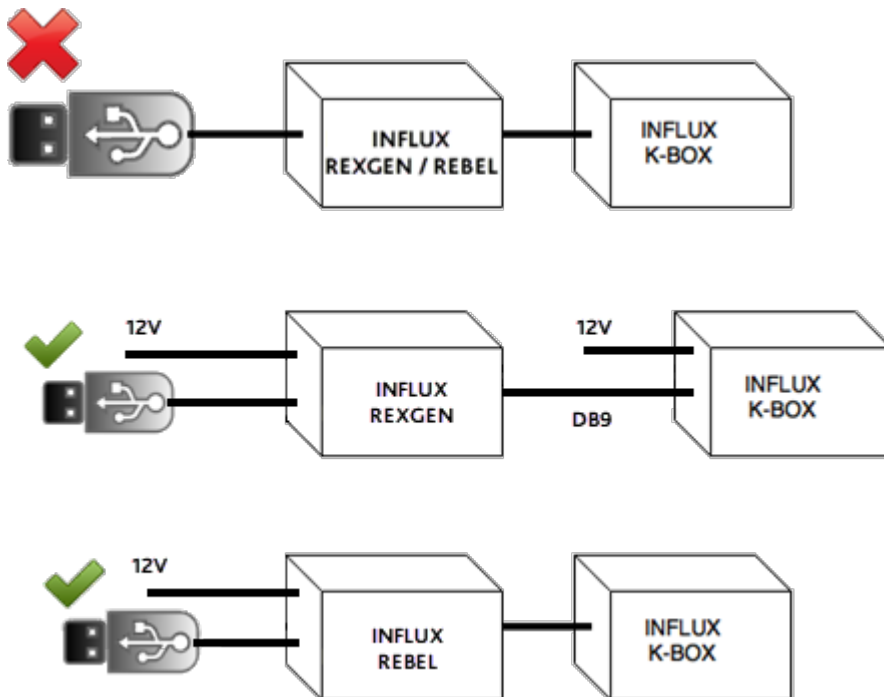
Analog Inputs	
Number of channels	8 Bipolar differential inputs
Accuracy	±0.0015%
Software switchable range	±80V, ±40V, ±20V, ±10V
Resolution (ADC)	16 Bit
Max Sampling Rate	1 KHz (all 8 channels), 2 KHz (4Channels), 10 KHz (2 Channels)
Input impedance	> 4 M Ohm
Max input voltage	±75 Analog Ground, ±34V Analog inputs
Thermocouple Inputs	
Number of channels	8 J/K/T-type inputs
Accuracy	±1°C accuracy
Measurement Range	Measurement: -200 °C to 1250 °C
Max Sampling Rate	10 Hz (all 8 channels)
Maximum input voltage	±3.3 V
Digital Input / Output	
Number of channels	×4 unipolar single-ended hardware configured as inputs or outputs
Input switching thresholds	Low < 1.5V
	High > 2.0V (up to 12V)
Input leakage current	< 10nA
Output states	(Optional) Open collector - 510 Ohm
Output drive capability (OK): Collector-emitter voltage	45V max
Collector current (DC)	10mA max
Saturation voltage (OK on)	< 0.15V

Equivalent on-resistance	< 510Ω
Leakage current at OK off	< 5μA
Min-max applied voltage	Digital input -8V to +12V; Digital output 0V to +40V power supply, which limits the current to 10mA
PWM	3 digital input frequency measurements up to 100kHz or pulse measurements. (min 100 Nano sec) (between pulses 10

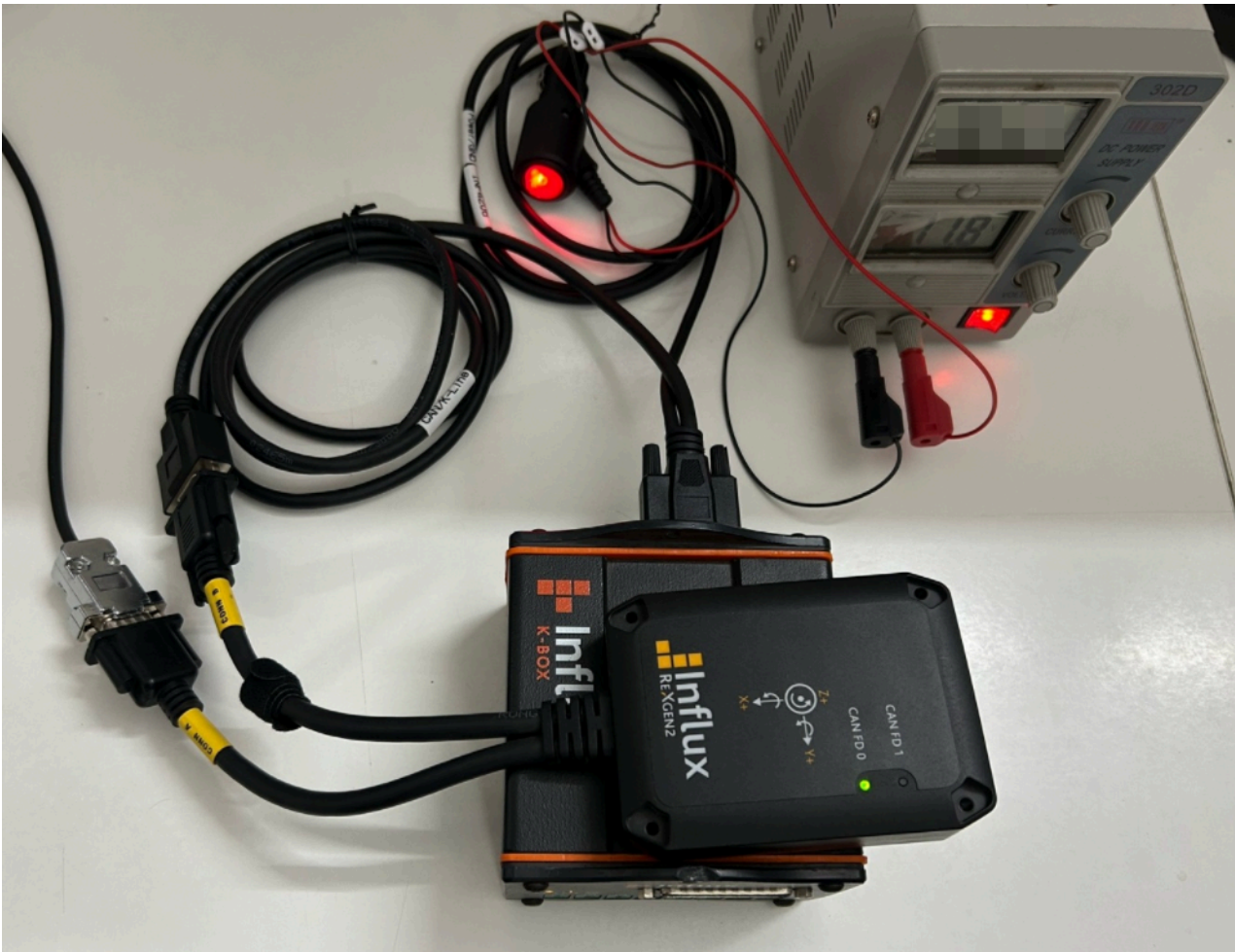
Connecting and powering the K-Box

The K-Box is powered via the CAN and power connectors. It has been designed with CiA® 102 pinout for the CAN bus and power to connect the device as easily as possible.

Most commonly, it will be powered from a Rebel Logger using the Multi-Connect Cable, but you can also power it via pin 9 (4.5 to 36V) and pin-5 PowerGND of the nine-pin Sub-D connectors. If connected via the Multi-connect cable, the CAN 1 (MS) bus is also connected, allowing the logger to record the data transmitted from the K-Box.



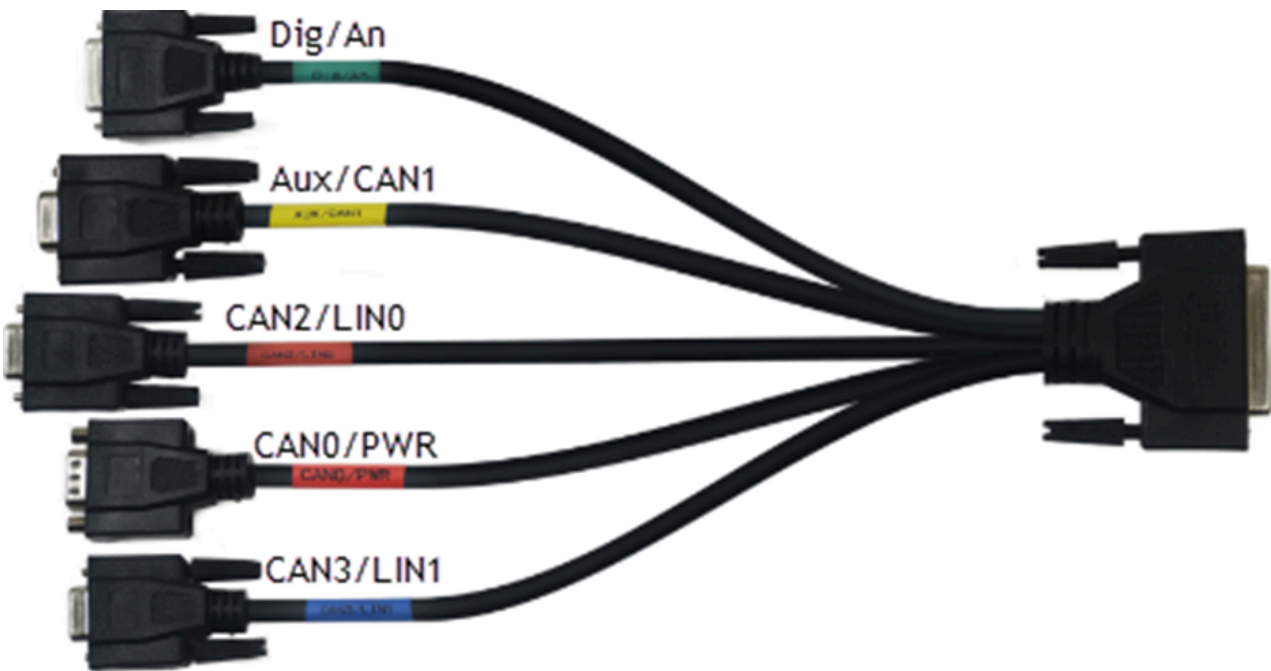
a) Setup for interfacing ReXgen Device with K-Box



Notes:

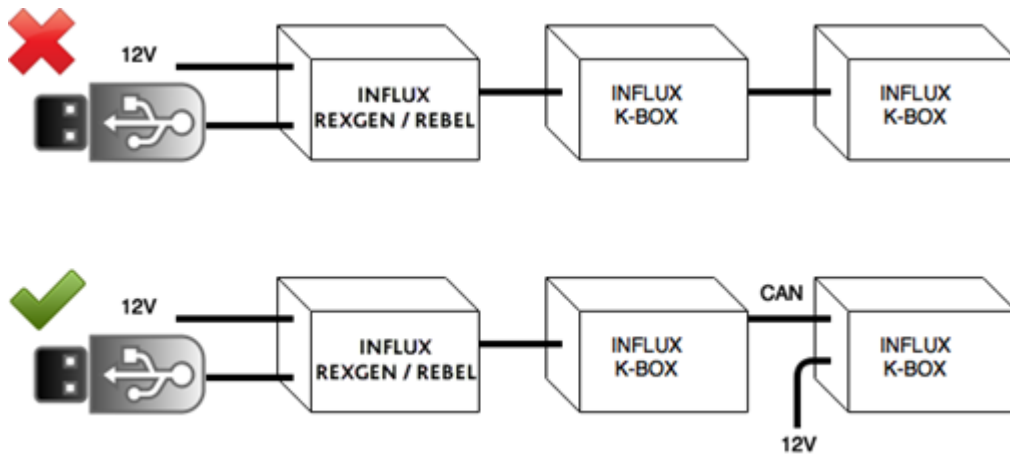
- When using a ReXgen Air device with K-Box device, be sure to get in touch with the technical support team at Influx.

b) Setup for interfacing Rebel Device with K-Box.

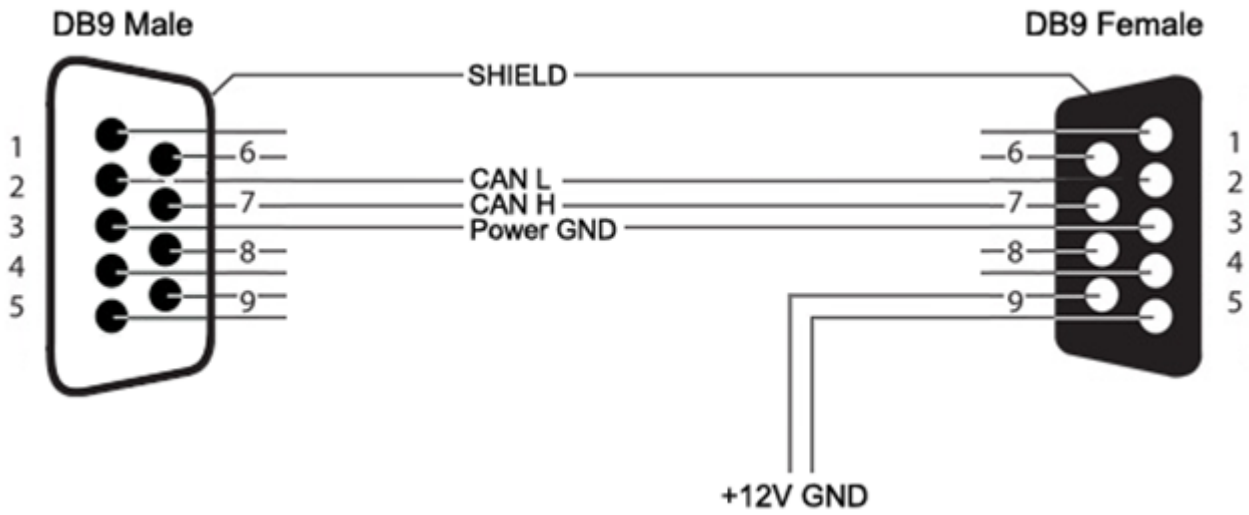


⚠ Warning:

- Several K-Boxes can be daisy chained via the additional DB9 Connector; however, they must have power supplied separately via power breakout in the Cable, not via the Logger. It can also be used to connect other devices, such as the Rebel Dash.



The pinout of the required Cable between the two K-Boxes is as follows:



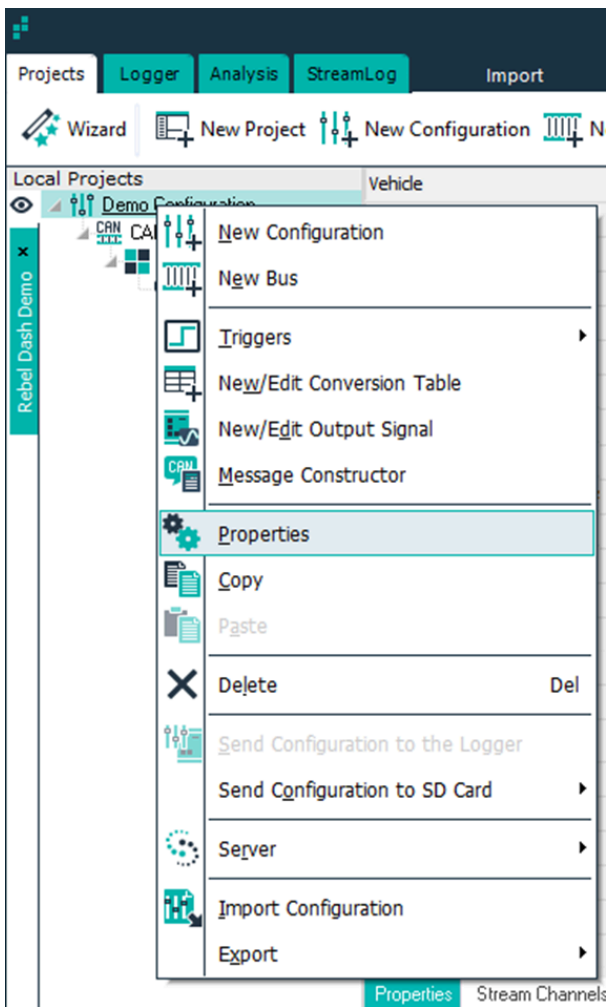
Enable the AUX Power setting within the Logger Configuration

 **Note:**

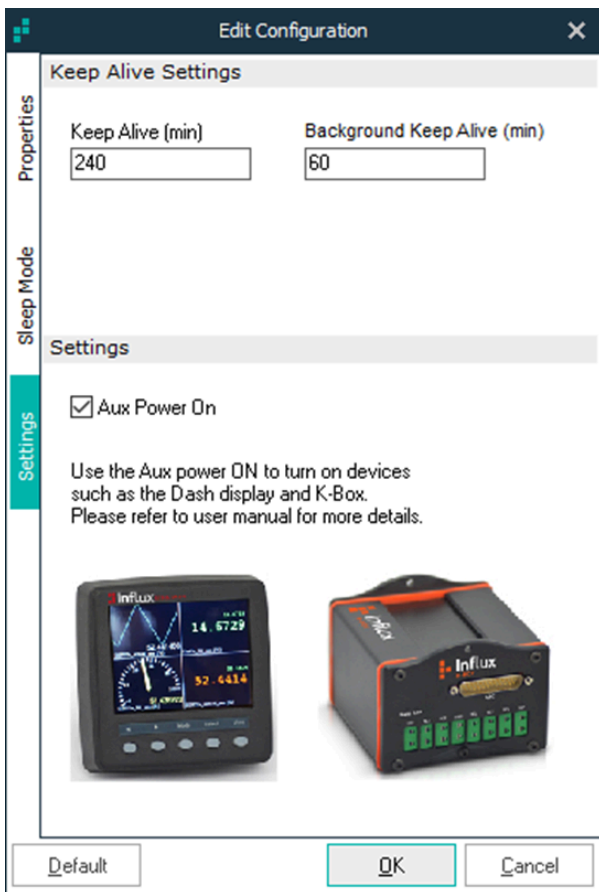
- Not not required when conneced via any of the ReXgen devices and the ReXdesk software

If you power it from the Logger, the Logger will need to be powered from the vehicle or an external power source (NOT just via USB), and you will need to ensure the AUX power feature in the Configuration is set to "On". To do this, follow the Steps Below:

Right-click on the "Project" you want to configure and select "Properties". If you need to create a configuration, it is detailed in this document's 'Loading the K-Box configuration into [Dialog](#)' section.

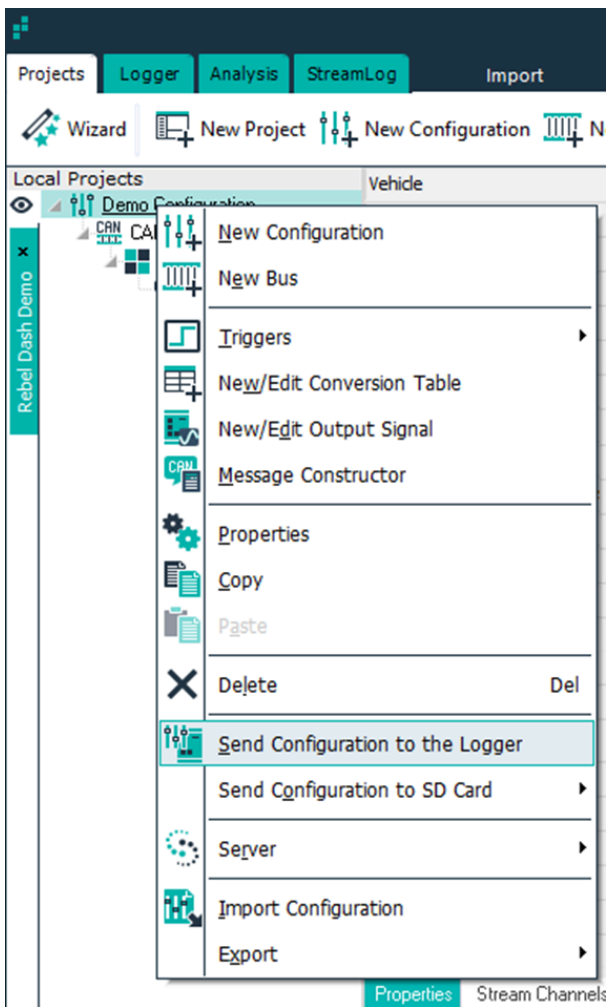


Once the Edit Configuration window is displayed, click the “Settings” tab and checkmark Aux Power On.



Click "OK" to set the Aux Power on Setting in the Configuration.

Send the Configuration to the Logger by right-clicking on the "Project" and choosing "Send Configuration to the Logger."



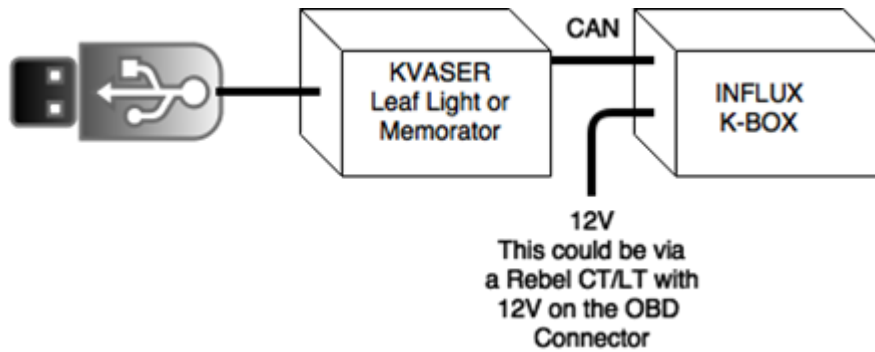
Notes:

- Within the 'Project', you should have the bus that the K-Box is connected to set as CAN 1 (MS) if you are using the AUX connector of the Multi Connect Cable.

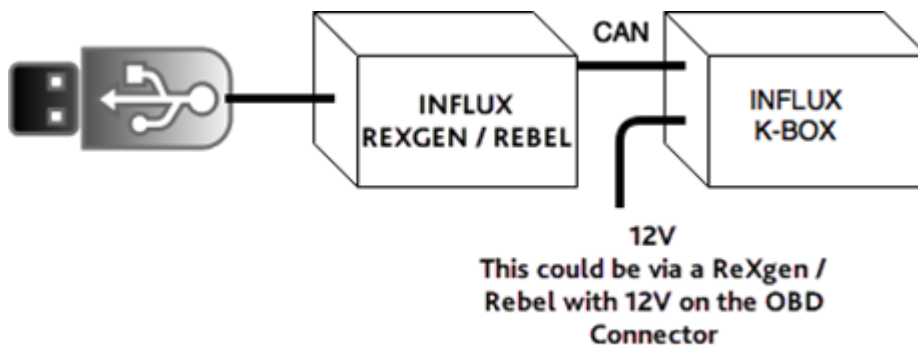
If you have the CAN bus that the K-Box is connected to set to the correct speed within your project, you will see the Status Light on Solid Orange and the CAN Light on Solid Green. If it is flashing green, the CAN bus is misconfigured; check the speed and termination.

Configuring the K-Box

The K-Box comes pre-configured, but the configuration is programmable using the K-Box Calibration utility. It requires installing a Kvaser Leaf Light, Memorator or an Influx Rebel CT or LT and installing the K-Box Calibration utility.



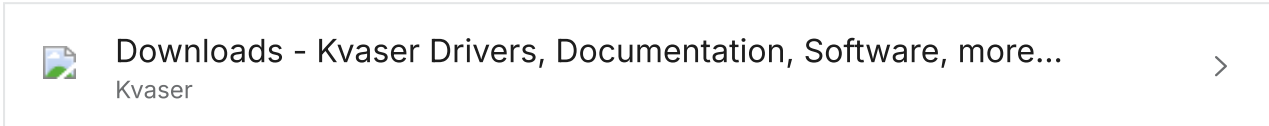
For the above example, please install the Kvaser Drivers.



For the above example, please install the Rebel Drivers.

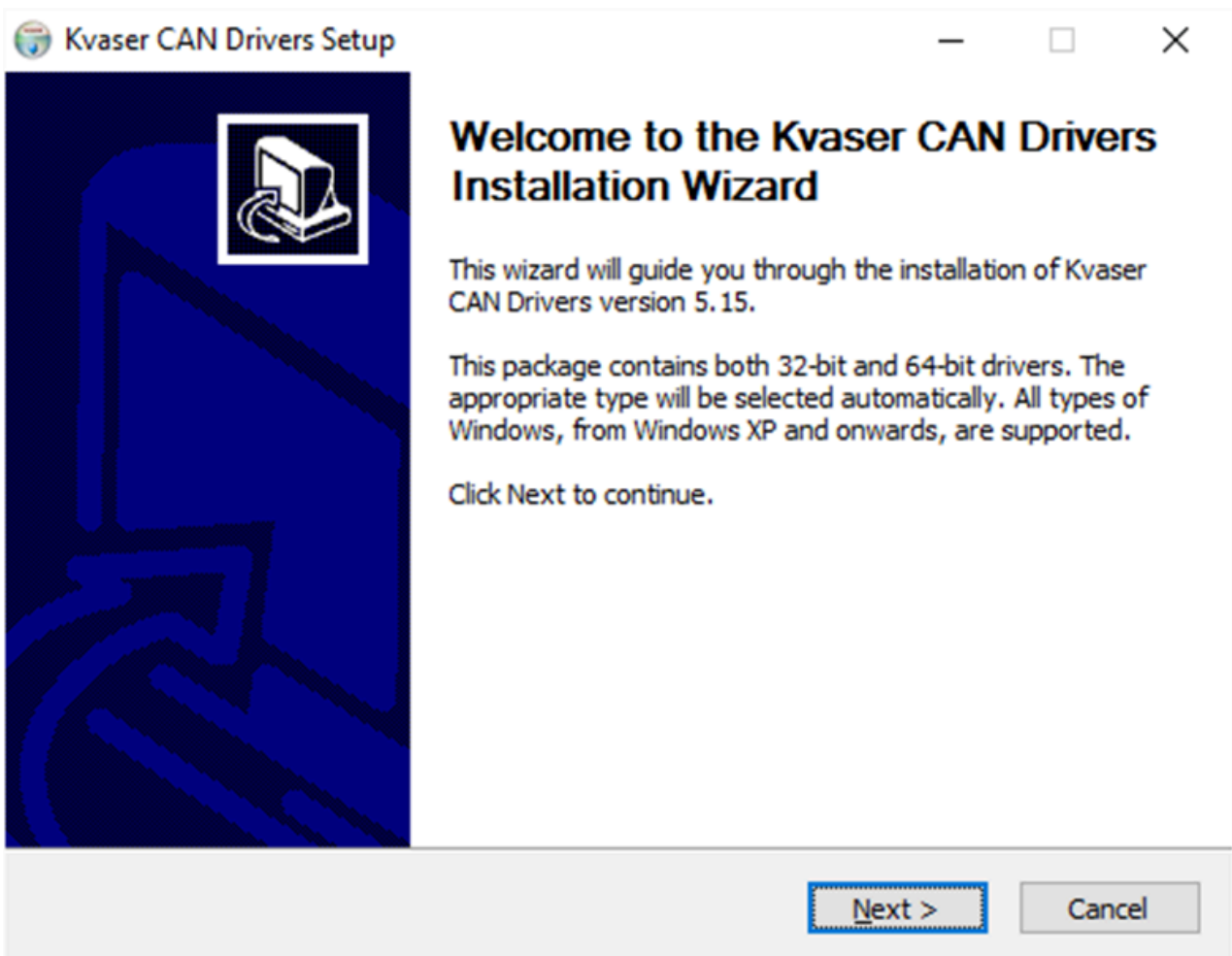
Installing the Kvaser Drivers

Download the Kvaser Drivers for Windows. They are located at:

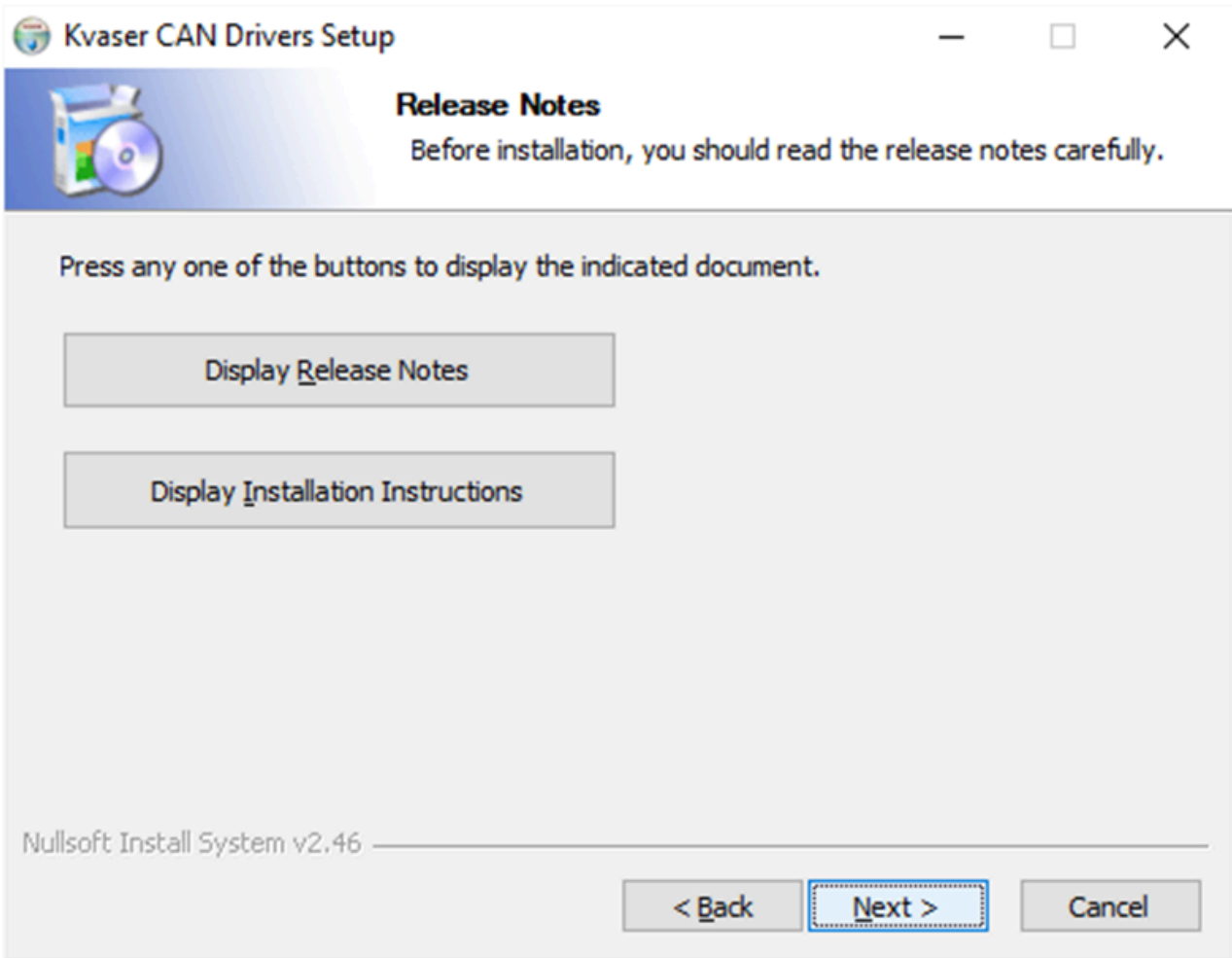


Run `kvaser_drivers_setup.exe`

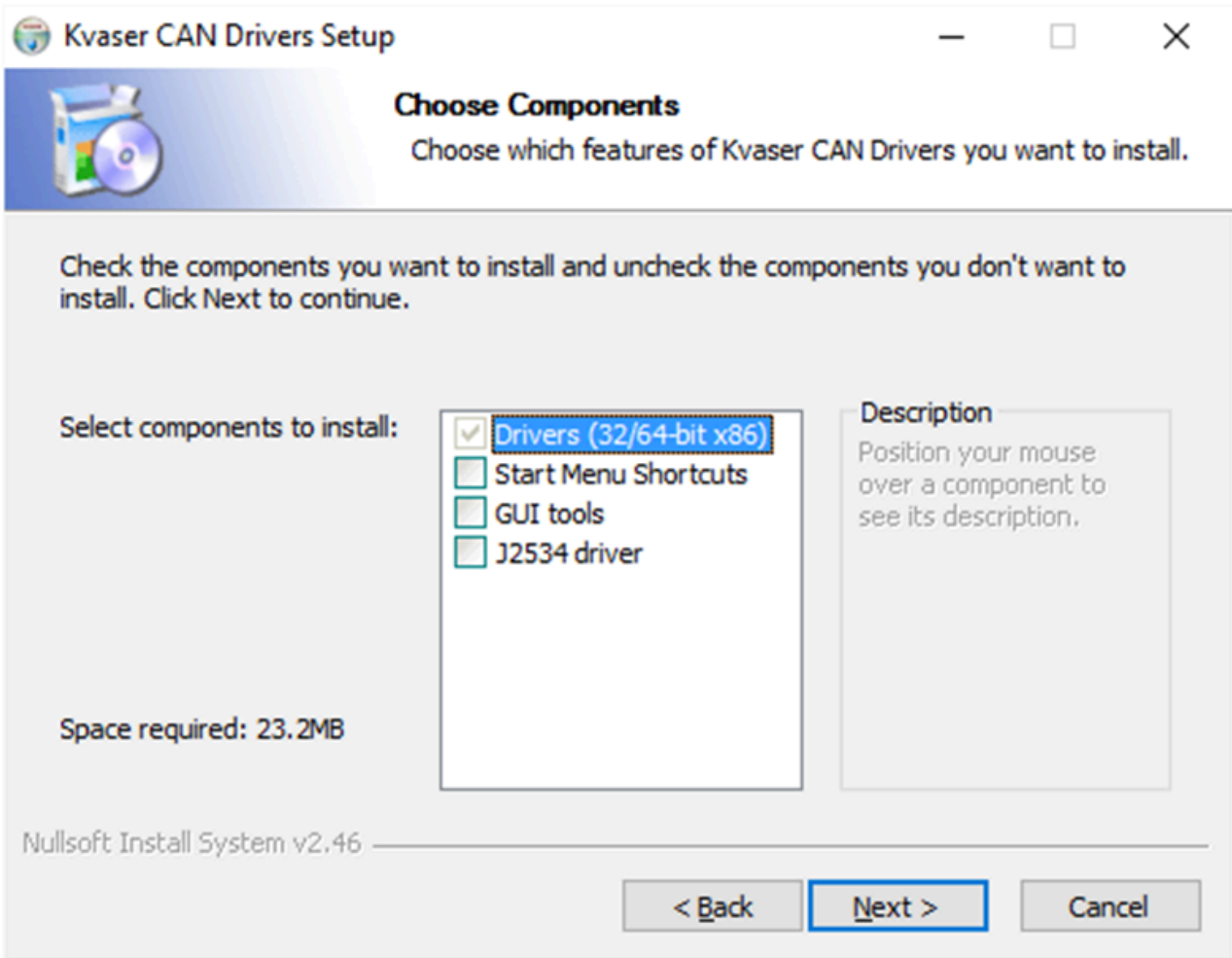
Click Next to start the Installation.



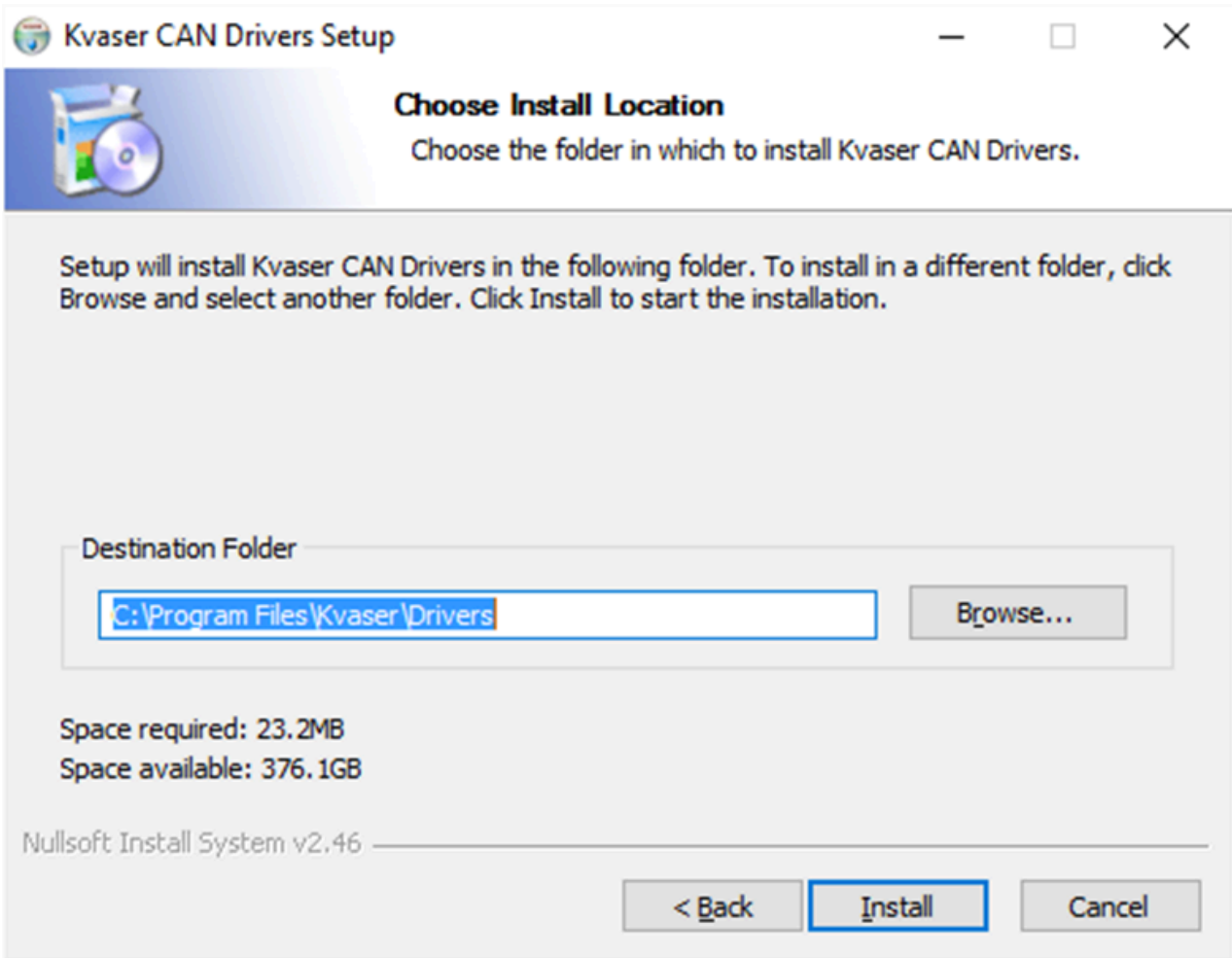
Click Next after viewing the documentation (optional).



Select the item(s) you wish to install (at least one is needed to install the Drivers).



Choose or confirm the location where you wish to install the drivers.



The Drivers will be installed. Click "Close" once the process is complete.



Installation Complete

Setup was completed successfully.

Completed

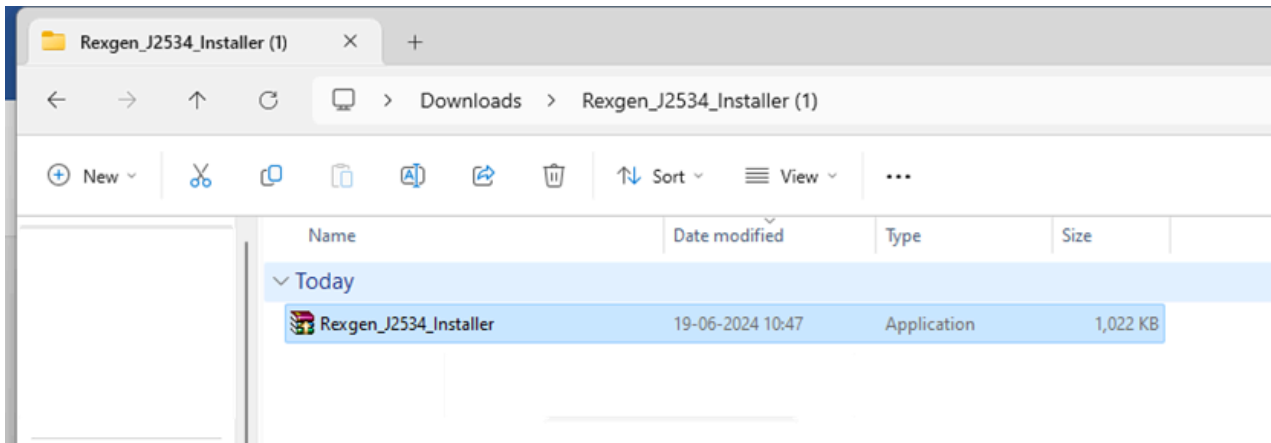


Show details

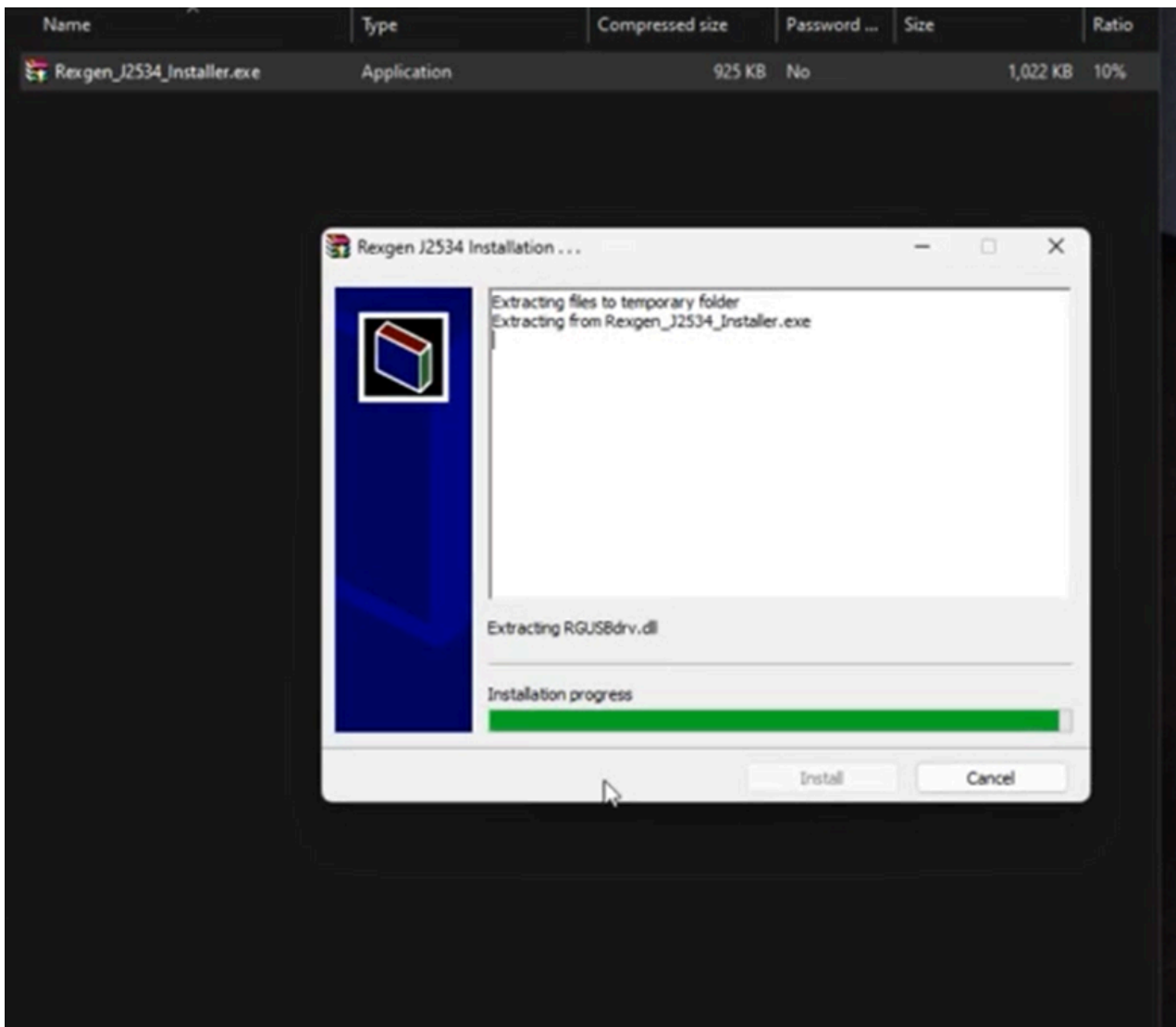
Installing ReXgen J2534 Drivers

Download the ReXgen J2534 Driver by clicking the below link and execute the file.
- https://downloads.influxtechnology.com/ReXdesk/Rexgen_J2534_Installer.zip ↗

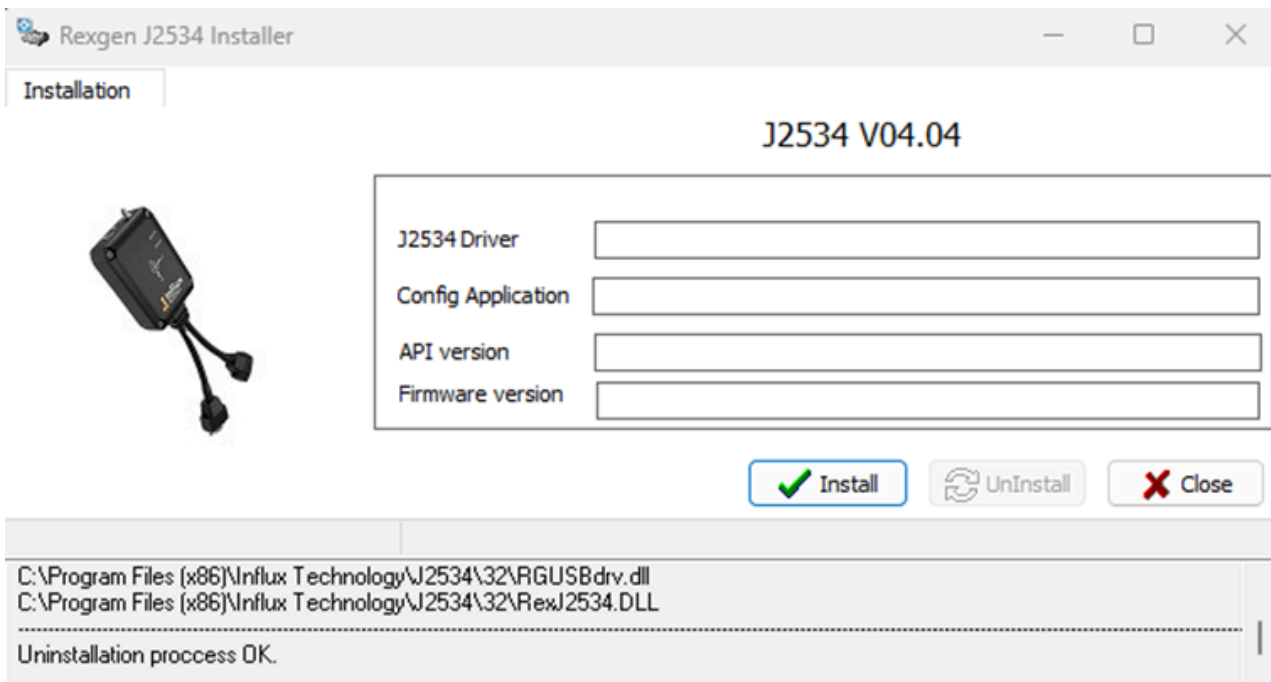
Double click on ReXgen j2534 Installer.



Click 'Cancel' to abort installation.



Click 'Install'.

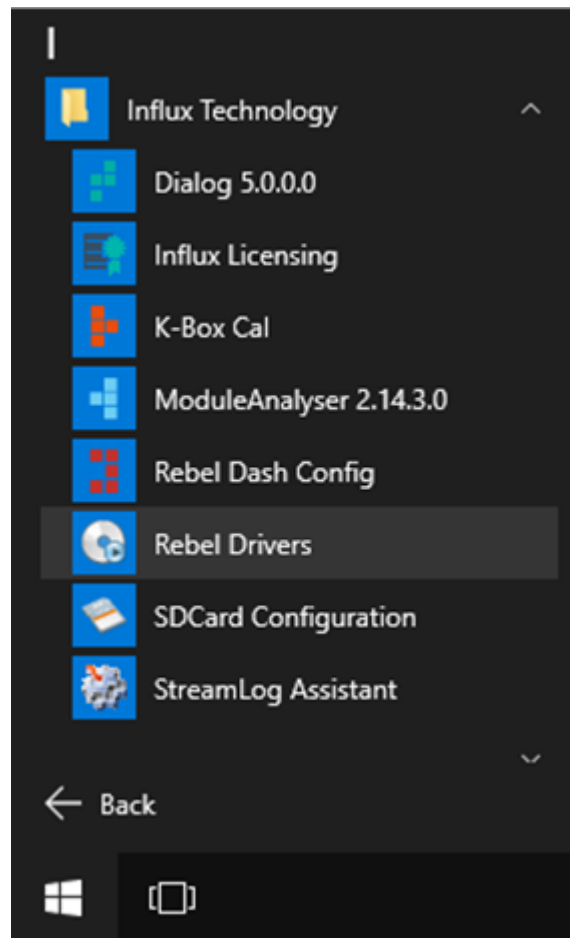


Click 'Close'.

Installing the Rebel Drivers

The Rebel drivers must be correctly installed to ensure the Rebel functions perfectly.

If DiaLog is installed, a driver installation application will be available, which can be found in the Influx Technology folder of the Start Menu, as shown below.



Ensure the Rebel is not plugged in and click 'Next' to continue.

Influx Technology



Welcome to the Influx Technology Rebel Installer!

This wizard will walk you through updating the drivers for your Rebel device.



To continue, click Next.

< Back

Next >

Cancel

Please read and accept the EULA, then click 'Next' to continue.

End User License Agreement



To continue, accept the following license agreement. To read the entire agreement, use the scroll bar or press the Page Down key.

INFLUX TECHNOLOGY LICENSE AGREEMENT

IMPORTANT - READ BEFORE COPYING, INSTALLING OR USING. Do not use or load this software and any associated materials (collectively, the "Software") until you have carefully read the following terms and conditions. By loading or using the Software, you agree to the terms of this Agreement. If you do not wish to so agree, do not install or use the Software.

- I accept this EULA
- I do not accept this EULA

Save As

Print

< Back

Next >

Cancel

The driver installation will begin and may take a few moments.

Once the installation is complete, click 'Finish' to close the application.

Influx Technology



Congratulations! You are finished installing your Rebel device.

The drivers were successfully installed on this computer.

You can now connect your device to this computer. If your device came with instructions, please read them first.



Driver Name	Status
✓ Cypress (CYUSB) USB (...)	Ready to use
✓ Influx Technology Ltd (...)	Ready to use

< Back

Finish

Cancel

Plug in the Rebel to allow the drivers to be recognised.

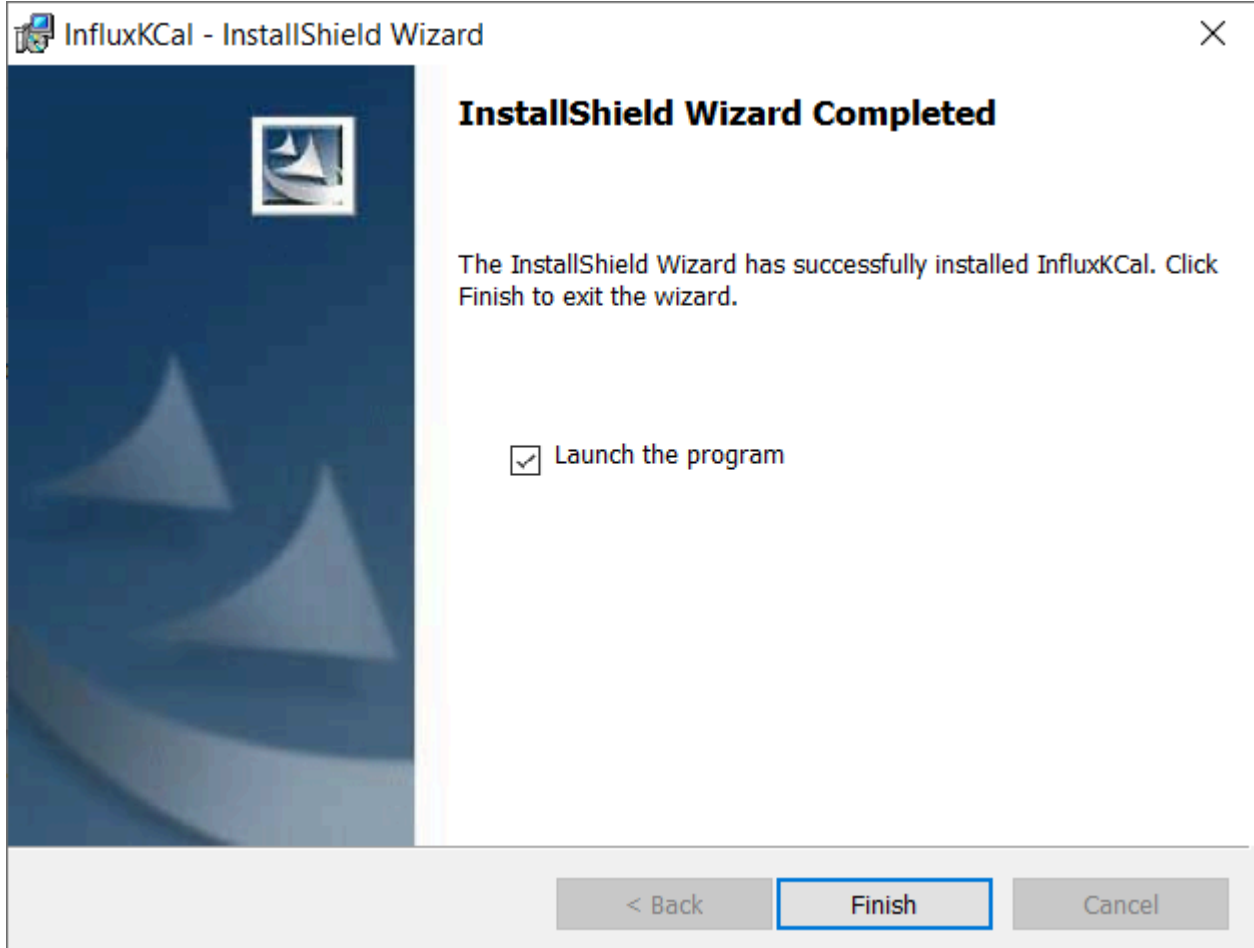
Installing the K-Cal Software

Run the K-BoxCal.msi

Click Next to start the installation.

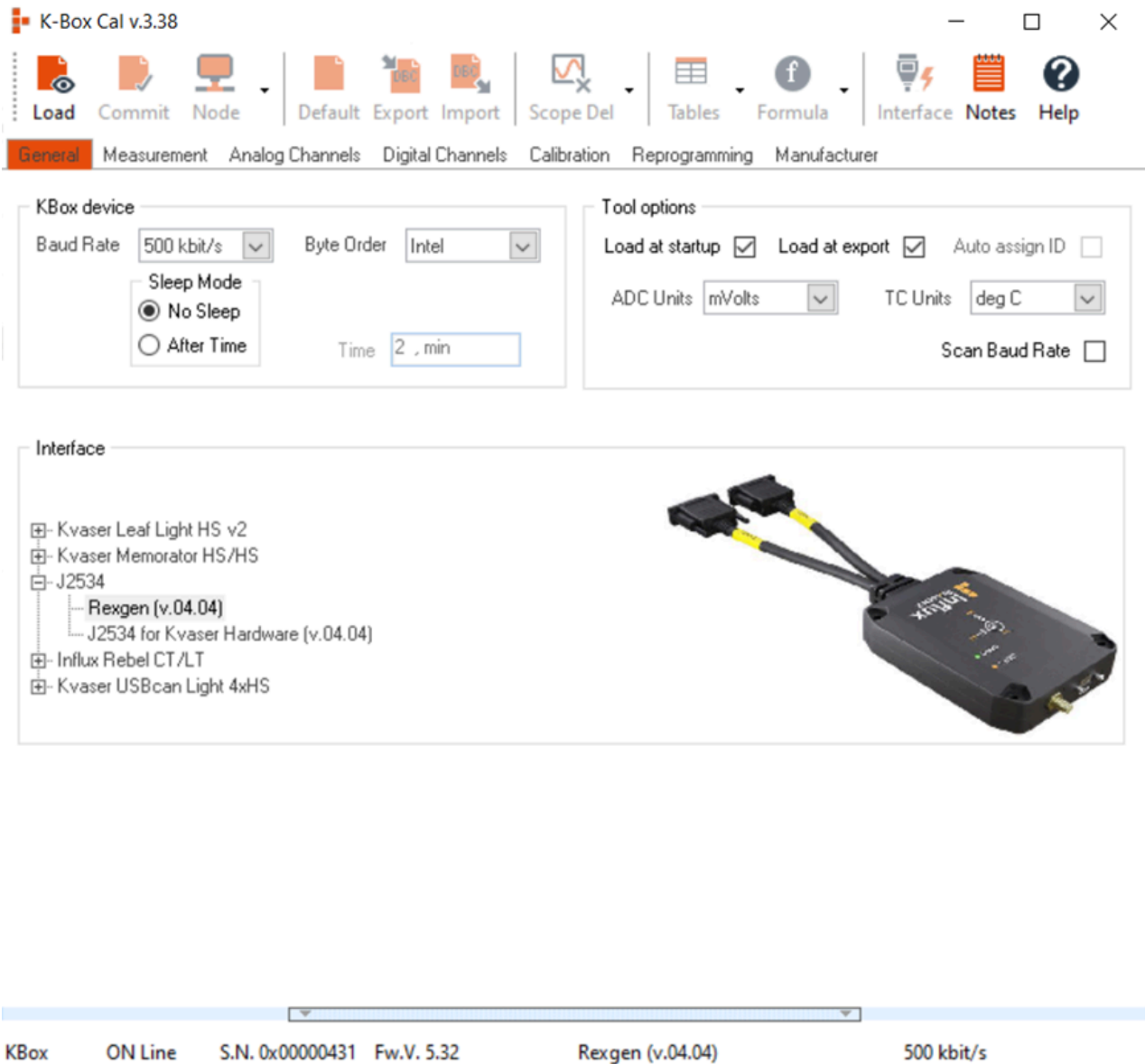


After the K-BoxCal software is installed, click 'Finish'.












Using the K-Cal Software

Once you launch the K-Box Configuration utility, you will see the settings for the interface you are using. If the K-Box is on and connected, its serial number (S.N.) and firmware (Fw) version will be displayed at the bottom of the screen.



Pressing the Load Button Loads the settings contained in the K-Box and displays them on the screen.

 <p>Commit</p>	<p>Pressing the Commit Button commits the settings that are on the screen to flash memory within the K-Box</p>
 <p>Node</p>	<p>Pressing the Node Button allows the user to change the selected node. This icon is active only when multiple KSeries devices are connected to the same CAN Bus.</p>
 <p>Default</p>	<p>Pressing the Default Button allows the user to set the default parameter values.</p>
 <p>Export</p>	<p>Pressing the Export Button allows exporting of signals to DBC files.</p>
 <p>Import</p>	<p>Pressing the Import Button allows importing of signals from DBC files.</p>
 <p>Scope Del</p>	<p>Pressing the Scope Del Button deletes selected channels from the scope.</p>
 <p>Tables</p>	<p>Pressing the Tables Button allows conversion tables management.</p>
 <p>Formula</p>	<p>Pressing the Formula Button assigns the formula.</p>
 <p>Interface</p>	<p>Pressing the Interface Button initialises the selected interface.</p>



Displays the release notes containing all the

On the General Tab, you can change the following parameters:

KBox Device	Baud Rate	The Baud rate at which the K-Box will communicate on the CAN Bus.
	Byte Order	The Byte order that the K-Box will use.
	Sleep Mode	If enabled, the logger will go to sleep when there is no CAN activity. If you do not wish to use this feature and want the K-Box to remain on while power is supplied, select "No Sleep".
	Time	Allows the user to set the "after sleep" time duration. Specifies how long the K-Box should wait before it enters sleep mode.
Baud Rate	The Baud rate at which the K-Box will communicate on the CAN Bus.	
Byte Order	The Byte order that the K-Box will use.	
Sleep Mode	If enabled, the logger will go to sleep when there is no CAN activity.	

	<p>If you do not wish to use this feature and want the K-Box to remain on while power is supplied, select "No Sleep".</p> <p>Allows the user to set the "after sleep" time duration. Specifies how long the K-Box should wait before it enters sleep mode.</p>	
Time		
Tool Options	Load at startup	Allows loading channel settings from device memory on startup.
	Load at export	Allows reloading channel settings from device memory while exporting DBC.
	Auto assign ID	Allows the user to assign the ID automatically. Relevant when there are multiple KSeries devices connected.
	ADC Units	Allows the user to set the units for analog/digital channels.
	TC units	Allows the user to set the units for thermocouples.
Load at startup	Allows loading channel settings from device memory on startup.	
Load at export	Allows reloading channel settings from device memory while exporting DBC.	
Auto assign ID	Allows the user to assign the ID automatically. Relevant when there are multiple KSeries devices connected.	

ADC Units	Allows the user to set the units for analog/digital channels.
TC units	Allows the user to set the units for thermocouples.

How to [interface K-Box](#) and view live data using K-Cal (tutorial video).

How to [assign BaudRate](#) using K-Cal (tutorial video).

Configuring the Analog Channels

You can change to the Analog Channel Configuration by clicking on the Tab: Not Connected.

Additional
Board: Not Connec

ADC Channels

ADC(0-3)
CAN ID: 0x181 Rate: 1 sec

ADC(4-7)
CAN ID: 0x182 Rate: 1 sec

Software Ranges

Hardware Range: Range 1

ADC 0: -10V +10V ADC 1: -10V +10V ADC 2: -10V +10V ADC 3: -10V +10V
ADC 4: -10V +10V ADC 5: -10V +10V ADC 6: -10V +10V ADC 7: -10V +10V

Thermo Couples

TC(0-3)
CAN ID: 0x281 Rate: 1 sec

TC (4-7)
CAN ID: 0x282 Rate: 1 sec

Type: K-type (-200)

Ident	Data	Comment	Time
0x07E4	F0 00 01 00 00 00 00 00		09:57:43
0x07E5	F0 06 01 0F 00 00 00 00	Get calibration points for Channel TC7	09:57:43
0x07E4	F0 00 01 00 00 00 00 00		09:57:43
✓	Load Calibration	Calibration table was loaded.	09:57:43
0x07E5	F0 00 01 00 00 00 00 00	Exiting the calibration mode	09:57:43
0x07E5	04 00 00 00 00 00 00 00		09:57:43

KBox ON Line S.N. 0x00000431 Fw.V. 5.32 Rexgen (v.04.04) 500 kbit/s



Pressing the Load Button Loads the settings contained in the K-Box and displays them on the screen.

Once you have configured the K-Box as desired, click Commit to send the configuration to the K-Box.



You will want to generate a new DBC file if you make any changes. This describes the configuration of the K-Box, and you can load the file into DiaLog (or another tool that supports DBC files), allowing DiaLog to interpret the data broadcast by the K-Box

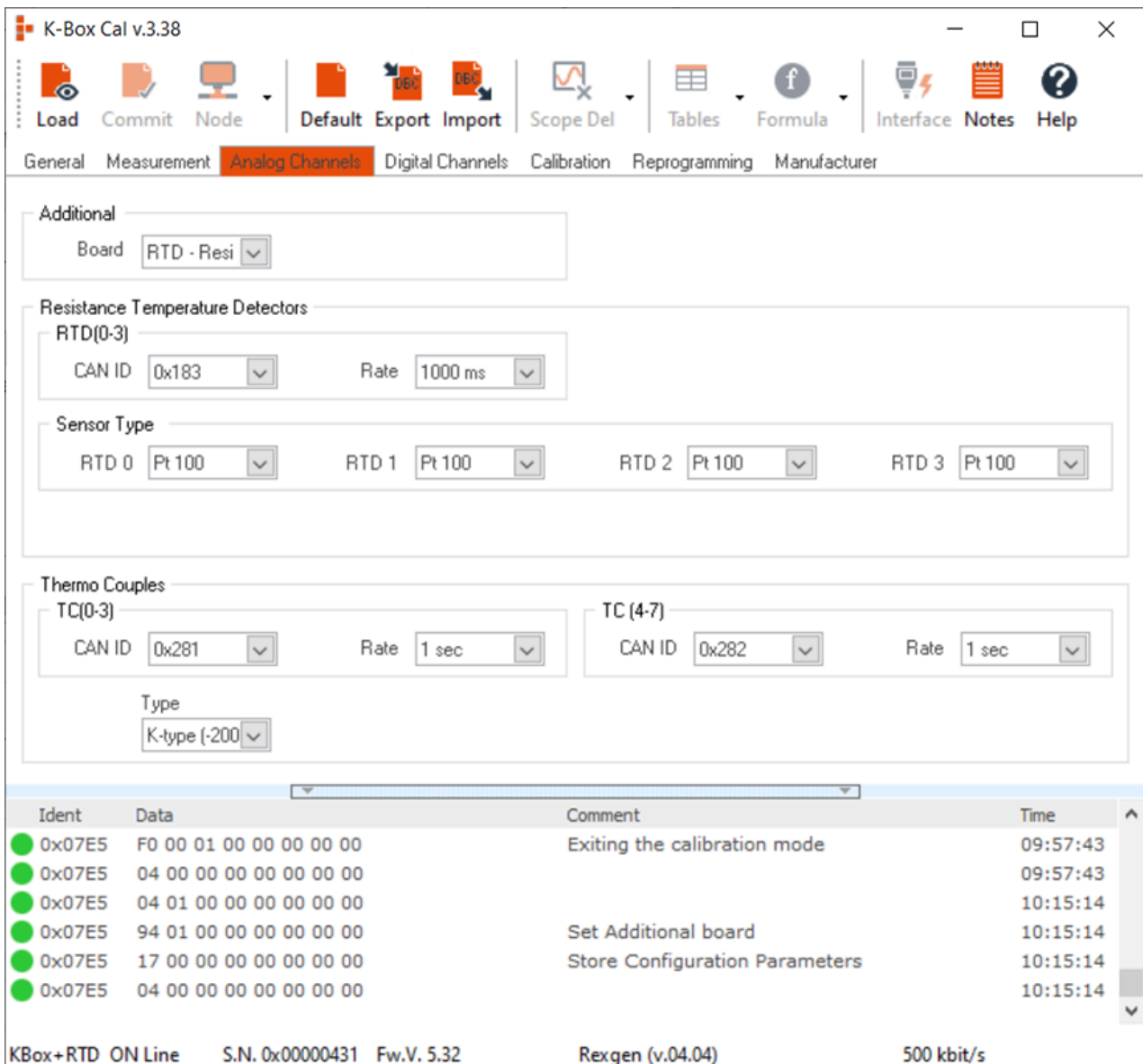


Clicking DBC Export will generate the DBC file and prompt you for the location to save it.

On this screen, you can change the following parameters:

- The additional board allows users to select the add-on board type if connected.
- The CAN Ident and rate that the K-Box will broadcast ADC channels 0-3.
- The CAN Ident and rate that the K-Box will broadcast ADC channels 4-7.
- The Voltage range you wish to use for the ADC channels is either -10 to +10V, -20 to +20V or -40 to +40V, individually selectable per channel or -20 to +20V, -40 to +40V or -80 to +80V, individually selectable per channel depending on whether you choose hardware range 1 or 2.
- The CAN Ident and rates that the K-Box will broadcast thermocouple channels 0-3.
- The CAN Ident and rates that the K-Box will broadcast thermocouple channels 4-7.
- The Thermocouple type may be selected from K, T and J Types.

By clicking on the tab RTD (Resistance thermometer detectors), you can configure the K-Box to work with add-on boards by selecting the board type from the drop-down menu.



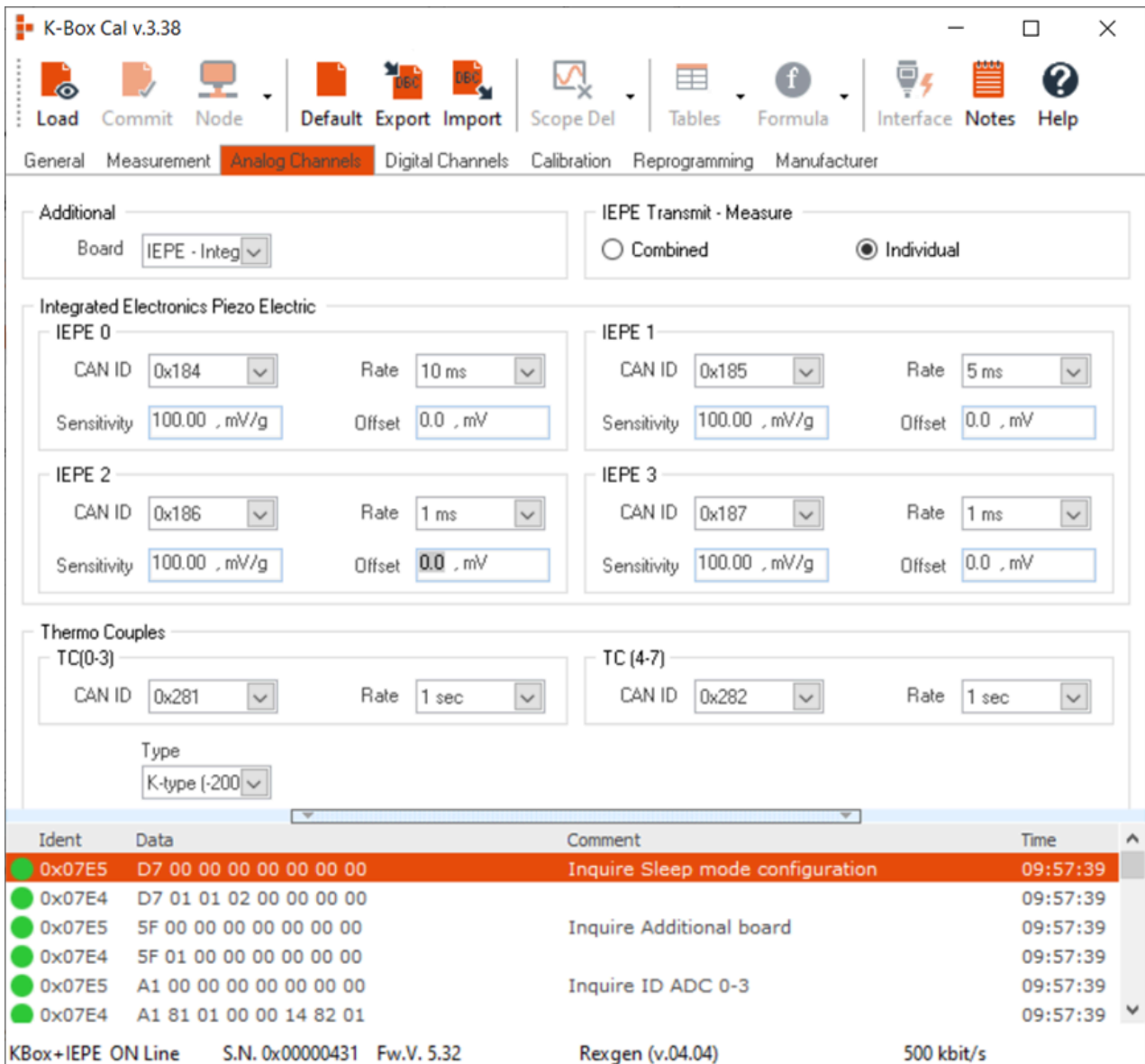
On this screen, you can change the following parameters:

- The CAN Ident and rates that the K-Box will broadcast RTD channels 0-3.
- Select the type of RTD for each channel. RTD (0-3). Pt 100 or Pt1000 is individually selectable per channel.
- The CAN Ident and rates that the K-Box will broadcast Thermocouple channels 0-3.
- The CAN Ident and rates that the K-Box will broadcast Thermocouple channels 4-7.
- The Thermocouple Type may be selected from K, T and J Types.

Click the tab IEPE (Integrated Electronics Piezoelectric) to change to the Analog Channel configuration.

On this screen, you can change the following parameters:

For more configuration options, refer to [Appendix 4](#).



- The CAN Ident and rates that the K-Box will broadcast IEPE channels 0-3.
- IEPE Transmit-Measure:
 - **Combined:** All the IEPE data is sent in one CAN message with one CAN ID.
 - **Individual:** Sends each IEPE channel data with a separate CAN ID.
- The sensitivity and offset of the IEPE 0, 1, 2 and 3.
- The CAN Ident and rates that the K-Box will broadcast Thermocouple channels 0-3.

- The CAN Ident and rates that the K-Box will broadcast Thermocouple channels 4-7.
- The Thermocouple type may be selected from K, T and J Types.

How to [set CAN-id and transmission rate](#) for Analog, Thermocouple, and Digital channels using K-Cal.

Configuring the Digital Channels

You can change to the Digital Channel Configuration by clicking on the tab:

Ident	Data	Comment	Time
0x07E5	04 00 00 00 00 00 00 00		10:17:17
0x07E5	04 01 00 00 00 00 00 00		10:28:57
0x07E5	94 00 00 00 00 00 00 00	Set Additional board	10:28:57
0x07E5	17 00 00 00 00 00 00 00	Store Configuration Parameters	10:28:57
0x07E5	04 00 00 00 00 00 00 00		10:28:57

KBox ON Line S.N. 0x00000431 Fw.V. 5.32 Rexgen (v.04.04) 500 kbit/s



Pressing the Load icon tab loads the settings contained in the K-Box and displays them on the screen.

Here, you can configure the Digital Channels:

- The CAN Ident and rates that the K-Box will broadcast channels used as input.
- The CAN Ident and rates that the K-Box will receive data to be output.

- In output mode, it should output 3.3V (Digital 1-3) or operate in Open Collector mode (Digital4).
- PINs 1-3 can be configured to measure pulse duration, frequency, duty cycle, count events, cycle duration, or RPM when in 'Input' mode.
- PIN 4 can be used as an output for wake-up or to supply power, for example, to another daisy-chained K-Box.

The 4 Digital Pins can all be configured as outputs: If that mode is used, then they either act in open collector mode (the base of the internal NPN transistor is energised according to the data that the K-Box receives via CAN message to the Outputs CAN ident configured) or they can act in 3.3V mode in which case they will output 3.3V or 0V depending on the to the data that the K-Box receives via CAN message to the Outputs CAN ident configured. If using the pins as outputs, you must set up CAN Messages with the same IDs as you have set up that broadcast data to the K-Box... The data format required is specified in the DBC file, and you can use the DiaLog DBC Editor (in the Presets section) to look at this.

The first 3 Digital Pins can also be used as inputs and measure pulse duration, frequency, duty cycle, count events, cycle duration or RPM, and output. They calculated measurements as CAN messages on the CAN Ident configured for the Inputs.



Once you have configured the K-Box as desired, click Commit to send the configuration to the K-Box.

You will want to generate a new DBC file if you make any changes. This describes the configuration of the K-Box. You can load the file into DiaLog (or another tool that supports DBC files), allowing DiaLog to interpret the data broadcast by the K-Box correctly.

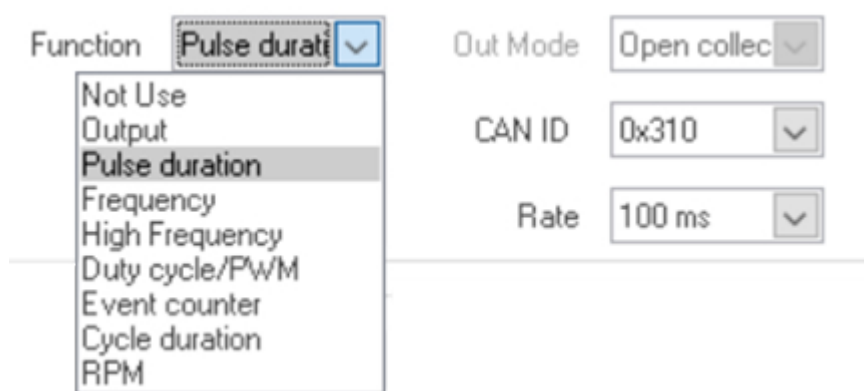


Clicking DBC Export generates the DBC file and prompts you for the location to save it.

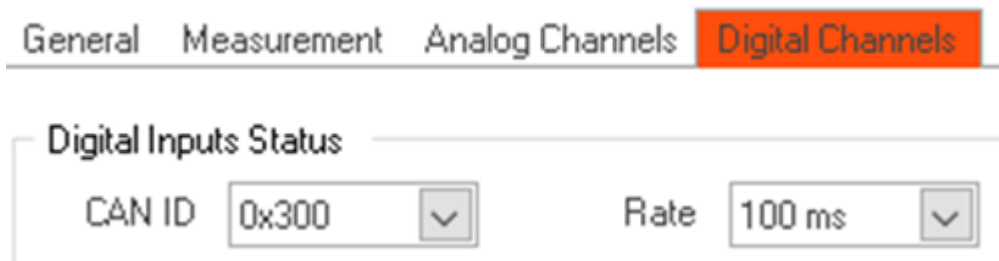
How to [assign Digital functions](#) using K-Cal (tutorial video).

The Input Function

Digital 1-3 can be used to measure input signals, process them, and output the result as a CAN message with a Defined CAN ID (e.g. Pulse duration could be measured and output as a CAN message on CAN ID 0x310)

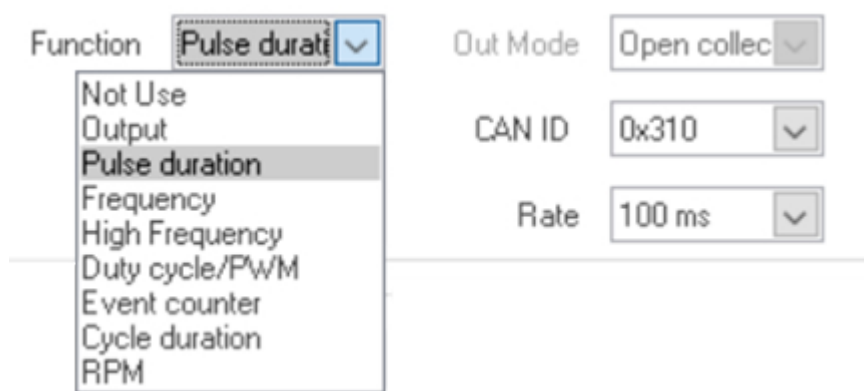


The K Box send CAN messages with a defined ID (in this example, 0x300 and rate 100 ms), containing information about the logical level of the Digital signals. This information is contained in the 1st byte of the message.



Pulse Duration Measurement

To measure Pulse duration, select Pulse duration in the drop-down box:



Also, set the CAN ID rate, where The K Box will transmit the result.



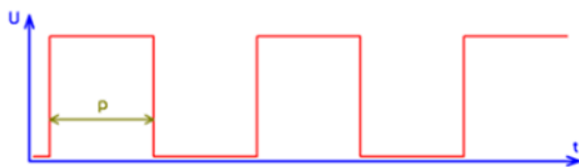
Set the Rate you wish to measure at:



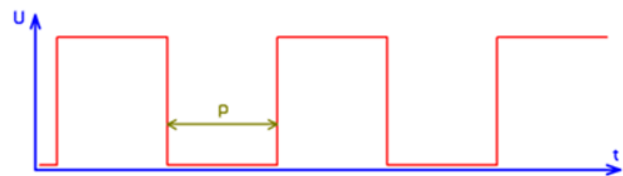
Select the edge on which you wish to start measuring the pulse duration.



The pulse measured is shown below:



The pulse measured is shown below:



The KBox will not send CAN messages (although the rate is met) until the required measurement is finished.

The KBox will re-calculate the message and Rate to prevent CAN bus overloading.

Examples:

Pulse frequency: 2000Hz (0.5ms). **Rate:** 50ms. **CAN bus Speed:** 125 kbps.

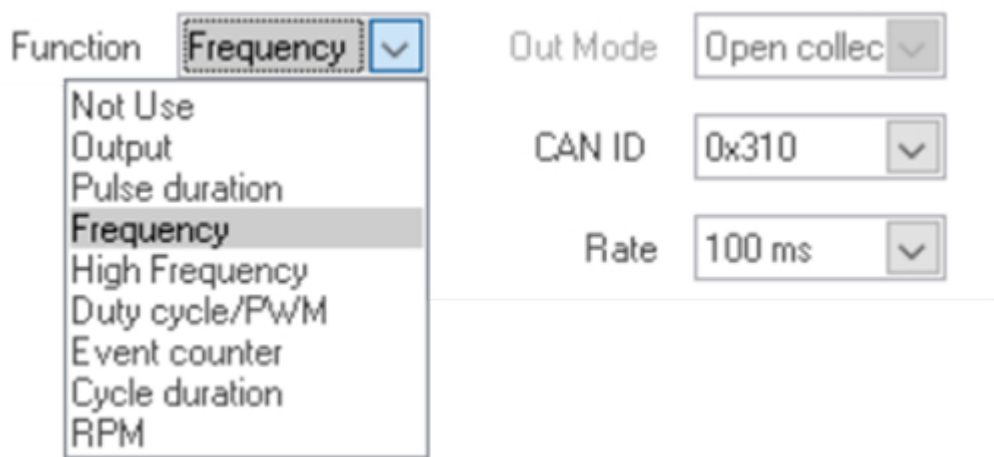
If there is no overloading of the CAN bus, a corresponding CAN Message will be sent every 50ms.

Pulse frequency: 2000Hz (0.5ms). **Rate:** 1ms. **CAN bus Speed:** 125 kbps.

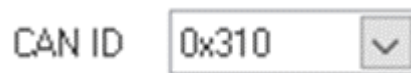
If there is no overloading of the CAN bus, a corresponding CAN Message will be sent every 2ms.

Frequency Measurement

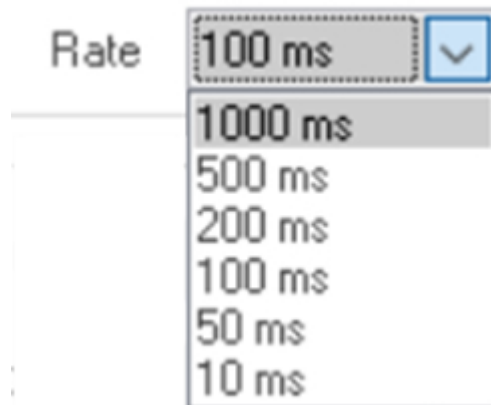
To measure frequency, select 'Frequency' in the drop-down box:



Also, set the CAN ID where The K Box will transmit the result.



Set the Rate you wish to measure at:



The Rate parameter affects measurement precision.

The K Box measures frequency using a pulse counter for the selected rate and normalises it to 1 second to calculate the value in $\text{Hz} = 1 \text{ s} * N \text{ pulses} / \text{Rate}$.

The K-Box averages measured values if the frequency changes for a measurement interval (Rate).

Example:

Selected Rate: 100ms.

The sensor sends at a frequency of 10kHz for 60ms, and the K-Box registers 600 pulses ($60\text{ms} * 10\text{kHz}$).

The sensor sends at a frequency of 8kHz. For 40ms and the K-Box registers 320 pulses ($40\text{ms} * 8\text{kHz}$).

For the whole measurement interval of 100ms, The K-Box registers a total of 920 pulses.

Normalised to Hz, the measured frequency is 9.2kHz ($1\text{ s} * 920\text{ pulses} / 100\text{ms}$).

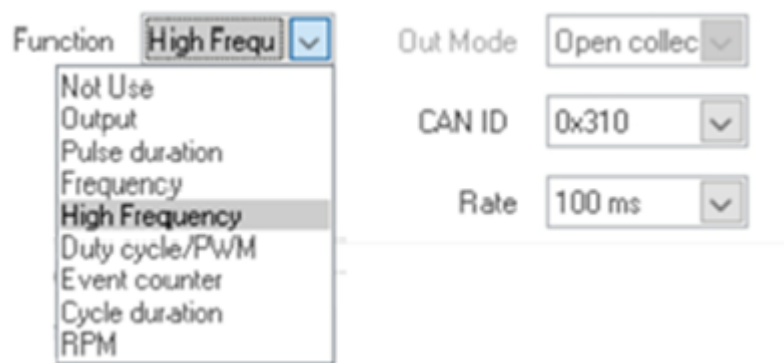
If the Rate is set to 1000 ms, the measurement's accuracy will be 1Hz.

Notes:

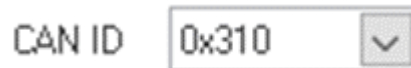
- The "Cycle duration" function should be used to measure low frequency with high precision.

High-Frequency measurement

To measure high frequency, select 'High Frequency' in the drop-down box:



Also, set the CAN ID where The K Box will transmit the result.



Set the Rate you wish to measure at:



The Rate parameter affects measurement precision.

The K Box measures high frequency using a pulse counter for the selected Rate and normalises it to 1 second to calculate the value in Hz = 1 s * N pulses / Rate.

The K-Box averages measured values if the high-frequency changes for a measurement interval (Rate).

Example:

Selected Rate: 100ms.

The sensor sends at a frequency of 10kHz for 60ms, and the K-Box registers 600 pulses ($60\text{ms} * 10\text{kHz}$).

The sensor sends at a frequency of 8kHz. For 40ms, the K-Box registers 320 pulses ($40\text{ms} * 8\text{kHz}$).

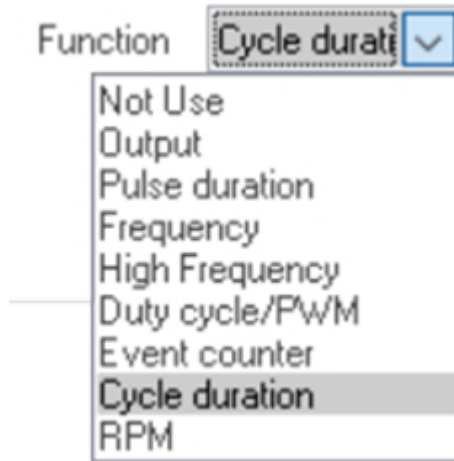
For the whole measurement interval of 100ms, The K-Box registers a total of 920 pulses.

Normalised to Hz, the measured frequency is 9.2kHz ($1\text{ s} * 920\text{ pulses} / 100\text{ms}$).

If the Rate is set to 1000 ms, the measurement's accuracy will be 1Hz.

Cycle Duration Measurement

To measure the duration of a cycle, select Cycle Duration in the drop-down box:



Frequency can then be calculated using the following formula:

$$F = 1 / T$$

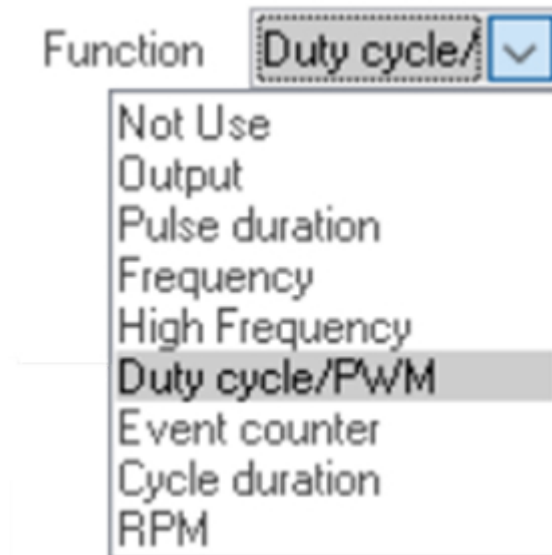
In this case, this frequency is NOT average frequency. It is instantaneous frequency.

The KBox will wait until the cycle measurement is finished before sending a CAN message with the duration. If the cycle duration is long, the messages may be sent slower than the selected Rate.

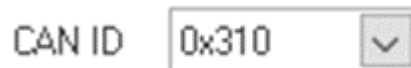
If the Cycle duration is shorter than the time between messages set by the Rate, the duration will be re-calculated before being sent.

Duty Cycle/PWM Measurement

To calculate the Duty cycle of a PWM signal, select Duty cycle/PWM in the drop-down box:



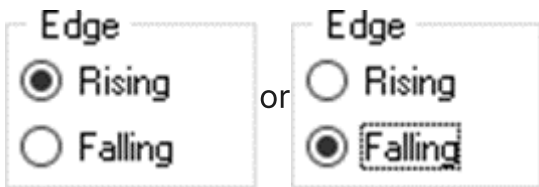
Also, set the CAN ID where The K Box will transmit the result.



Set the Rate you wish to measure at:



Select the edge you wish to start measuring the duty cycle on.



or

according to whether the modulation is on the

rising or falling edge:

Pulse Wave Modulation examples:

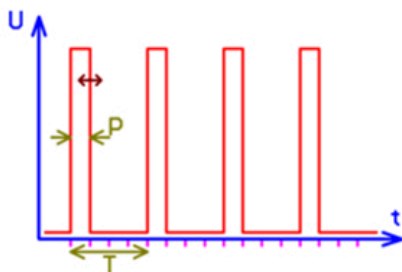
e.g. 1) Modulation on the falling edge:



Correctly Configured



$$0.25 = P / T$$

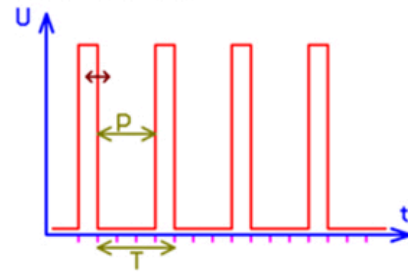


Incorrectly configured



$$0.75 = P / T$$

Measured "T" is affected by modulation.
This is incorrect



e.g. 2) Modulation on the rising edge:

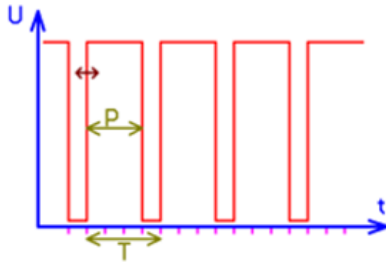


Incorrectly configured

Edge
 Rising
 Falling

$$0.75 = P / T$$

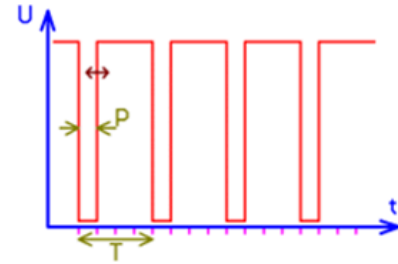
Measured "T" is affected by modulation.
This is incorrect



Correctly configured

Edge
 Rising
 Falling

$$0.25 = P / T$$

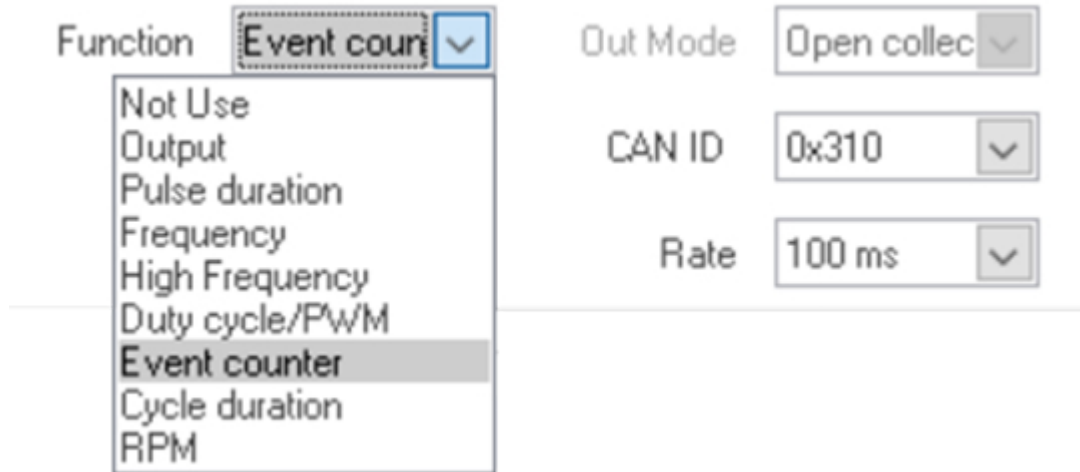


Notes:

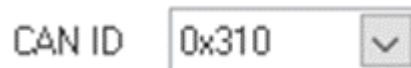
- The K-Box will change the CAN message Rate for this measurement to prevent CAN bus overloading.

Event Measurement

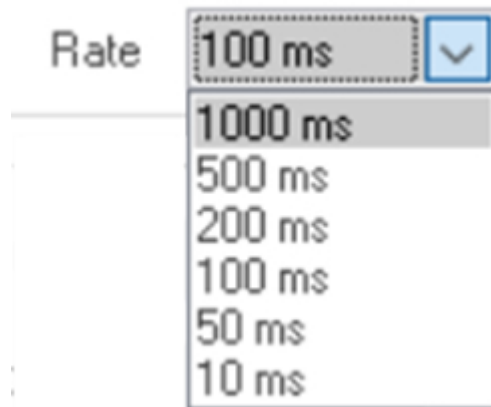
To count digital events, select Event Counter in the drop-down box:



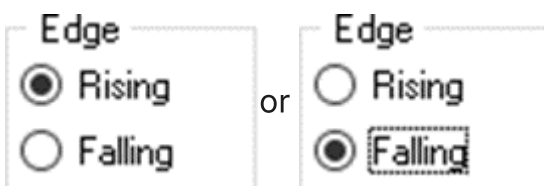
Also, set the CAN ID where The K Box will transmit the result.



Set the Rate you wish to measure at:




Select the edge on which you wish to start measuring the events.



or

according to whether the Modulation is on the

rising or falling edge:

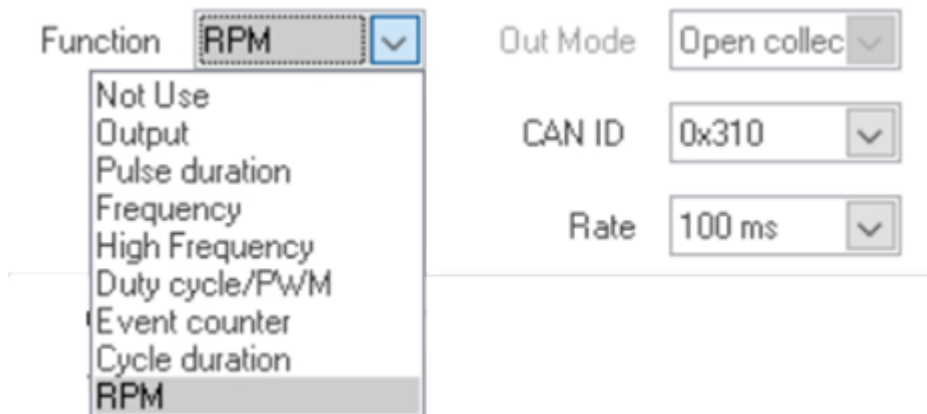
 **Notes:**

- The Event counter will be reset if the K-Box is power cycled or loaded with a new configuration.

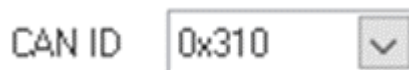
The Event counter will be incremented on any received registered event edge.

RPM Measurement

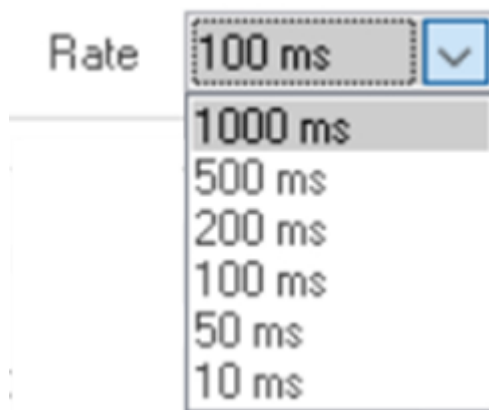
To calculate Revolutions per Minute, select RPM in the drop-down box:



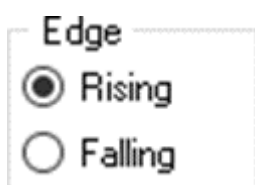
Also, set the CAN ID where The K Box will transmit the result.



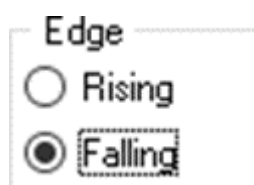
Set the Rate you wish to measure at:



Select the edge you wish to normalise measuring the revolutions on.



or



according to whether the Modulation is on the

rising or falling edge:

The Rate parameter affects the measurement precision.

The K-Box measures RPM using a pulse counter for the selected rate and normalises it to 1 minute to calculate the output value.

$\text{RPM} = \text{Rate} \times \text{N pulses} / \text{Rate}$.

The K-Box averages the measured values if RPM changes over the measurement interval.

Example:

If the Selected Rate = 500ms.

If a Sensor sends 2000rpm for 300ms (sensor generates 2000 pulses per minute)

The KBox registers 10 pulses ($10 = 2000\text{rpm} \times 0.3\text{s}/60\text{s}$).

If it then sends 4800 rpm for 200ms (sensor generates 4800 pulses per minute).

The KBox registers a further 16 pulses ($16 = 4800\text{rpm} \times 0.2\text{s}/60\text{s}$)

For the whole measurement interval (500ms), the KBox registers will register a total of 26 pulses.

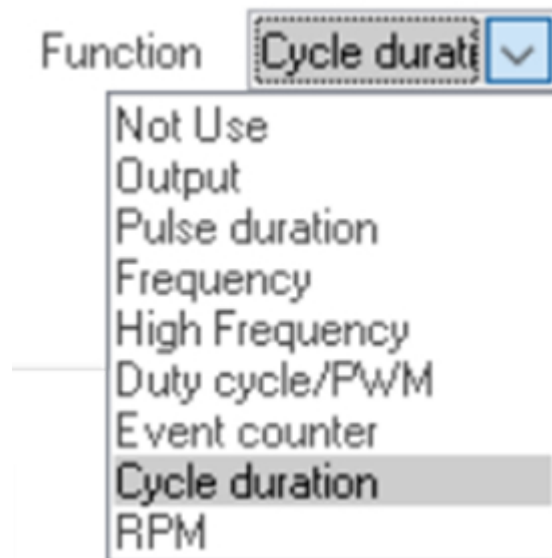
The Normalised value calculated will be 3120 rpm ($60\text{s} \times 26 \text{ pulses}/0.5\text{s}$).

The increment size of 120rpm limits the accuracy of measurement.

If the parameter Rate were= 1000 ms, the measurement's accuracy would be limited by the increment size of 60rpm.

Notes:

- The "Cycle duration" function should be used to measure low RPM with high precision.



Frequency can then be calculated using the following formula:

$$\text{RPM} = 60 / T$$

In this case, this RPM is **NOT** average RPM; it is instantaneous RPM.

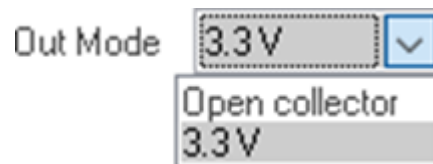
The KBox will wait until the cycle measurement is finished before sending a CAN message with the duration. If the cycle duration is long, the messages may be sent slower than what is selected as the Rate.

Rate If the Cycle duration is shorter than the time between messages set by the Rate, the duration will be re-calculated before being sent.

The Output Function

Important: Configuring the Output Mode:

Unless you have special hardware, build your K-Box Digital 1, Digital 2 and Digital 3 MUST be configured as 3.3V if used in output Mode due to the Outputsign of the circuitry:

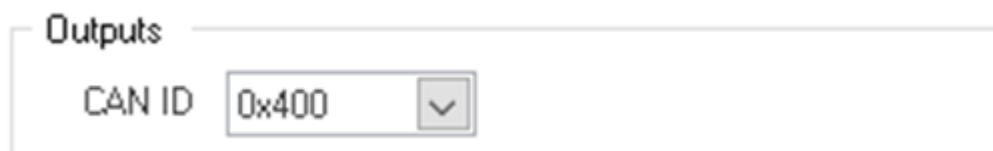


Unless you have a unique hardware build, your K-Box Digital 4 MUST be configured as Open Collector (if used in output Mode due to the design of the circuitry):



Operation of the Output Signals

If any of the PINs are set to an "Output", the output CAN ID becomes active, and you can select the CAN ID, which will receive messages that will be output on the appropriate pins of the K-BOX.



If the CAN ID were set to 0x400, when the Kbox receives a CAN message with Ident 0x400, the first byte is interpreted as an 8-bit command as follows:

b0: Dig1OutLevel

b1: Dig1OutSet

b2: Dig2OutLevel

b3: Dig2OutSet

b4: Dig3OutLevel

b5: Dig3OutSet

b6: Dig4OutLevel

b7: Dig4OutSet

OutLevel indicates whether the PIN should give output 1 or 0. "OutSet" sets the OutLevel on the PIN if it is = 1 (enable); if the OutLevel is 0 (disable), then the OutLevel value in the message is not set.

Example:

If the KBox receives a CAN message with DLC = 1 and CAN ID = 0x400.

Data byte = 0x30 (00110000) High Level on Digital 3, Digital 3 enabled. Outputbyte = 0x20 (00100000) don't care about Digital 3; keep old level on Digital 3.

In this, the command controls all Digital Outputs at once and at any time.

The Output level can only be changed with a new CAN message with Ident 0x400, re-configuration with B-Box Cal, or turning the KBox power off.

If **NONE** of the PINs is set to Output, the Outputs CAN ID will become greyed out, and the K-Box will not enable the Output on the Digital pins when CAN messages are received.

K-Box Cal v.3.38

Load Commit Node |
 Default Export Import |
 Scope Del |
 Tables |
 Formula |
 Interface Notes Help

General | Measurement | Analog Channels | **Digital Channels** | Calibration | Reprogramming | Manufacturer

Digital Inputs Status

CAN ID: Rate:

Digital Outputs Control

CAN ID:

Digital 1

Function: Out Mode:

Edge: Rising Falling

CAN ID: Rate:

Digital 2

Function: Out Mode:

Edge: Rising Falling

CAN ID: Rate:

Digital 3

Function: Out Mode:

Edge: Rising Falling

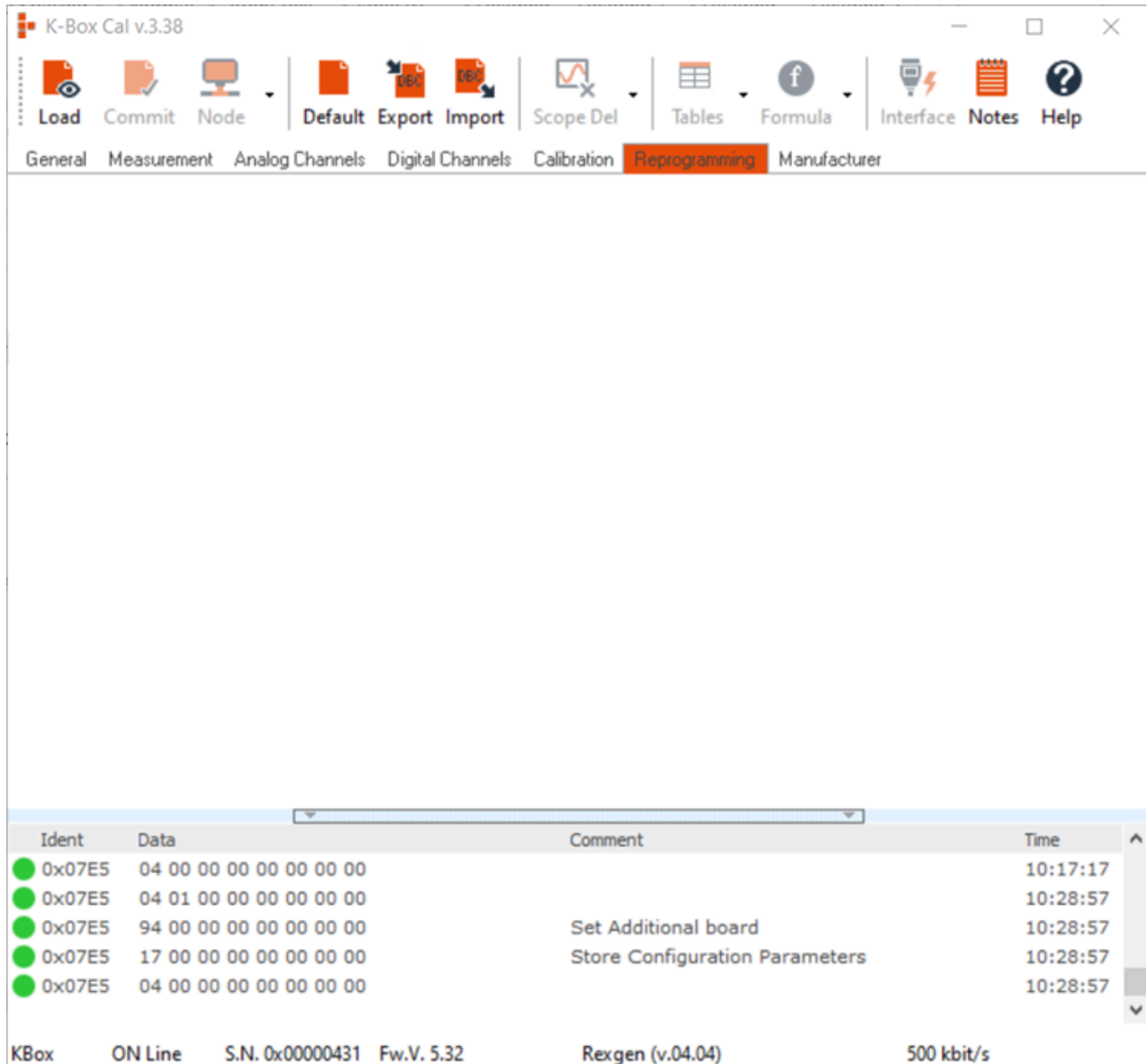
CAN ID: Rate:


Digital 4 / +4.5V inst

Function: Out Mode:

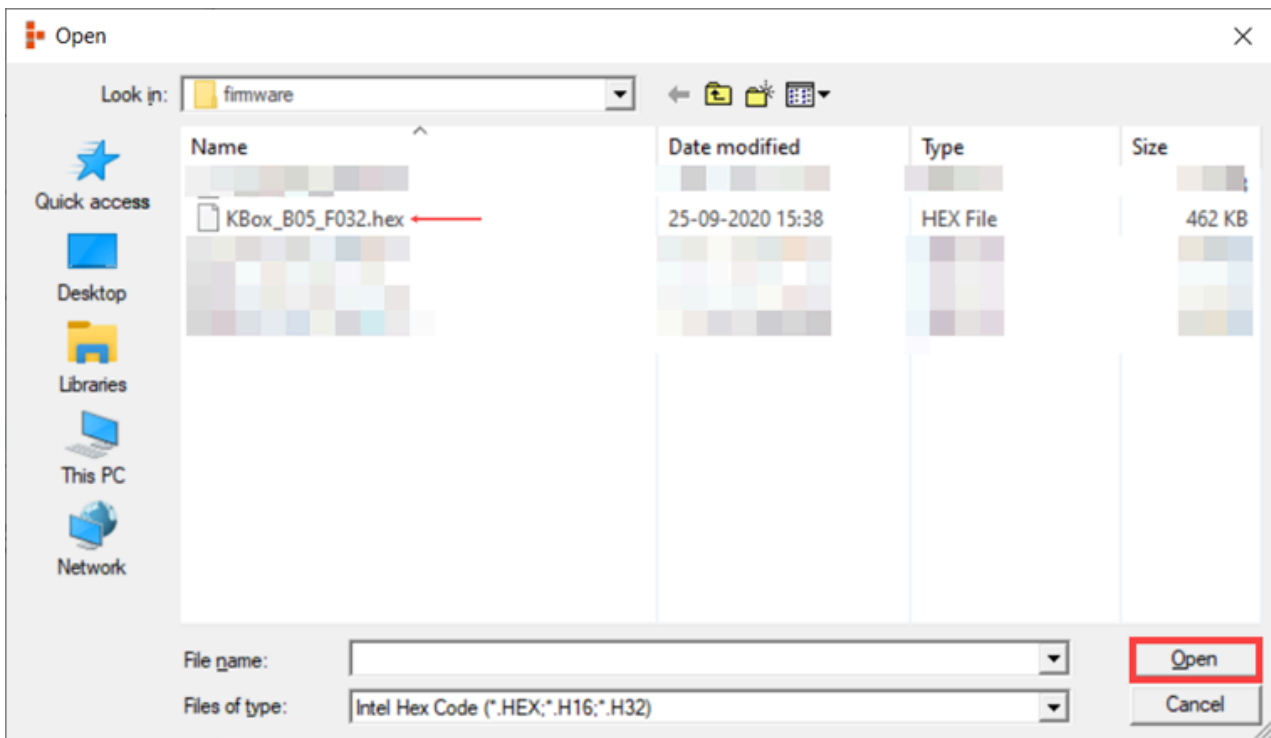
Reprogramming the K-Box

You can change to the Reprogramming Function by clicking on this tab. The following window appears:



Click the Open Button 
Open

Locate the hex file that you wish to program into the K-Box. Generally, this will be located in C:\Program Files (x86)\Influx Technology\K-Box Config\firmware.



Then click the Open Button.

Click the Commit button. The following progress indicator at the bottom of the screen becomes visible:



When the progress indicator reaches the right-hand side, reprogramming is complete.

Calibrating the K-Box

To improve the accuracy, one can calibrate the K-Box measurements. The software allows the user to cycle through several measurement points. Once done committing, the calibration applies to the K-Box, improving the measurement accuracy.

K-Box Cal v.3.38 [KBox_B05_F032.hex] 25-09-2020 15:38:00

General Measurement Analog Channels **Digital Channels** Calibration Reprogramming Manufacturer

Calibrate Reference Measured Temperature Noise Settings Noise Level

RUN -50 C **-353.8 C**

Settings: Go to next channel

Noise Level: 0.5 C, 2.5 C, Tolerance Default

Analog Inputs: ADC 0-7

Thermo Couples: TC 0-7

Channel	Reference 1	Reference 2	Reference 3	Reference 4
ADC 0	-12 V	-9 V	+9 V	+12 V
ADC 1	-12 V	-9 V	+9 V	+12 V
ADC 2	-12 V	-9 V	+9 V	+12 V
ADC 3	-12 V	-9 V	+9 V	+12 V
ADC 4	-12 V	-9 V	+9 V	+12 V
ADC 5	-12 V	-9 V	+9 V	+12 V
ADC 6	-12 V	-9 V	+9 V	+12 V
ADC 7	-12 V	-9 V	+9 V	+12 V
TC 0	-50 C	0 C	+100 C	+200 C
TC 1	-50 C	0 C	+100 C	+200 C
TC 2	-50 C	0 C	+100 C	+200 C
TC 3	-50 C	0 C	+100 C	+200 C
TC 4	-50 C	0 C	+100 C	+200 C
TC 5	-50 C	0 C	+100 C	+200 C
TC 6	-50 C	0 C	+100 C	+200 C
TC 7	-50 C	0 C	+100 C	+200 C

Clear calibration

Clear channel

Ident	Data	Comment	Time
0x07E5	F5 01 07 00 00 00 00 00	Inquire software range Channel Ain7	11:12:36
0x07E4	F5 00 01 01 00 00 00 00		11:12:36

KBox ON Line S.N. 0x00000431 Fw.V. 5.32 Rexxen (v.04.04) 500 kbit/s

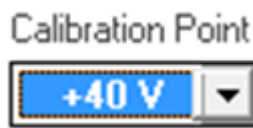


Pressing the Load Button Loads the calibration contained in the K-Box and displays them on the screen.

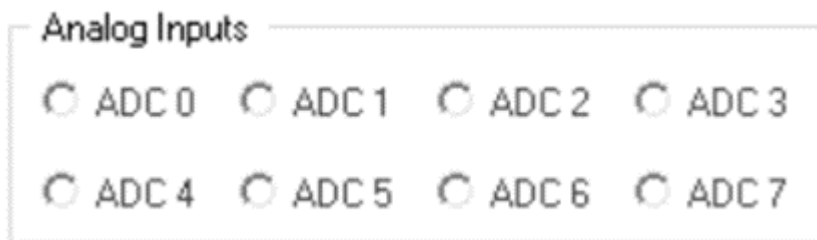
Noise Level

Alternatively, press the start button and attach the appropriate voltages/thermocouple test signals to the inputs of the K-Box to cycle through the test points to calibrate the K-Box for maximum accuracy:

Select the Voltage of the Calibration Point you wish to calibrate, and make these points appropriate to the range of inputs you expect. For example, if you expect input signals to be between 0V and +38V, Influx recommends you calibrate the +40V and 0V calibration points for that channel:



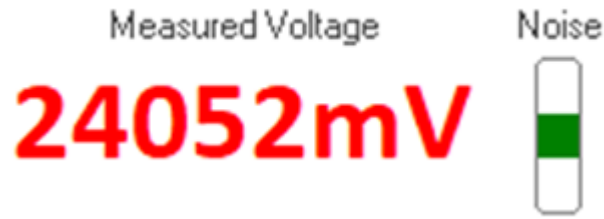
Select the Channel of the Calibration Point you wish to calibrate by either clicking the Radio Button of the channel



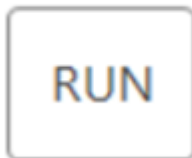
Or, by clicking on the point, you wish to calibrate in the field to the right.

Channel	Reference 1	Reference 2	Reference 3	Reference 4
ADC 0	-12 V	-9 V	+9 V	+12 V
ADC 1	-12 V	-9 V	+9 V	+12 V
ADC 2	-12 V	-9 V	+9 V	+12 V
ADC 3	-12 V	-9 V	+9 V	+12 V
ADC 4	-12 V	-9 V	+9 V	+12 V
ADC 5	-12 V	-9 V	+9 V	+12 V
ADC 6	-12 V	-9 V	+9 V	+12 V
ADC 7	-12 V	-9 V	+9 V	+12 V

Adjust the input voltage from the calibrated test equipment that you are using to match the voltage for the test point:



Calibrate

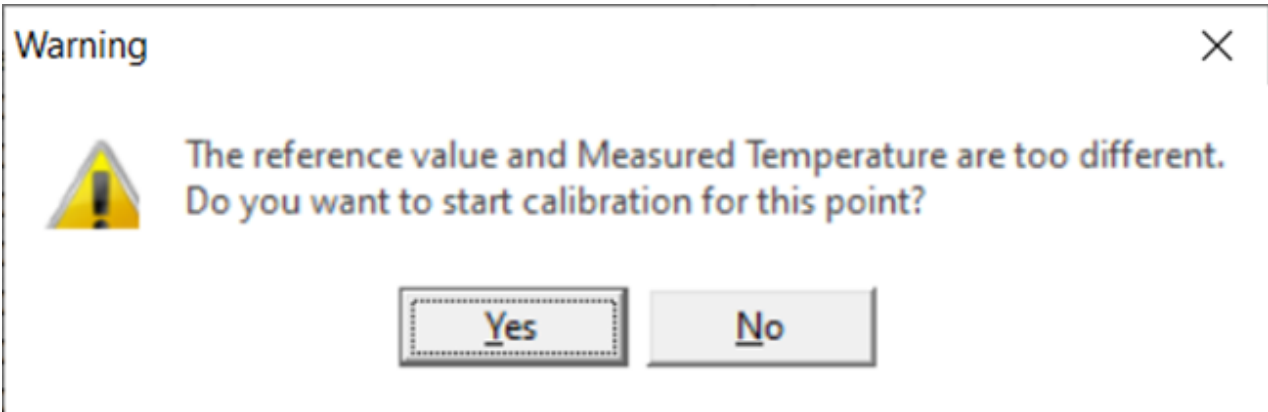


Press RUN:

If the input voltage is stable and correct, the calibration of the channel will be updated as follows:

Channel	Reference 1	Reference 2	Reference 3	Reference 4
ADC 0	-12 V	-9 V	+9 V	+12 V
ADC 1	-12 V	-9 V	+9 V	+12 V
ADC 2	-12 V	-9 V	+9 V	+12 V
ADC 3	-12 V	-9 V	+9 V	+12 V
ADC 4	-12 V	-9 V	+9 V	+12 V
ADC 5	-12 V	-9 V	+9 V	+12 V
ADC 6	-12 V	-9 V	+9 V	+12 V
ADC 7	-12 V	-9 V	+9 V	+12 V
TC 0	-50 C	0 C	+100 C	+200 C
TC 1	-50 C	0 C	+100 C	+200 C
TC 2	-50 C	0 C	+100 C	+200 C
TC 3	-50 C	0 C	+100 C	+200 C
TC 4	-50 C	0 C	+100 C	+200 C
TC 5	-50 C	0 C	+100 C	+200 C
TC 6	-50 C	0 C	+100 C	+200 C
TC 7	-50 C	0 C	+100 C	+200 C

If it is not, you will receive a warning:



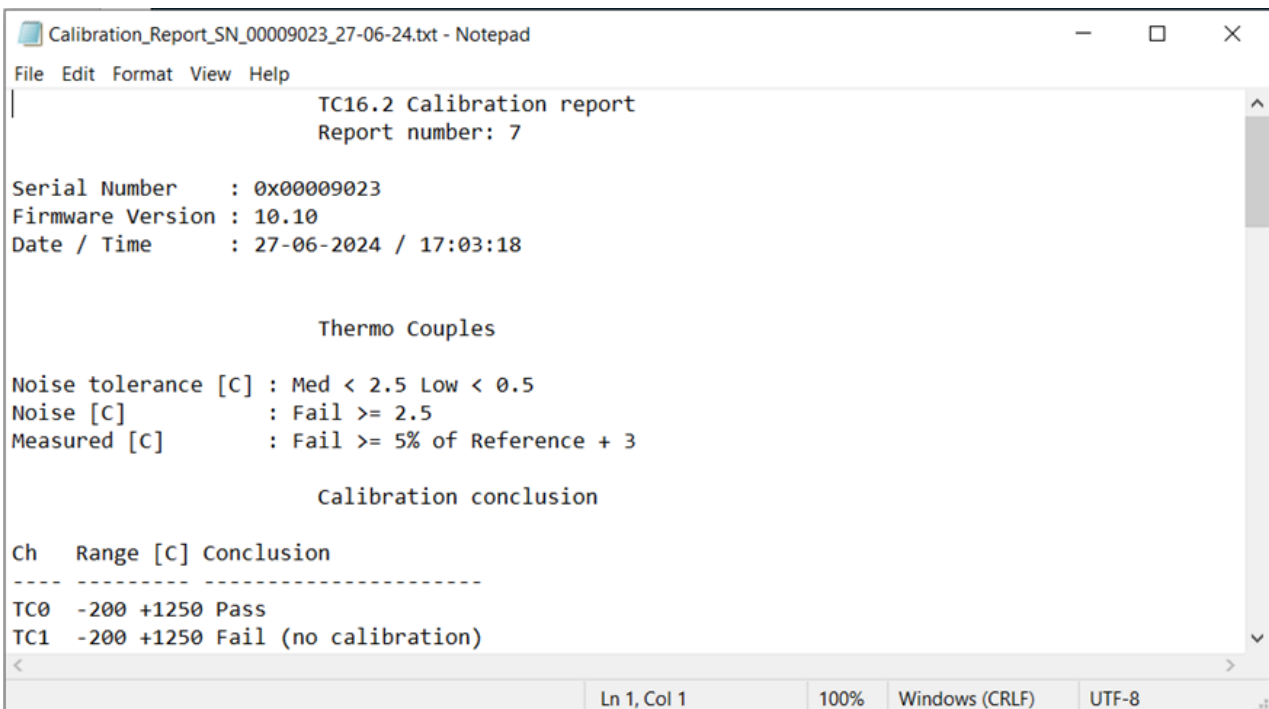
Repeat the steps above until you have calibrated all the calibration points.



Commit

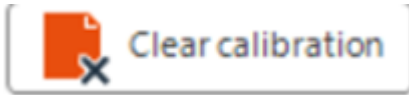
Once you have configured the K-Box as desired, click Commit to send the configuration to the K-Box. If you make a mistake and wish to clear the calibration, use the Clear button.

Doing this will save the calibration to the K-Box and create a report detailing the calibration:



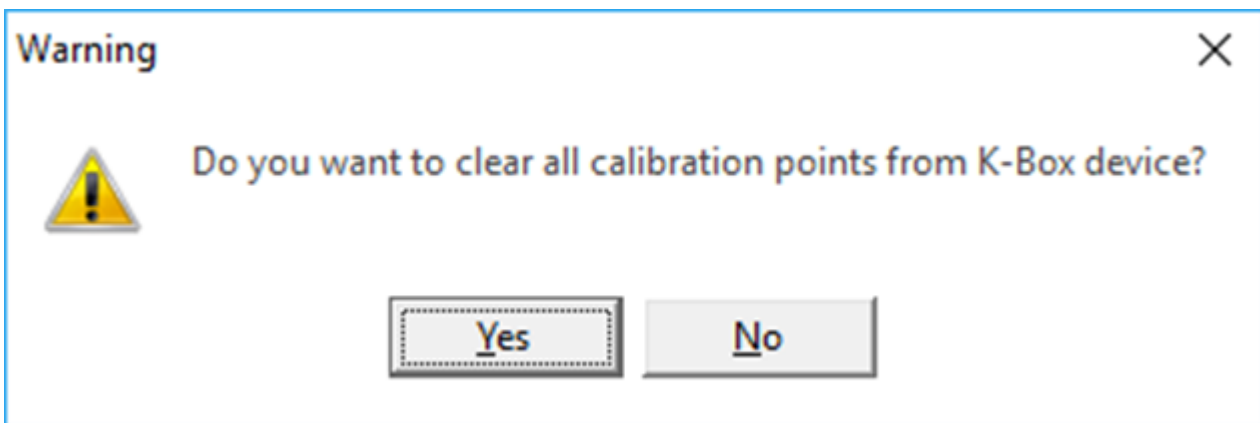
Erasing the Calibration

To erase the calibration, follow the following steps:



Click the Clear calibration.

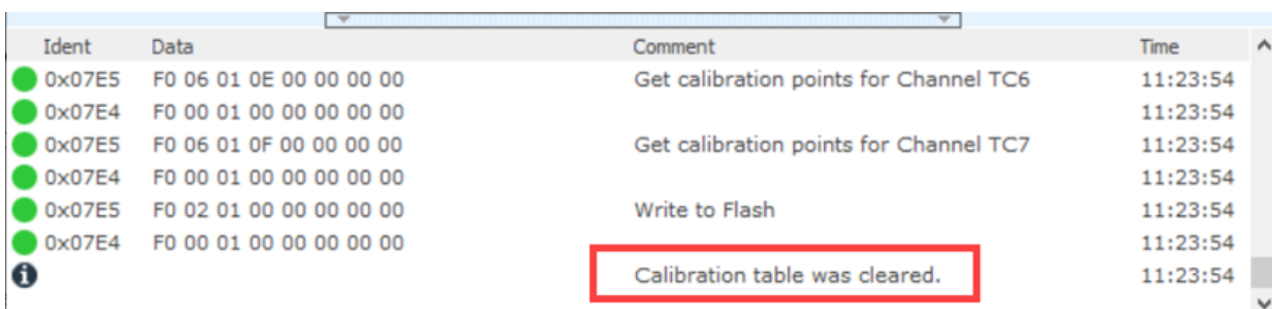
Click Yes to confirm that you want to clear the calibration.



Check that you can see the status messages at the bottom of the K-Box Cal Application if you can't click on the light blue line and drag it upwards.



Wait until the status messages at the bottom of the window show that the Calibration table has been cleared:



Ident	Data	Comment	Time
0x07E5	F0 06 01 0E 00 00 00 00	Get calibration points for Channel TC6	11:23:54
0x07E4	F0 00 01 00 00 00 00 00		11:23:54
0x07E5	F0 06 01 0F 00 00 00 00	Get calibration points for Channel TC7	11:23:54
0x07E4	F0 00 01 00 00 00 00 00		11:23:54
0x07E5	F0 02 01 00 00 00 00 00	Write to Flash	11:23:54
0x07E4	F0 00 01 00 00 00 00 00		11:23:54
		Calibration table was cleared.	11:23:54

Using K-Box Cal to display data

The user can use the K-Box Cal application to display the Analog voltages being measured by the K-Box visually.

The screenshot displays the K-Box Cal v.3.38 software interface. The main window shows the following information:

- Measured:** -272.94 deg C
- Conversion:** -272.94 deg C
- Analog Channels:** ADC 0 through ADC 7 (all unselected).
- Digital Channels:** Ch 1 through Ch 3, and PINs (all unselected).
- Thermo Couples:** TC 0 through TC 7. **TC 5** is selected.

The **Item information** table is as follows:

Color	Channel	Units	Value	Name
<input type="checkbox"/>	TC1	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC2	deg C	-272.9375	
<input type="checkbox"/>	TC3	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC4	deg C	-272.9375	
<input type="checkbox"/>	TC5	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC6	deg C	1242.8125	
<input checked="" type="checkbox"/>	TC7	deg C	-272.9375	

The **Oscilloscope** view shows a graph of temperature over time (82 to 107 seconds). The y-axis ranges from -272.94 to 1242.93 deg C. The graph displays several data series:

- TC2 [deg C]:** A green horizontal line at approximately -272.94 deg C.
- TC4 [deg C]:** A purple horizontal line at 0 deg C.
- TC6 [deg C]:** A red line that fluctuates between approximately 1242.8 and 1242.9 deg C.
- TC7 [deg C]:** A blue horizontal line at approximately -272.94 deg C.

The bottom status bar shows the date and time: 25/06/24 14:07:32. Below this is a table of data points:

Ident	Data	Comment	Time
0x07E4	A7 82 02 00 00 14 82 01		14:05:51
0x07E5	A9 00 00 00 00 00 00 00	Inquire ID Digital Inputs	14:05:51
0x07E4	A9 01 03 00 00 15 00 01		14:05:51
0x07E5	04 00 00 00 00 00 00 00		14:05:51

At the bottom, the system status is displayed: KBox ON Line, S.N. 0x00000431, Fw.V. 5.32, Rexgen (v.04.04), 500 kbit/s, Channel HS.

Channel Display and Conversion

The top area of the Measurement Tab is used to display the Measured and Converted (if applicable) Values for each of the K-Boxes Channels and to Assign Conversion Tables and Formulas to channels:

The screenshot shows the K-Box Cal v.3.38 software interface. At the top, there is a menu bar with options like Load, Commit, Node, Default, Export, Import, Scope Del, Tables, Formula, Interface, Notes, and Help. Below the menu bar, there are tabs for General, Measurement (selected), Analog Channels, Digital Channels, Calibration, Reprogramming, and Manufacturer.

In the Measurement tab, the Measured value is -272.94 deg C and the Conversion value is -272.94 deg C. Below this, there are three groups of radio buttons for selecting channels: Analog Channels (ADC 0-7), Digital Channels (Ch 1-3, PINs), and Thermo Couples (TC 0-7). TC 5 is selected.

The Item information table shows the following data:

Color	Channel	Units	Value	Name
<input type="checkbox"/>	TC1	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC2	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC3	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC4	deg C	-272.9375	
<input type="checkbox"/>	TC5	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC6	deg C	1242.8125	
<input checked="" type="checkbox"/>	TC7	deg C	-272.9375	

The Oscilloscope view shows the temperature data for TC2, TC4, TC5, TC6, and TC7 over time. The x-axis is Time [seconds] from 82 to 107. The y-axis shows temperature values in deg C. TC6 shows a square wave between 1242.8 and 1242.9 deg C. Other channels show constant values.

At the bottom, there is a log window showing the following data:

Ident	Data	Comment	Time
0x07E4	A7 82 02 00 00 14 82 01		14:05:51
0x07E5	A9 00 00 00 00 00 00 00	Inquire ID Digital Inputs	14:05:51
0x07E4	A9 01 03 00 00 15 00 01		14:05:51

At the very bottom, there is a status bar with the following information: KBox ON Line S.N. 0x00000431 Fw.V. 5.32 Rexgen (v.04.04) 500 kbit/s Channel HS

Selecting the Channel to display

Click on the radio button of the channel you wish to display. The Actual Measured Value will be displayed. If a 'Conversion Table' or 'Formula' is assigned to that channel, the converted value and units will be shown along with the formula or name of the conversion table:

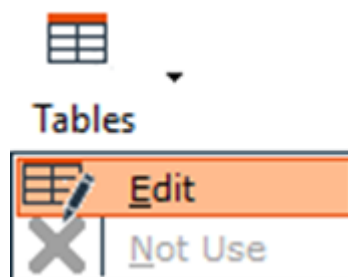
Analog Channels	Digital Channels	Thermo Couples
<input type="radio"/> ADC 0 <input type="radio"/> ADC 1 <input type="radio"/> ADC 2 <input type="radio"/> ADC 3	<input type="radio"/> Ch 1 <input type="radio"/> Ch 2	<input type="radio"/> TC 0 <input type="radio"/> TC 1 <input type="radio"/> TC 2 <input type="radio"/> TC 3
<input checked="" type="radio"/> ADC 4 <input type="radio"/> ADC 5 <input type="radio"/> ADC 6 <input type="radio"/> ADC 7	<input type="radio"/> Ch 3 <input type="radio"/> PINs	<input type="radio"/> TC 4 <input type="radio"/> TC 5 <input type="radio"/> TC 6 <input type="radio"/> TC 7

Creating a Conversion Table

Using a conversion table, the K-Box can use a table to map measured values to engineering units. For example, this feature could convert the output voltage from a pressure sensor to pressure in PA, allowing sensor values to be interpreted easily.

To create a 'Conversion Table', follow the following steps:

Clicking the Edit button allows the conversion table to be created.



Fill the Name field, Y-Axis Units and add points to the Conversion table:

In this example, the conversion Table has been named V-PA. The units it will convert to have been set to kPA. Once that is done, the Add button adds the various points on the graph. That describes the sensor's transfer function (in this example, 0,0; 200,442; 400,981, and so on)

Edit Conversion Tables ✕

⋮ + New ✕ Del

Table List	Conversion Values		
V-PA	X Axis , mV	Y Axis , kPA	
	0	0	+
	200	442	
	400	981	✕
	600	1780	
	800	2417	✎
	1000	2803	
	1200	2927	🧼

Table Properties

Name:

X Axis Units: Y Axis Units:

Save the conversion table by pressing OK:

Applying a Conversion Table to a Channel

Use the following steps to apply a Conversion Table to a channel.

Click the Channel you want to assign the Conversion Table to:

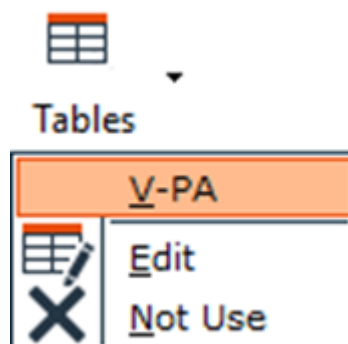


If the Channel already has a Conversion Table or Formula assigned, the corresponding button will be highlighted in red.



If you wish to remove the existing Conversion Table or Formula, click Table or Formula and uncheck the tick by clicking on the tick next to the Table in use or the **X** Not Use button.

Click the name of the Table you wish to apply to the Channel.



The Conversion Table will immediately be applied. You will see the name of the conversion table in use for the selected Channel.

Measured

0.94

mV

Conversion

2.08

kPA

Conversion Table

V-PA

Applying a Formula to a Channel

Use the following steps to apply a Formula to a channel:

Click the Channel you want to assign the Formula to:

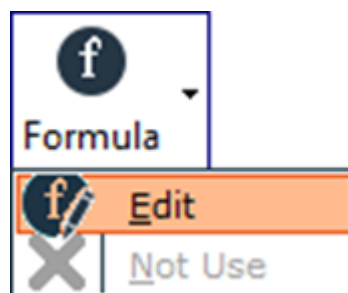


If the Channel already has a Conversion Table or Formula assigned to it, the corresponding button will be highlighted in red:

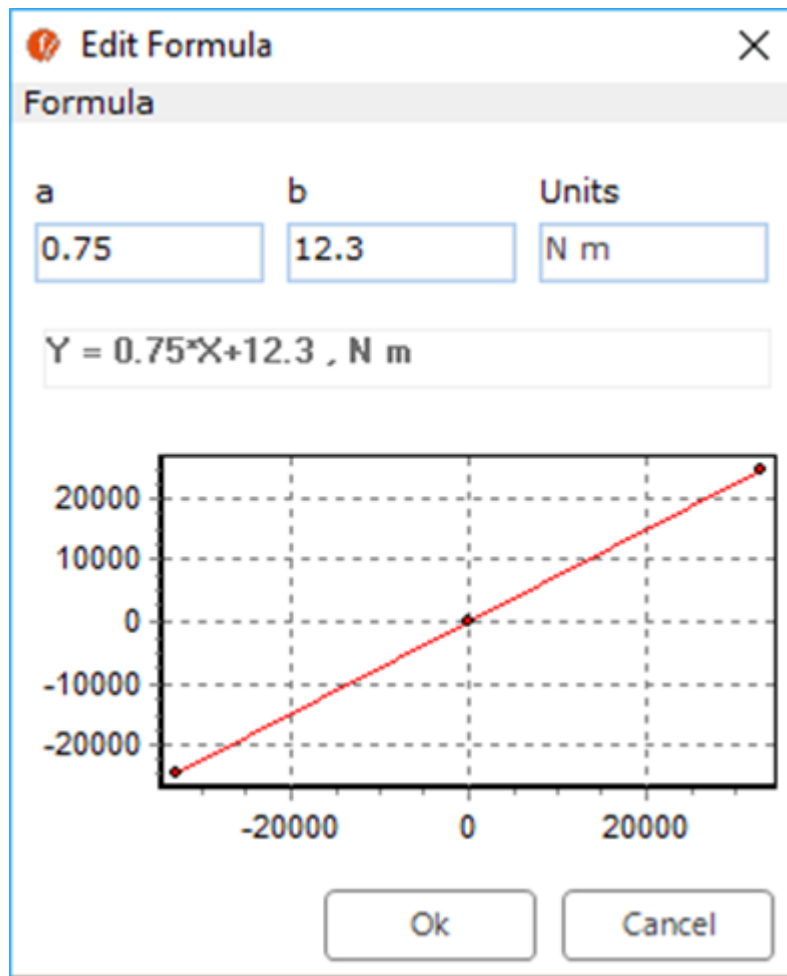


If you wish to remove the existing Conversion Table or Formula, click Table or Formula and uncheck the tick by clicking on the tick next to the Table in use or the Not Use button.

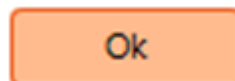
Select Formula / Edit:



Enter the Formula you would like to use, e.g. $Y=0.75*X+12.3$ and also the units of the output:



Click OK to apply the Formula to the Channel.

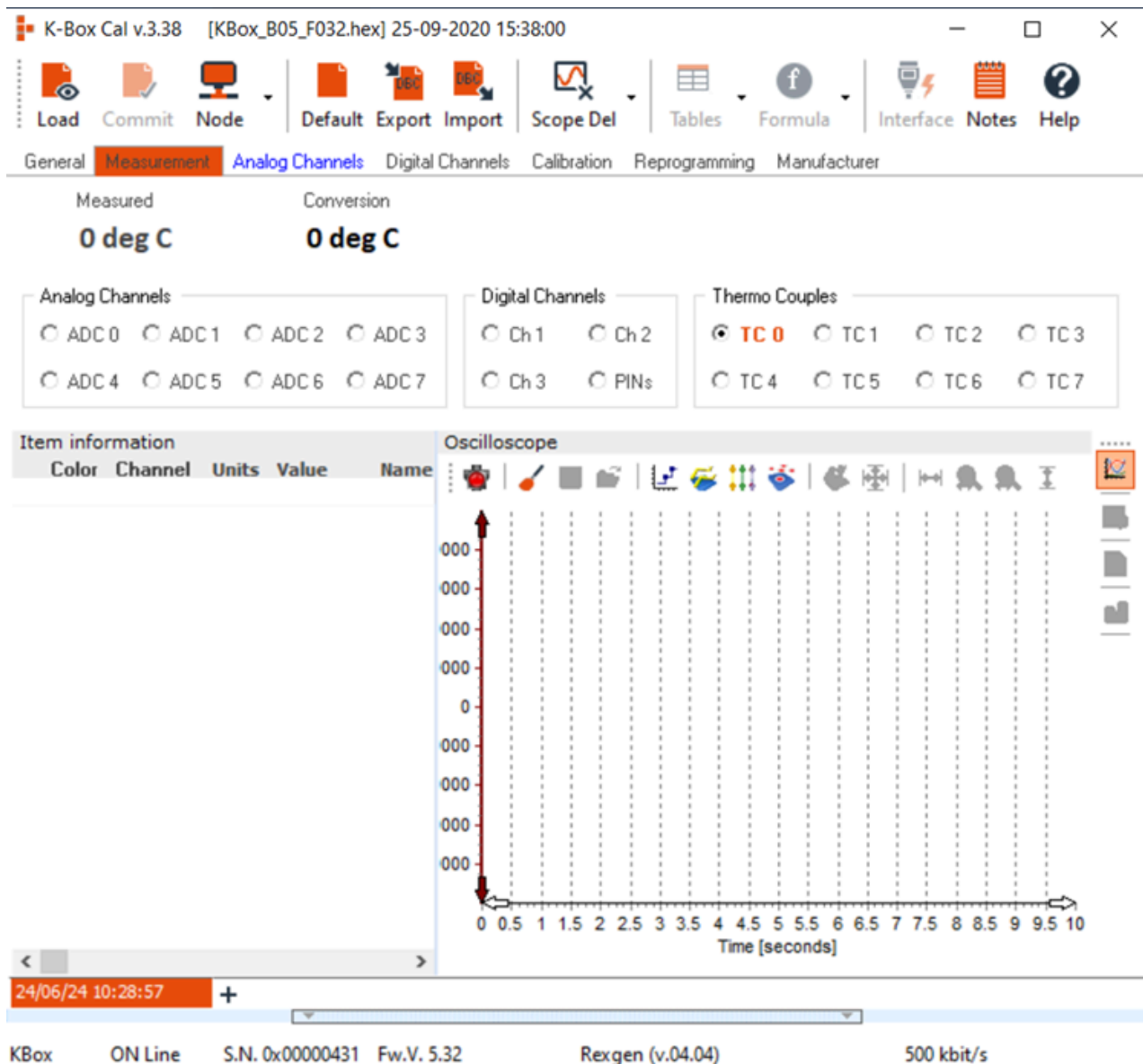


The Formula will immediately be applied, and you will see the Formula in use for the selected Channel.

Measured	Conversion	Formula
-17.22 mV	-0.61 N m	Y = 0.75*X+12.3 , N m

Using the Oscilloscope to display data

The lower area of the 'Measurement' tab is used to display the oscilloscope:



There are several ways to add items to the Oscilloscope:

[Individually Adding items to the Oscilloscope.](#)

[Adding All Channels to the Oscilloscope \(Method 1\).](#)

[Adding All Channels to the Oscilloscope \(Method 2\).](#)

[Working with items added to the Oscilloscope.](#)

Individually Adding items to the Oscilloscope.

Items can be added to the Oscilloscope individually by following the following steps:

Click the Channel you want to add to the Oscilloscope:

Analog Channels	Digital Channels
<input checked="" type="radio"/> ADC 0 <input type="radio"/> ADC 1 <input type="radio"/> ADC 2 <input type="radio"/> ADC 3	<input type="radio"/> Ch 1 <input type="radio"/> Ch 2
<input type="radio"/> ADC 4 <input type="radio"/> ADC 5 <input type="radio"/> ADC 6 <input type="radio"/> ADC 7	<input type="radio"/> Ch 3 <input type="radio"/> PINs

Click the Scope Add button.



The Channel will be added to the Oscilloscope.

Measured **9593.93 mV**
 Conversion **9593.93 mV**

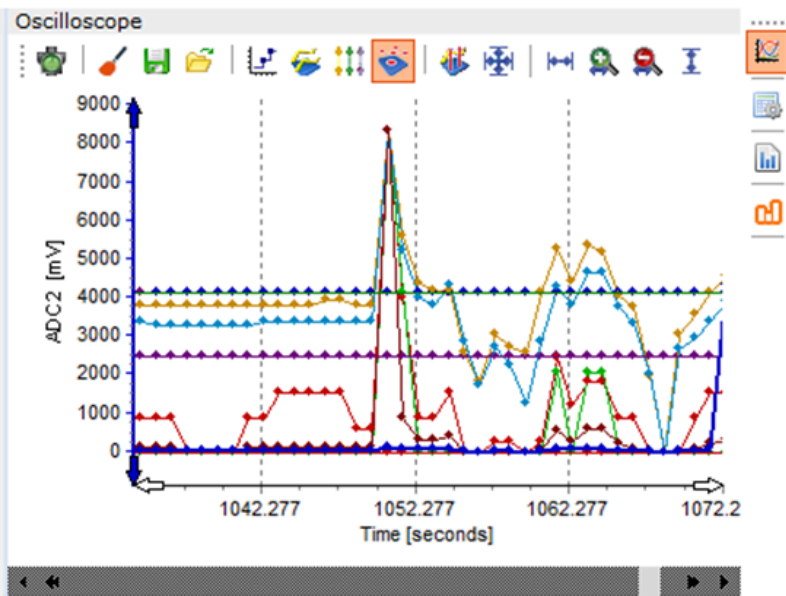
ADC 0 ADC 1 **ADC 2** ADC 3
 ADC 4 ADC 5 ADC 6 ADC 7

Ch 1 Ch 2
 Ch 3 PINs

TC 0 TC 1 TC 2 TC 3
 TC 4 TC 5 TC 6 TC 7

Item information

Color	Channel	Units	Value	Na
<input type="checkbox"/>	ADC0	mV	-5.008576	
<input checked="" type="checkbox"/>	ADC1	mA	0.020034304	
<input checked="" type="checkbox"/>	ADC2	mV	8274.167554	
<input checked="" type="checkbox"/>	ADC3	mA	0	
<input checked="" type="checkbox"/>	ADC4	mV	-4.382504	
<input type="checkbox"/>	ADC5	Kmph	0	
<input checked="" type="checkbox"/>	ADC6	mV	6.26072	
<input checked="" type="checkbox"/>	ADC7	mA	0.02504288	
<input type="checkbox"/>	Ch1	--	--	
<input type="checkbox"/>	Ch2	--	--	
<input checked="" type="checkbox"/>	Ch3	--	--	
<input checked="" type="checkbox"/>	PIN1	--	--	Dig
<input checked="" type="checkbox"/>	PIN2	--	--	Dig
<input checked="" type="checkbox"/>	PIN3	--	--	Dig
<input checked="" type="checkbox"/>	PIN4	--	--	Dig
<input type="checkbox"/>	TC0	deg C	-272.9375	
<input type="checkbox"/>	TC1	deg C	-272.9375	
<input type="checkbox"/>	TC2	deg C	-272.9375	



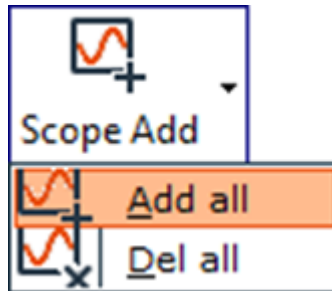
25/06/24 14:22:11

Ident	Data	Comment	Time
KBox	ON Line	S.N. 0x00000431 Fw.V. 5.32	Rexgen (v.04.04) 500 kbit/s Channel HS

Adding All Channels to the Oscilloscope (Method 1)

All Channels can be added to the Oscilloscope by following the following steps:

Click the 'Scope add / Add all' button.



All channels will be added to the Oscilloscope.

K-Box Cal v.3.38

General **Measurement** Analog Channels Digital Channels Calibration Reprogramming Manufacturer

Measured: **-272.94 deg C** Conversion: **-272.94 deg C**

Analog Channels: ADC 0 ADC 1 ADC 2 ADC 3
 ADC 4 ADC 5 ADC 6 ADC 7

Digital Channels: Ch 1 Ch 2
 Ch 3 PINs

Thermo Couples: TC 0 TC 1 TC 2 TC 3
 TC 4 TC 5 TC 6 TC 7

Item information					
	Color	Channel	Units	Value	Na
<input type="checkbox"/>		ADC0	mV	-5.008576	
<input checked="" type="checkbox"/>		ADC1	mA	0.020034304	
<input checked="" type="checkbox"/>		ADC2	mV	8274.167552	
<input checked="" type="checkbox"/>		ADC3	mA	0	
<input checked="" type="checkbox"/>		ADC4	mV	-4.382504	
<input type="checkbox"/>		ADC5	Kmph	0	
<input checked="" type="checkbox"/>		ADC6	mV	6.26072	
<input checked="" type="checkbox"/>		ADC7	mA	0.02504288	
<input type="checkbox"/>		Ch1	--	--	
<input type="checkbox"/>		Ch2	--	--	
<input type="checkbox"/>		Ch3	--	--	
<input checked="" type="checkbox"/>		PIN1	--	--	Dig
<input checked="" type="checkbox"/>		PIN2	--	--	Dig
<input checked="" type="checkbox"/>		PIN3	--	--	Dig
<input checked="" type="checkbox"/>		PIN4	--	--	Dig
<input checked="" type="checkbox"/>		TC0	deg C	-272.9375	
<input type="checkbox"/>		TC1	deg C	-272.9375	

Oscilloscope

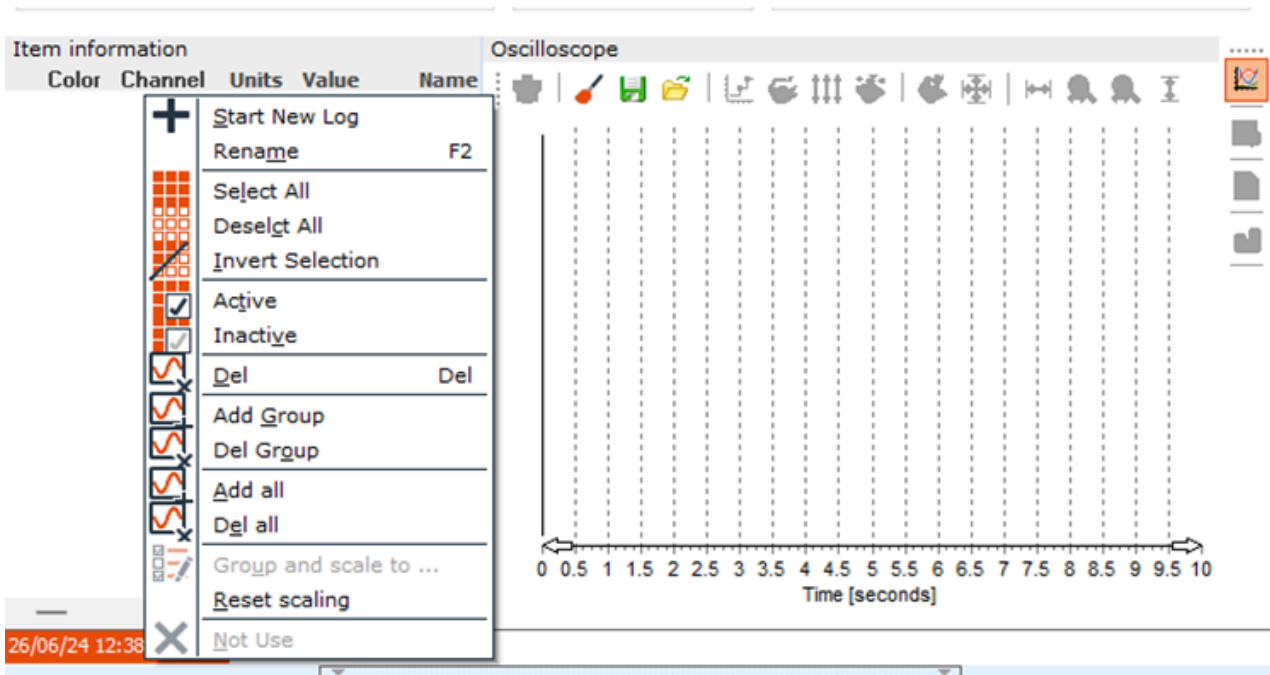
25/06/24 14:22:11 +

Ident	Data	Comment	Time
KBox	ON Line	S.N. 0x00000431 Fw.V. 5.32	Rexgen (v.04.04) 500 kbit/s Channel HS

Adding All Channels to the Oscilloscope (Method 2)

All Channels can be added to the Oscilloscope by following the following steps:

Right-click in the Item Information Area and Select Add All:



All channels will be added to the Oscilloscope.

K-Box Cal v.3.38

General **Measurement** Analog Channels Digital Channels Calibration Reprogramming Manufacturer

Measured: **-272.94 deg C** Conversion: **-272.94 deg C**

Analog Channels: ADC 0 ADC 1 ADC 2 ADC 3
 ADC 4 ADC 5 ADC 6 ADC 7

Digital Channels: Ch 1 Ch 2
 Ch 3 PINs

Thermo Couples: TC 0 TC 1 TC 2 **TC 3**
 TC 4 TC 5 TC 6 TC 7

Item information				
Color	Channel	Units	Value	Name
<input checked="" type="checkbox"/>	ADC0	mV	-7.512864	
<input checked="" type="checkbox"/>	ADC1	mV	6.26072	
<input checked="" type="checkbox"/>	ADC2	mV	-1.252144	
<input checked="" type="checkbox"/>	ADC3	mA	0	
<input checked="" type="checkbox"/>	ADC4	mV	-4.382504	
<input checked="" type="checkbox"/>	ADC5	mV	0	
<input checked="" type="checkbox"/>	ADC6	mV	6.26072	
<input checked="" type="checkbox"/>	ADC7	mA	0.015025728	
<input checked="" type="checkbox"/>	Ch1	--	--	
<input checked="" type="checkbox"/>	Ch2	--	--	
<input checked="" type="checkbox"/>	Ch3	--	--	
<input checked="" type="checkbox"/>	PIN1	--	--	Digital input status ch
<input checked="" type="checkbox"/>	PIN2	--	--	Digital input status ch
<input checked="" type="checkbox"/>	PIN3	--	--	Digital input status ch
<input checked="" type="checkbox"/>	PIN4	--	--	Digital input status ch
<input checked="" type="checkbox"/>	TC0	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC1	deg C	-272.9375	
<input checked="" type="checkbox"/>	TC2	deg C	-272.9375	

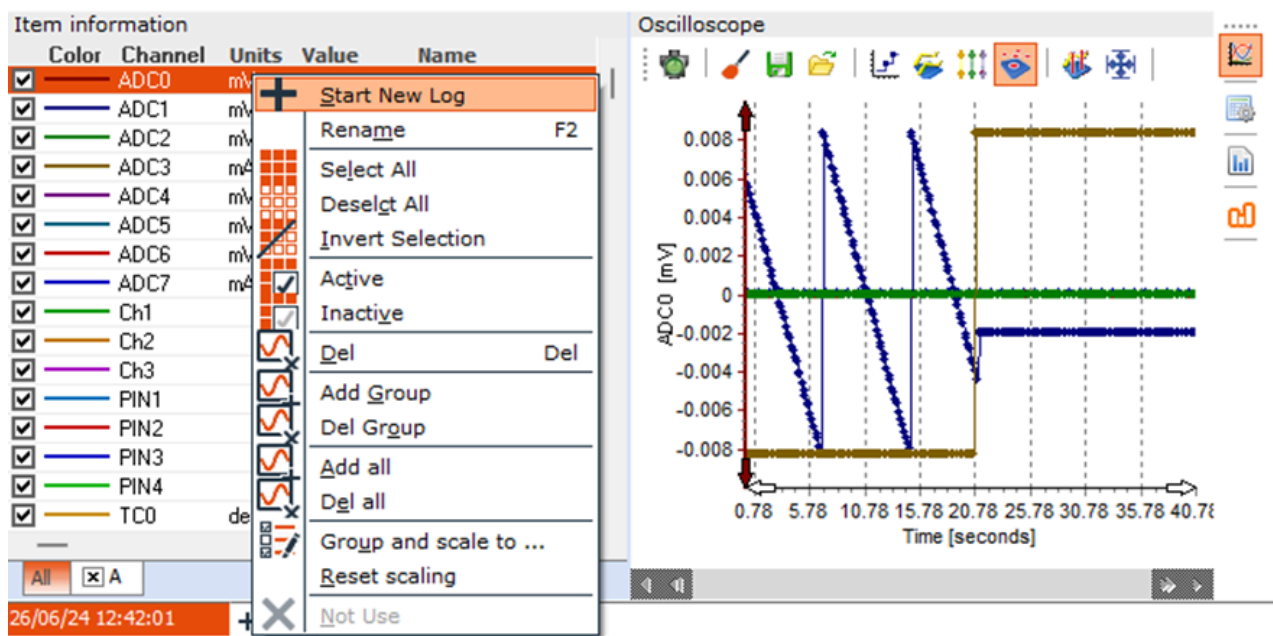
Oscilloscope

26/06/24 12:51:05

KBox ON Line S.N. 0x00000431 Fw.V. 5.32 Rexgen (v.04.04) 500 kbit/s Channel HS

Working with items added to the Oscilloscope

Right-clicking in the Item Information Area brings up the following menu:


















The Menu Items allow the following functionality:




Start New Log	Allows to start a new log, clear log and refresh the Oscilloscope
Rename	Assigns a name to the channel; this will appear in the name column.
Select All	Selects all items
Deselect All	Deselects all items
Invert Selection	Selects all items not currently selected and deselects the items currently selected.
Active	Makes the selected items 'Active'; they will be shown on the oscilloscope.
Inactive	Makes the selected items 'Inactive'; they will NOT be shown on the oscilloscope.

Del	Deletes the item or item selected in Orange.
Add Group	Adds selected item groups to the oscilloscope.
Del Group	Delete the selected item group from the oscilloscope.
Add all	Adds all items to the oscilloscope.
Del all	Deletes all items from the oscilloscope.
Groups and scale to...	Allows customisation of the scaling of selected items.
Reset Scaling	Sets the default scaling.
	Removes conversion tables or formulae















Using the Oscilloscope

The 'Oscilloscope' functionality is controlled by a dedicated toolbar, which is considered below. Each feature is then considered individually.

	Allows the Oscilloscope to go online.
	Clear the Logged Data in the Oscilloscope.
	Saves the data Logged in the Oscilloscope. It can be saved in: Vector MDF (.DAT). MATLAB 5.0 (.MAT). MATLAB 5.0 Structured single or double precision (.MAT). MATLAB 5.0 Structure Extended (.MAT). Comma Separated Variables (.CSV).
	Opens previously Logged data files.
	Show steps between data points.
	Separate Items on Oscilloscope.
	Axis display modes.
	Show item points.
	Show cursors.
	Reset Zoom Factor.
	Reset X-axis Zoom Factor.
	Zooms in X-axis.
	Zooms out X-axis.
	Fit Items to visible zoom area.
	Zooms in Y-axis.

	Zooms out Y-axis.
	Zooms in all axis.
	Zooms out all axis.

Right-clicking on the oscilloscope also brings up a menu with several further options. These include changing the scale of the time axis to several different resolutions and changing the axis colour, clearing the data, and printing and exporting the image displayed on the scope.

	<u>S</u> eparate	
	S <u>t</u> ep mode	
	A <u>x</u> is mode	
	S <u>h</u> ow points	
	<u>C</u> ursors	
<hr/>		
	Sca <u>l</u> e	▶
	A <u>x</u> is color	
<hr/>		
	Cl <u>e</u> ar	
	<u>P</u> rint	
<hr/>		
	Exp <u>o</u> rt to image file	
	Co <u>p</u> y to clipboard	
<hr/>		
	N <u>o</u> rmal	
	<u>Z</u> oom in	
	Zo <u>o</u> m out	

Exporting a DBC file with conversion tables and Formulas

The DBC Export feature allows you to export the Conversion tables and Formulas Applied to the various Analog channels for use in other tools such as DiaLog.



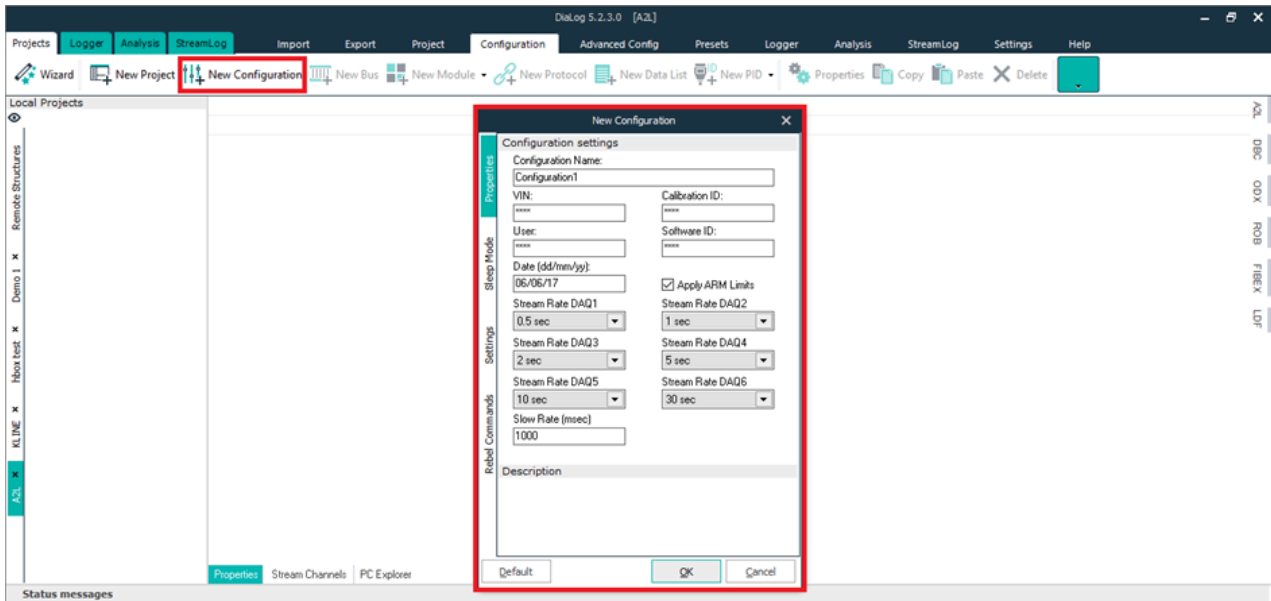
Clicking DBC Export will generate the DBC file and prompt you for the location to save it.

How to [export CAN DBC](#) using the K-box (tutorial video).

Making a Configuration in Dialog to Log K-Box

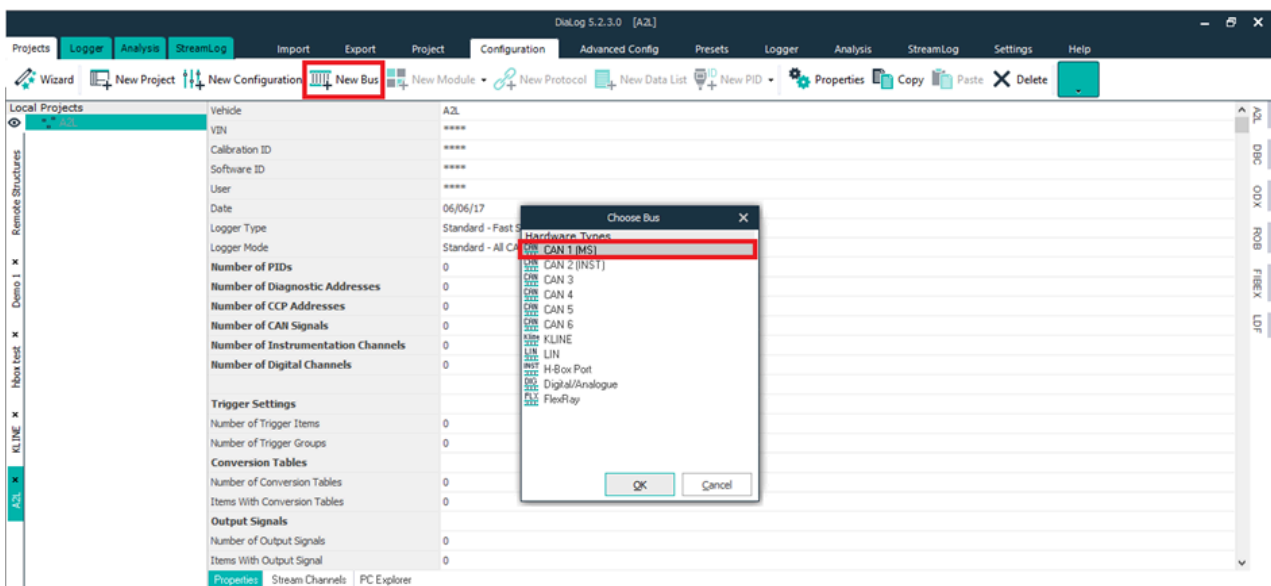
Create a new Configuration.

Enable AUX Power ON in the settings tab. Click OK.

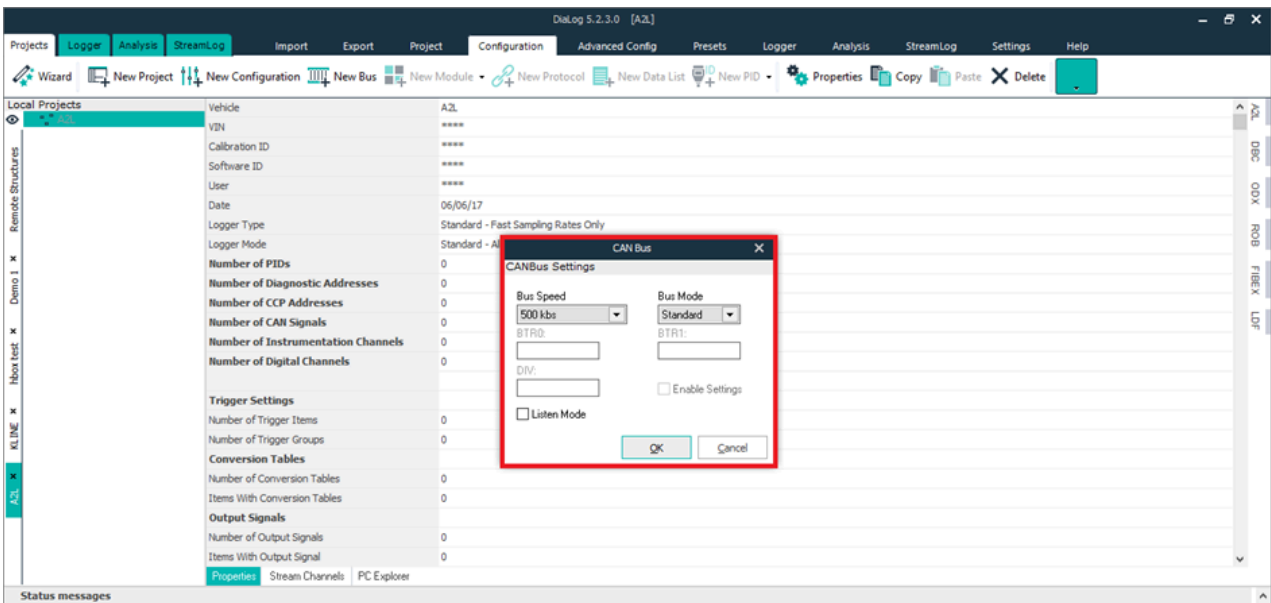


Create a new BUS.

Select CAN 1 (MS) from the pop-up menu.

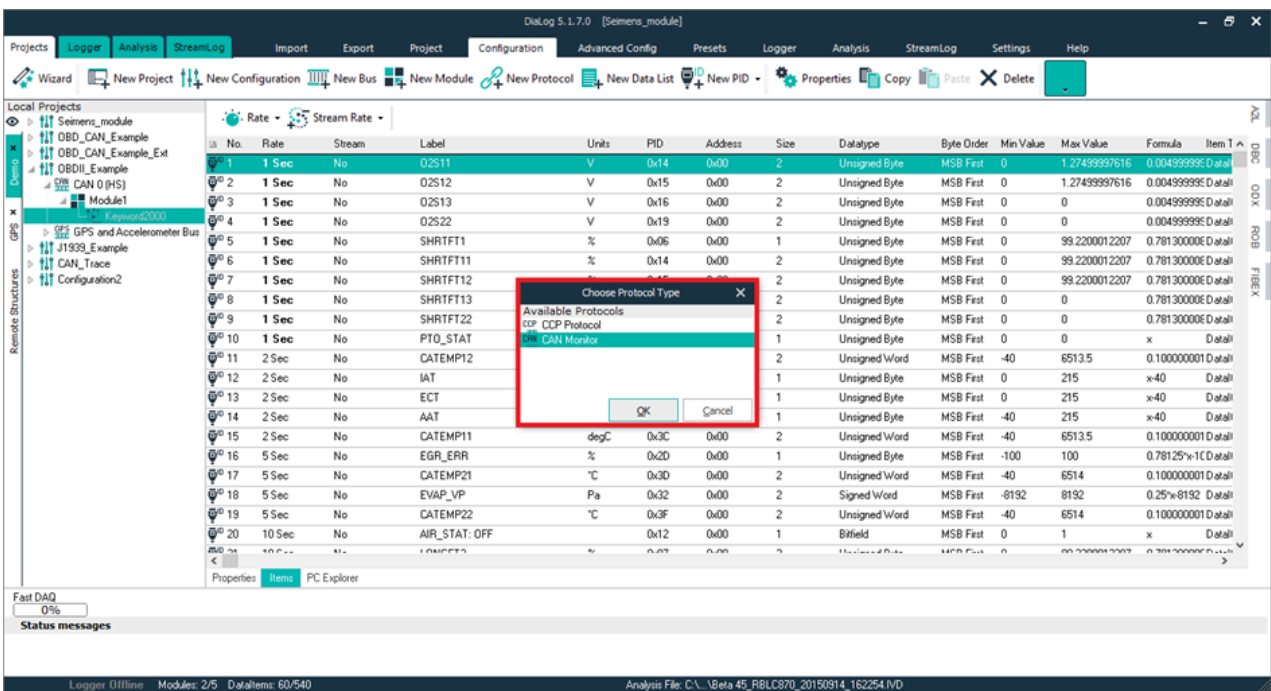


Enter the BUS properties.

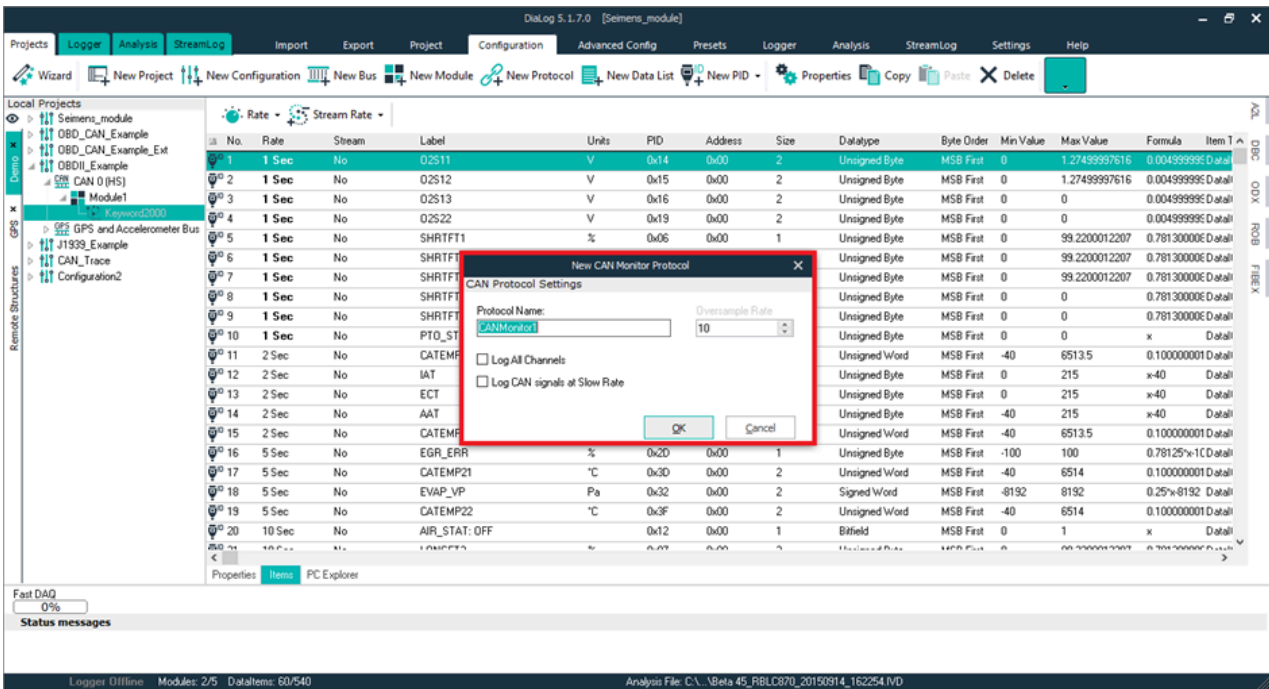


Create a New Protocol.

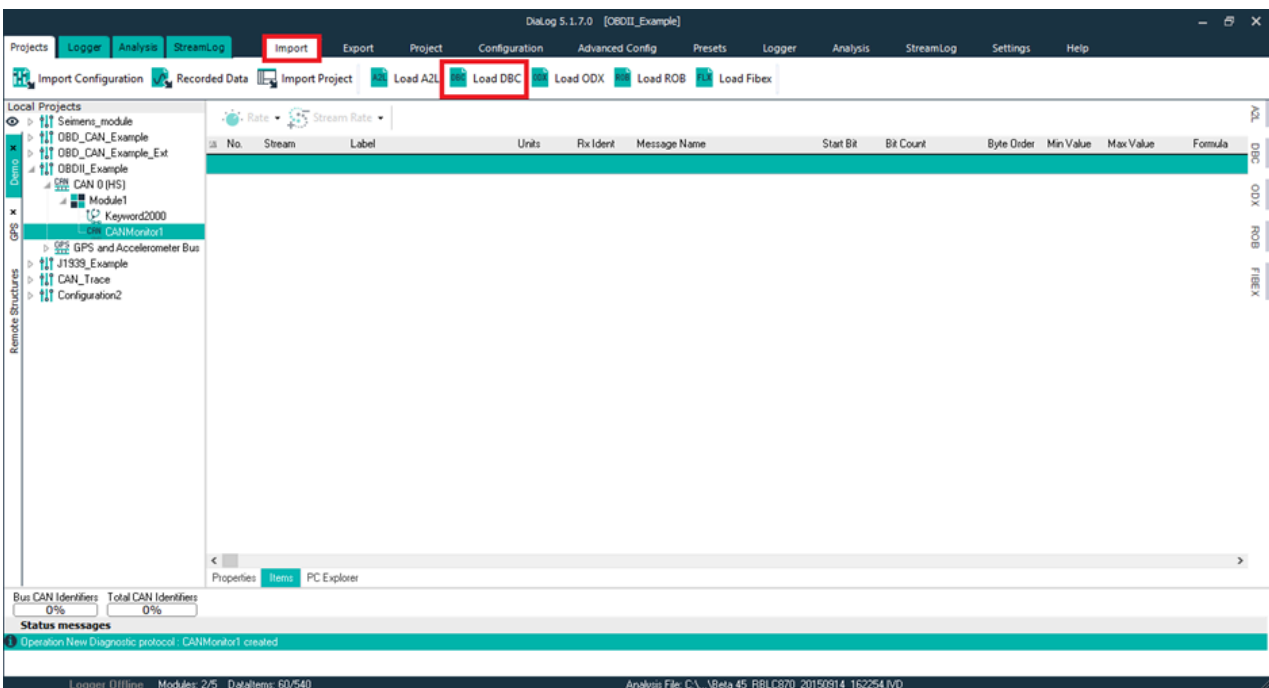
Select the CAN Monitor protocol.



Assign the settings and Protocol Name.

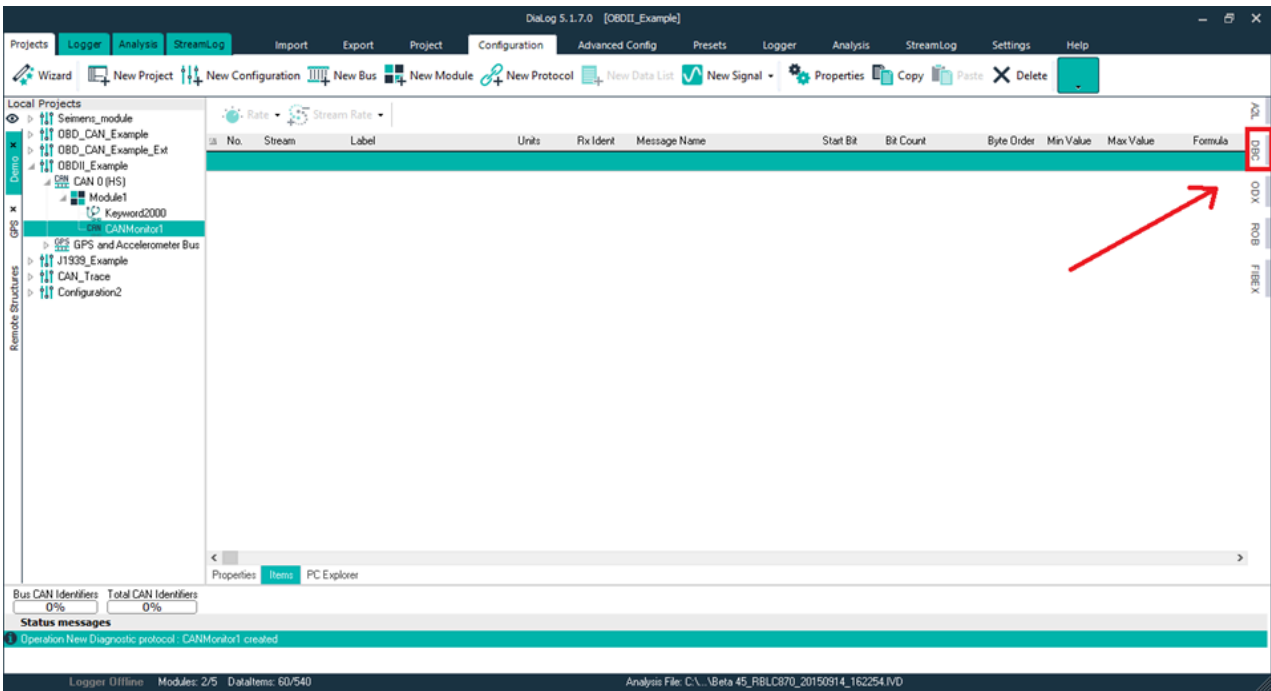


Select the Import tab and click Load DBC.

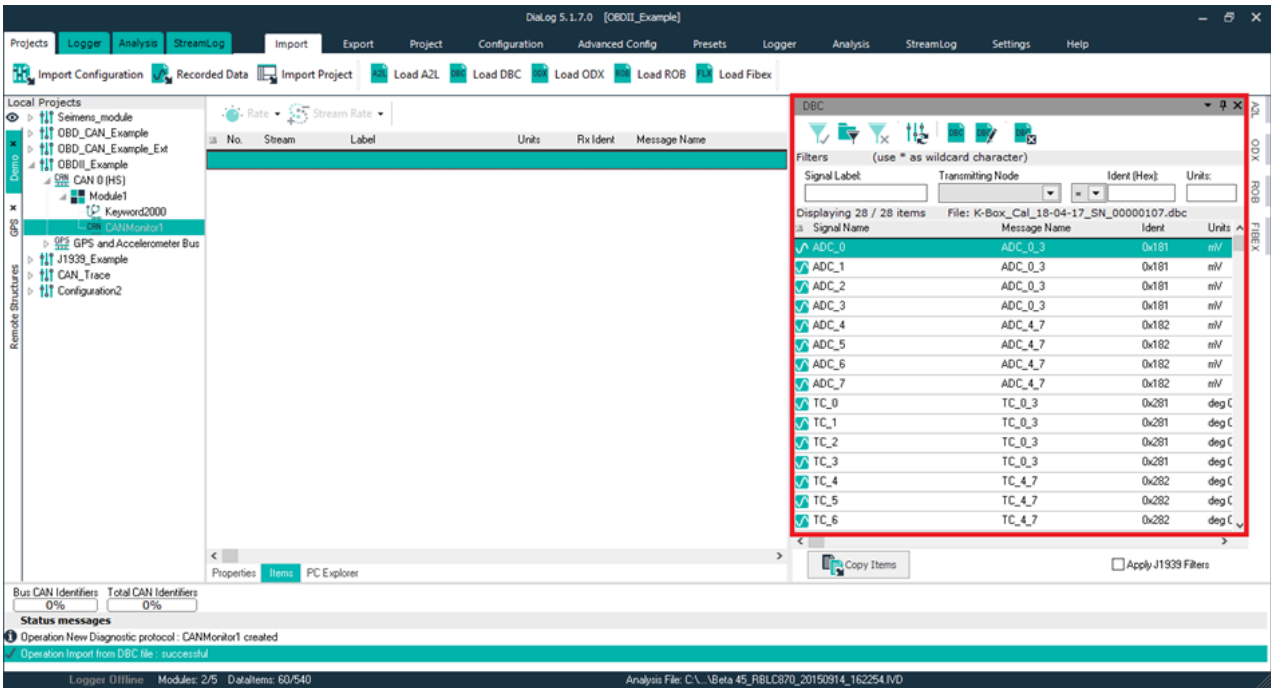


Or

Click the DBC tab on the right side.

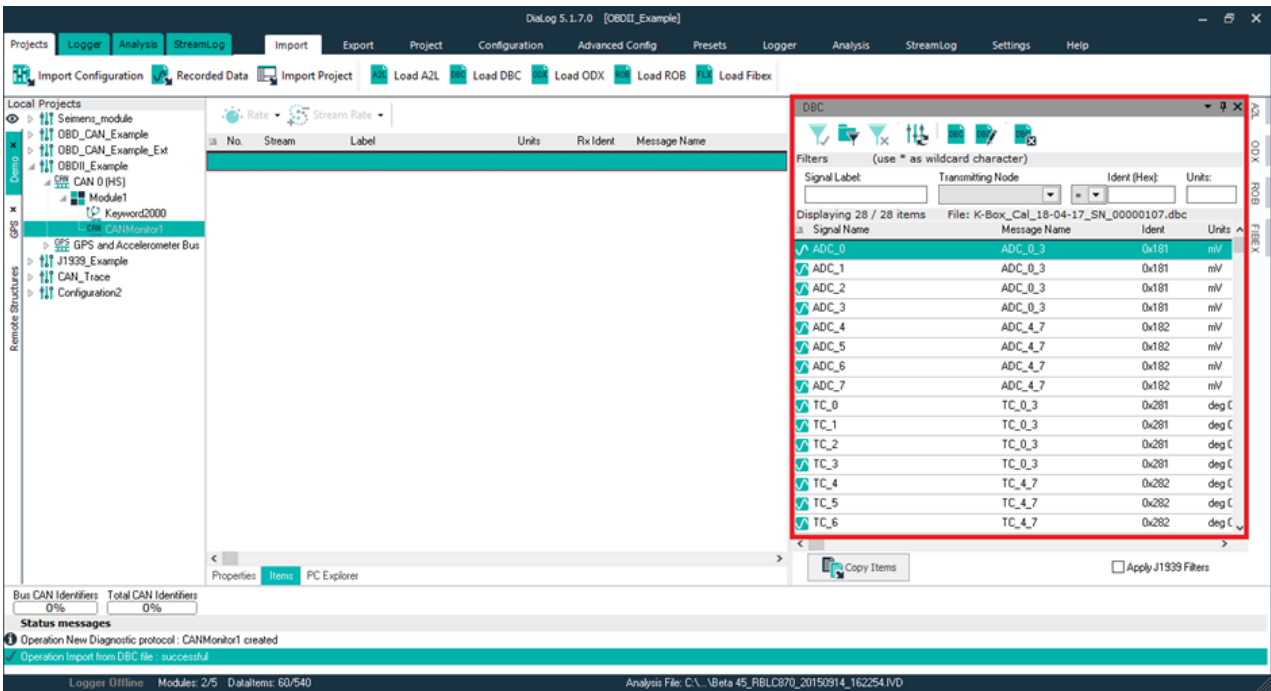


Click the open DBC file icon to browse and select the previously generated K-Box DBC.



Select the required signal from the DBC window.

Copy the selected signals and paste them into the DAQ list.



Send the configuration to the logger.

Notes:

- You can have multiple buses in a single configuration. You can log OBD, A2L or ODX data along with K-Box.

Appendix

[Specifications](#)

[Pinout of the K-Box](#)

[Pinout of the Multi Connect Cable](#)

[Measurement IEPE Procedure](#)

Specifications

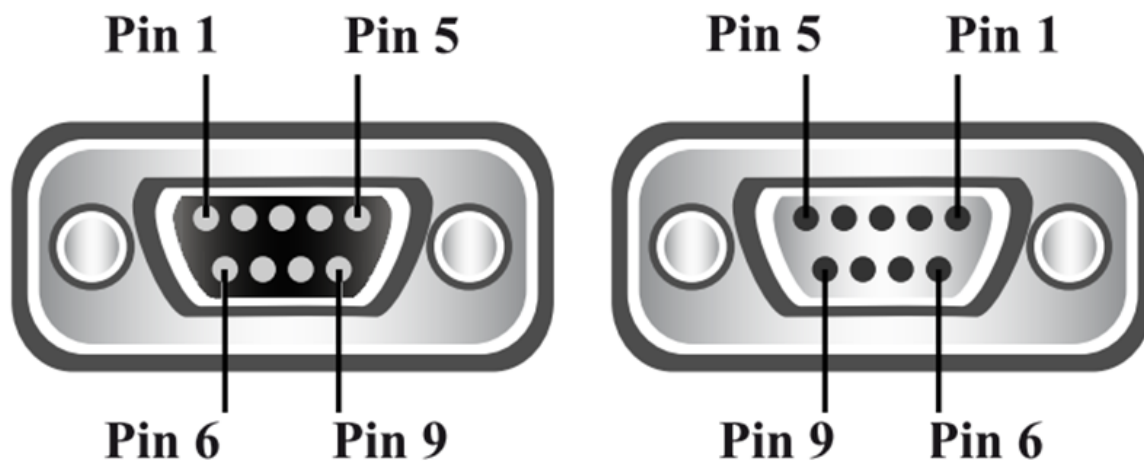
Technical Data	Description
Power supply	6 to 36V DC.
Interfaces	CAN Bus
PC interfaces	None
Enclosure	Dimension (L115xH46xW105) Weight 450g/IP65/ABS
Environmental	-40°C to +85°C Humidity max 90%
Output voltages	5V and 24V (Max current drawn 80 mA combined)
	Analog Inputs
Number of channels	8 Bipolar differential inputs
Accuracy	±0.0015%
Software switchable range	±80V, ±40V, ±20V, ±10V
Resolution (ADC)	16 Bit
Max Sampling Rate	(10 KHz) 2 channel, (5 KHz) 2 channel, (2 KHz) 4 channel, (1 KHz) 8 channel (Thermocouple and Digital Data will be turned off when rates above 1 ms are used for ADC channels.)
Input impedance	> 4 M Ohm
Max input voltage	±75 Analog Ground, ±50 V Analog inputs
	Thermocouple Inputs
Number of channels	8 J/K/T-type inputs
Accuracy	±1°C accuracy
Measurement Range	Measurement: -200 °C to 1250 °C
Max Sampling Rate	10 Hz (all 8 channels)

Maximum input voltage	±3.3 V
	Digital Input / Output
Number of channels	×4 unipolar single-ended hardware configured as inputs or outputs
Input switching thresholds	Low < 1.5V
	High > 2.0V (up to 12V)
Input leakage current	< 10nA
Output states	(Optional) Open collector - 510 Ohm
Output drive capability (OK): Collector-emitter voltage	45V max
Collector current (DC)	10mA max
Saturation voltage (OK on)	< 0.15V
Equivalent on-resistance	< 510Ohm
Leakage current at OK off	< 5uA
Min-max applied voltage	Digital input -8V to +12V; Digital output 0V to +40V power supply, which limits the current to 10mA
PWM	3 digital input frequency measurements up to 100kHz or pulse measurements. (min 100 Nano sec) (between pulses 10 microseconds)

Pinout of the K Box

2x DB9 CAN Connectors

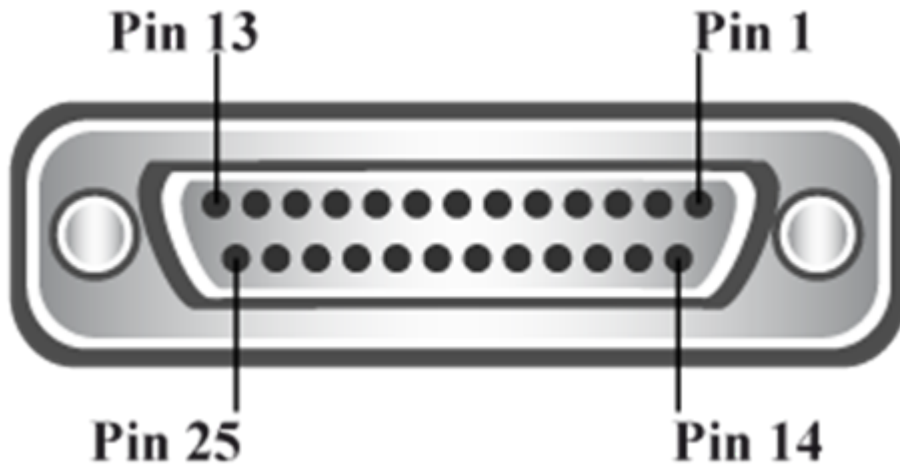
The CAN connectors are 1x Male and 1x Female 9-pin Subminiature D Type connectors.



DB9	Pin Function
Pin 1	Digital 4/+4.5V inst
Pin 2	CAN L
Pin 3	Ground
Pin 4	Digital 1
Pin 5	Power Ground
Pin 6	Digital 3
Pin 7	CAN H
Pin 8	Digital 2
Pin 9	Power Supply 4.5-36V

ADC Connector

The ADC connector is a Male 25-pin Subminiature D Type connector.

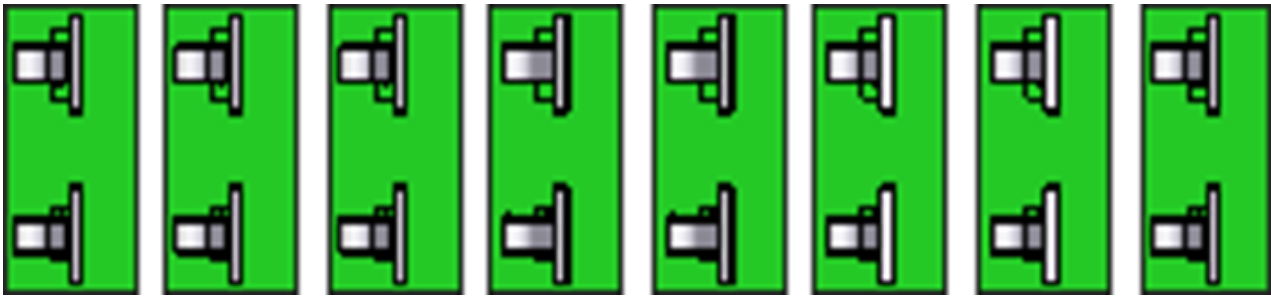


DB25	Pin Function
Pin 1	+24V Output
Pin 2	+5V Output
Pin 5	Analog Ground
Pin 6	Analog Input 0 +
Pin 7	Analog Input 1 +
Pin 8	Analog Input 2 +
Pin 9	Analog Input 3 +
Pin 10	Analog Input 4 +
Pin 11	Analog Input 5 +
Pin 12	Analog Input 6 +
Pin 13	Analog Input 7 +
Pin 14	Ground Out
Pin 15	Ground Out
Pin 17	Analog Ground
Pin 18	Analog Input 0 -
Pin 19	Analog Input 1 -

Pin 20	Analog Input 2 -
Pin 21	Analog Input 3 -
Pin 22	Analog Input 4 -
Pin 23	Analog Input 5 -
Pin 24	Analog Input 6 -
Pin 25	Analog Input 7 -

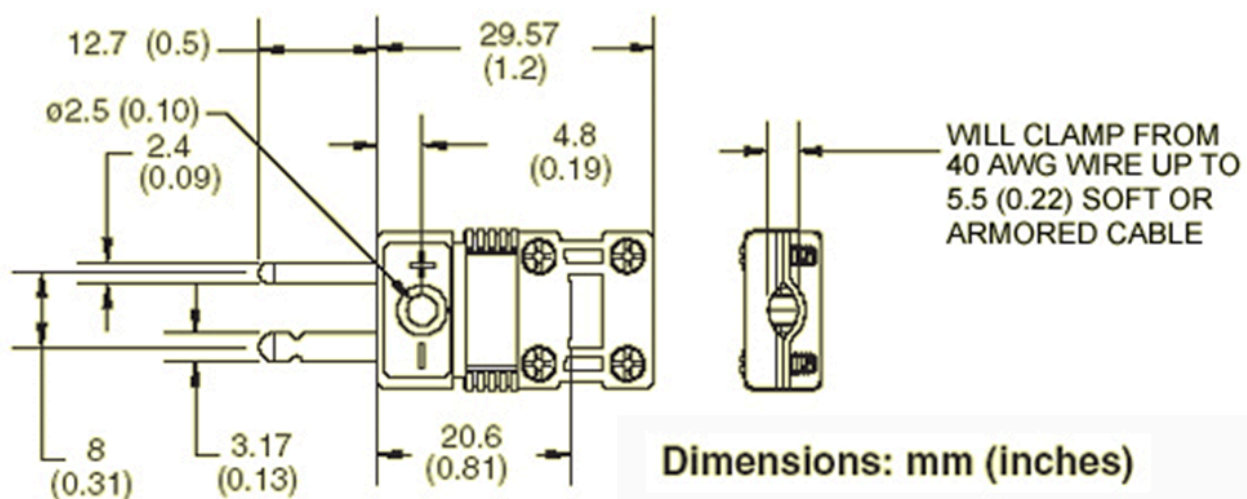
Thermocouple Connectors

The Thermocouple connectors on the K-Box are miniature-size flat-type sockets.



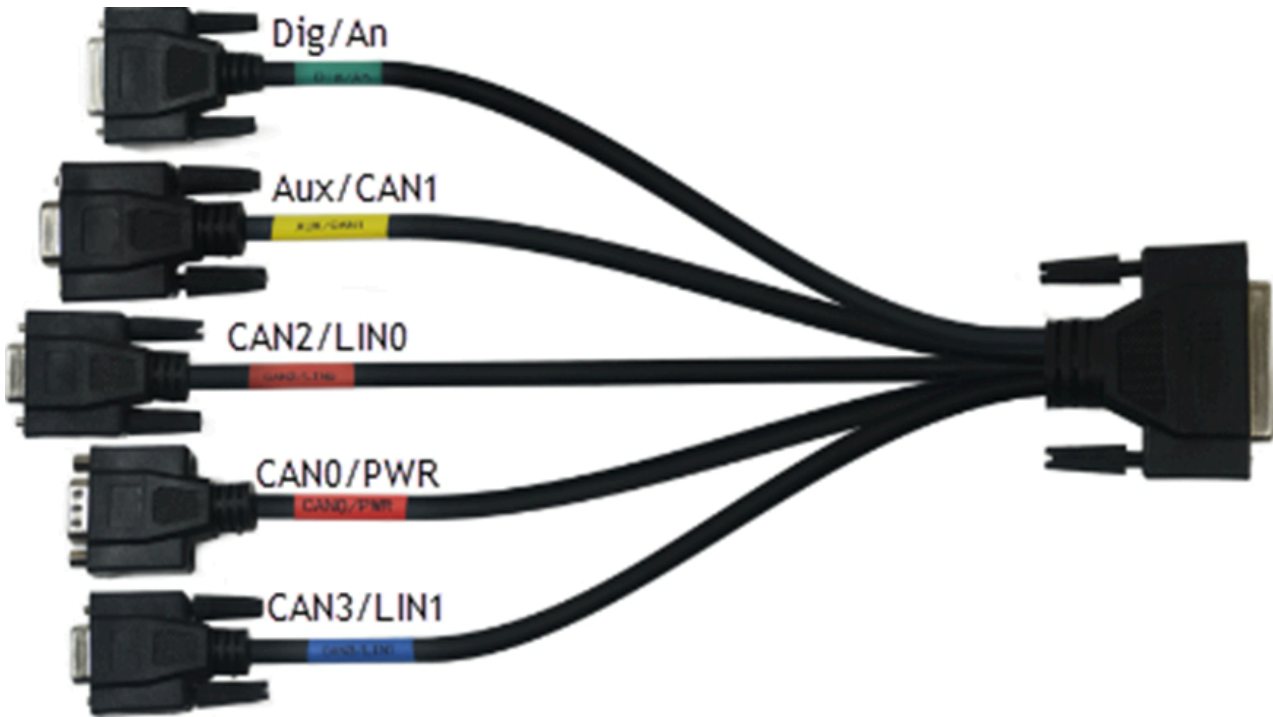
IEC Connector	Pin Function
Top	+
Bottom	K

The dimensions of the Male Flat Type Miniature Size Thermocouple Plug that you would plug into it are as follows:



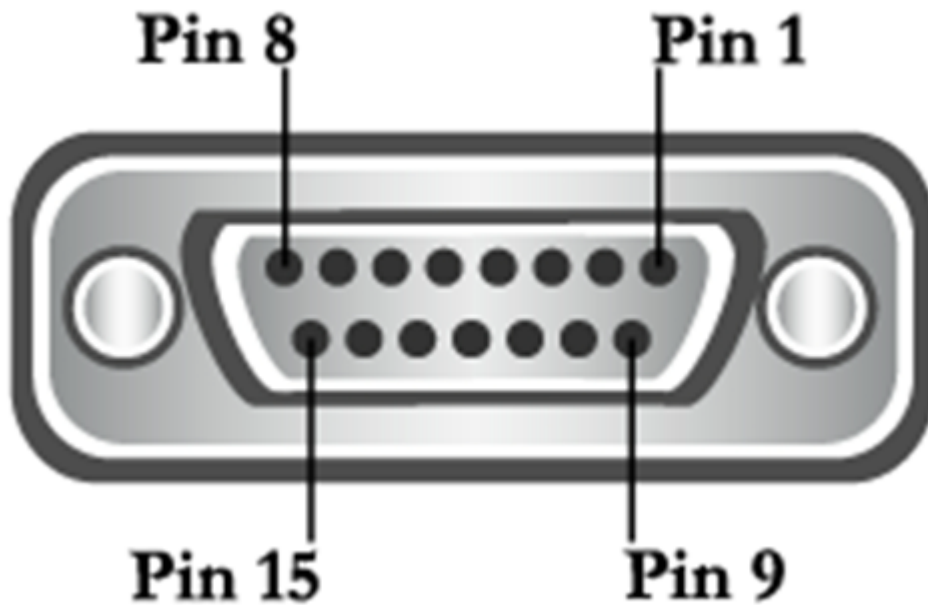
Pinout of the Multi Connect Cable

The K-Box may be connected to the multi-connect cable's AUX cable to connect it to the Rebel CT or LT Loggers. The pinout is as follows:



Dig/An (This Connector is used to connect Digital and Analog signals to the Logger)

The Dig & An connector is a Female 15-pin Subminiature D Type connector.

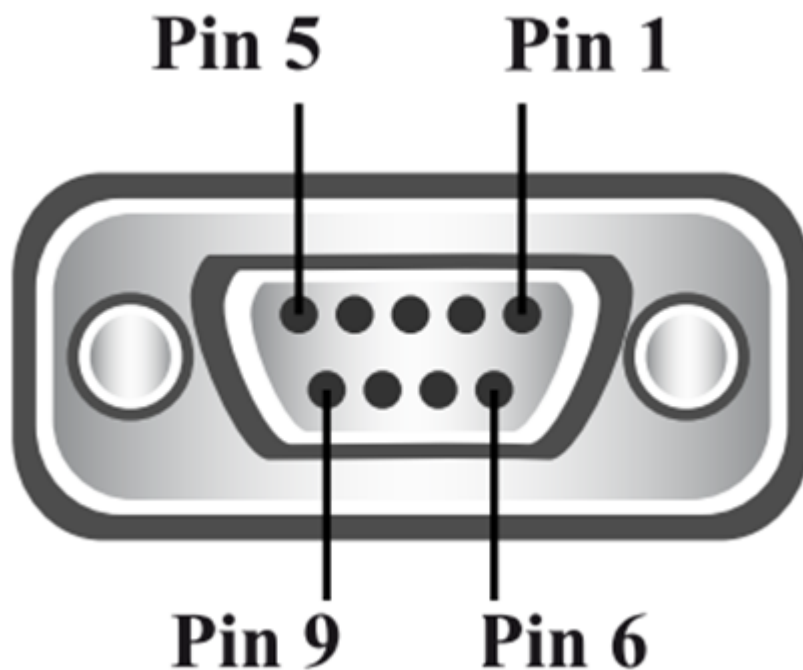


Pin No	Pin Function
Pin 2	Digital Input or Output 1 - When used as an input, do not apply voltages outside the 0 to +12V range. When used as an Output, ensure that the current drawn is not more than 100mA. More information on the use of this pin can be found in Appendix 2 and 3
Pin 3	+4.5V Instrumentation Supply Voltage, ensure that current draw is not more than 100mA
Pin 4	Ground
Pin 6	Analog Ground
Pin 7	Analog Input 1 - do not apply voltages outside of the -10 to +10V range
Pin 8	Analog Input 3 - do not apply voltages outside of the -10 to +10V range
Pin 9	Digital Input or Output 0 - When used as Input, do not apply voltages outside the 0 to +12V range. When used as an Output, ensure that the current drawn is not more than 100mA. More information on the use of this pin can be found in Appendix 2 and 3

Pin 10	Digital Input or Output 2 - When used as Input, do not apply voltages outside the 0 to +12V range. When used as an Output, ensure that the current drawn is not more than 100mA. More information on the use of this pin can be found in Appendix 2 and 3
Pin 11	Ground
Pin 13	Wake-Up pin to wake logger from sleep mode (for use see Appendix 1)
Pin 14	Analog Input 0 - do not apply voltages outside of the -10 to +10V range
Pin 15	Analog Input 2 - do not apply voltages

AUX/CAN1 (The port of the Multi Connect Cable that is generally used with the K-Box)

The AUX/CAN1 connector is a Female 9-pin Subminiature D Type connector.



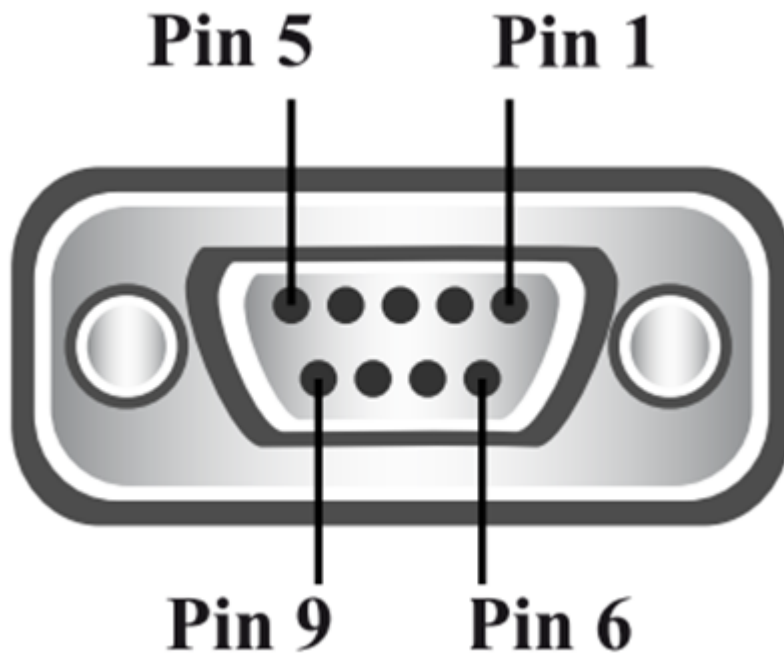
Pin No

Pin Function

Pin 2	CAN Bus 1 (Medium Speed Bus) Low Signal
Pin 3	Ground
Pin 5	Power Ground
Pin 7	CAN Bus 1 (Medium Speed Bus) High Signal

CAN2/LIN0 (Used for connecting CAN2 and Ethernet to the Logger)

The LAN connector is a Female 9-pin Subminiature D Type connector.



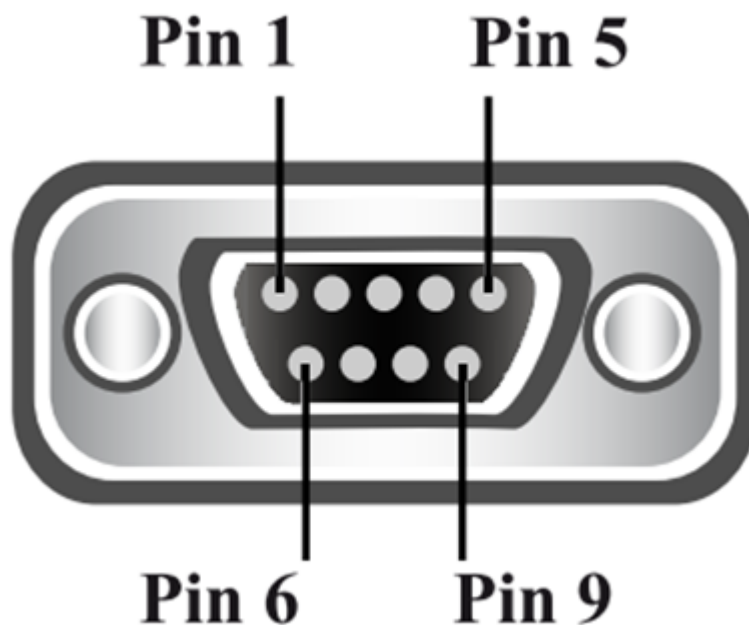
Pin No	Pin Function
Pin 1	LIN 0
Pin 2	CAN / CAN FD Bus 2 (Instrumentation Bus) Low Signal
Pin 3	Ground
Pin 5	Power Ground
Pin 7	CAN / CAN FD Bus 2 (Instrumentation Bus) High Signal

Pin 9

Digital Input or Output 3 (can also be used as a switched power supply +Vd). When used as Input, do not apply voltages outside of the 0 to +12V range.

CAN0/PWR (This Connector is used to power the Logger; e.g. it could be powered via the diagnostics connector of a vehicle connected to the OBD2 to DB9 Cable.)

The CAN0/PWR connector is a Male 9-pin Subminiature D Type connector.



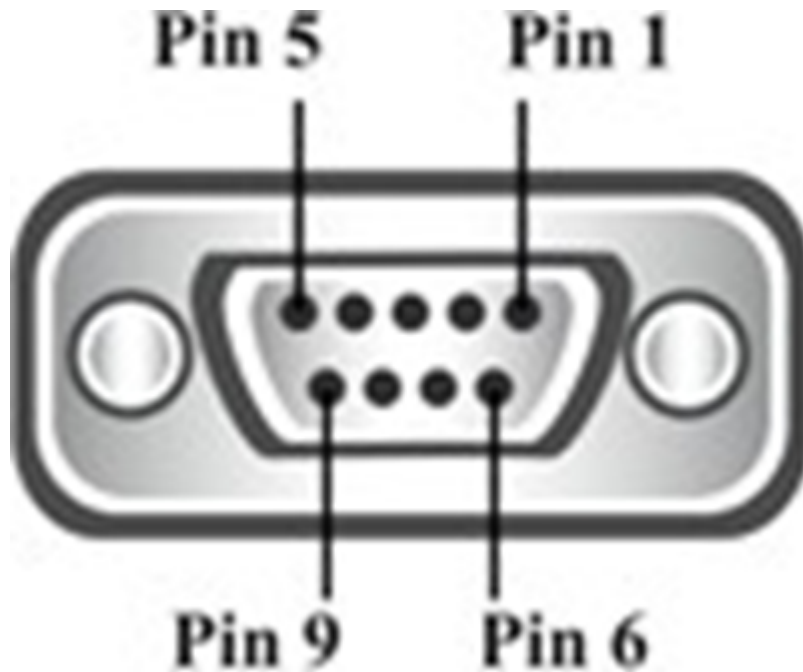
Pin No	Pin Function
Pin 1	CAN Bus 1 (Medium Speed Bus) Low Signal
Pin 2	CAN Bus 0 (High Speed Bus) Low Signal
Pin 3	Ground
Pin 4	K-Line (1 wire bus) of ISO 9141
Pin 5	Power Ground
Pin 7	CAN Bus 0 (High Speed Bus) High Signal
Pin 8	CAN Bus 1 (Medium Speed Bus) High Signal

Pin 9

4.5-36V Supply Voltage

CAN3/LIN1

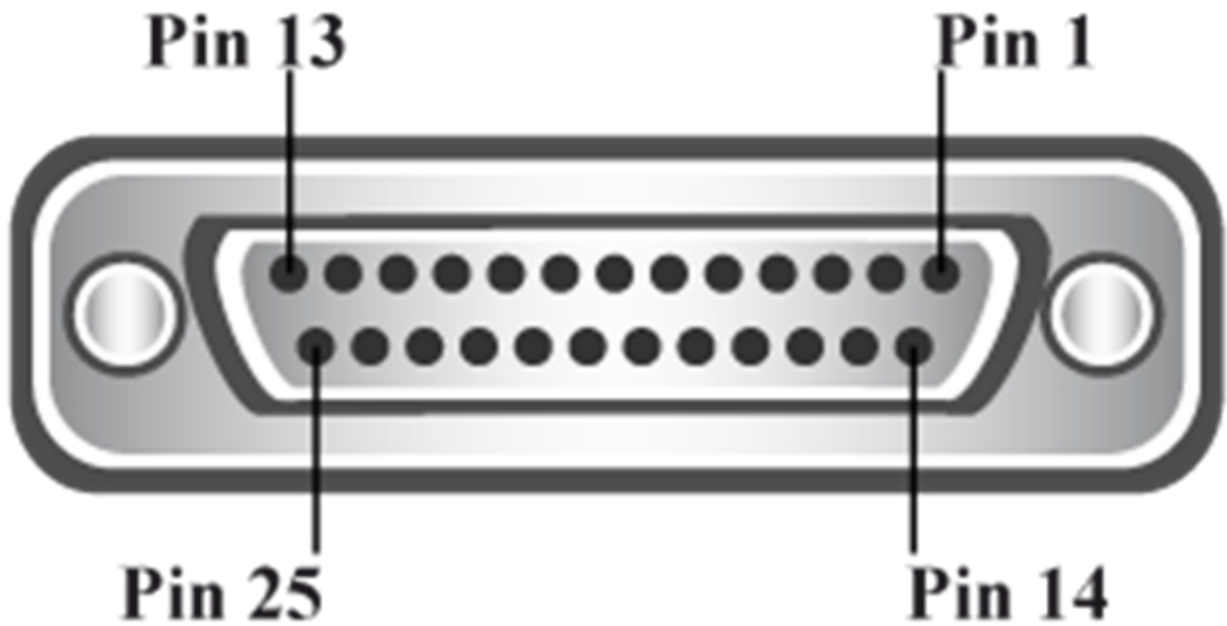
The CAN3/LIN1 is a Female 9-pin standard D-type connector with screws.



Pin No	Pin Function
Pin 1	LIN 1
Pin 2	CAN / CAN FD Bus 3 (Instrumentation Bus) Low Signal
Pin 3	Ground
Pin 5	Power Ground
Pin 7	CAN / CAN FD Bus 3 (Instrumentation Bus) High Signal
Pin 9	Digital Input or Output 3 (can also be used as a switched power supply +Vd). When used as Input, do not apply voltages outside of the 0 to +12V range.

OBD&INST (The multi-connect cable attaches to the Logger via this connector)

The OBD&INST connector is a Female 25-pin Subminiature D Type connector.



Pin No	Pin Function
Pin 1	Analog Input 3 - do not apply voltages outside of the -10 to +10V range
Pin 2	LIN 1
Pin 3	CAN / CAN FD 3 L
Pin 4	Analog Input 1 - do not apply voltages outside of the -10 to +10V range
Pin 5	Wake-Up pin to wake logger from sleep mode (for use see Appendix 1)
Pin 6	CAN Bus 1 (Medium Speed Bus) Low Signal
Pin 7	CAN Bus 0 (High-Speed Bus) Low Signal
Pin 8	K-Line (1 wire bus) of ISO 9141

Pin 9	4.5-36V Supply Voltage
Pin 10	+4.5V Instrumentation Supply Voltage, ensure that current draw is not more than 100mA
Pin 11	Digital Input or Output 2 - When used as Input, do not apply voltages outside the 0 to +12V range. When used as an Output, ensure that the current drawn is not more than 100mA. More information on the use of this pin can be found in Appendix 2 and 3
Pin 12	Digital Input or Output 0 - When used as Input, do not apply voltages outside the 0 to +12V range. When used as an Output, ensure that the current drawn is not more than 100mA. More information on the use of this pin can be found in Appendix 2 and 3
Pin 13	CAN / CAN FD Bus 2 (Instrumentation Bus) Low Signal
Pin 14	Analog Input 2 - do not apply voltages outside of the -10 to +10V range
Pin 15	LIN 0
Pin 16	CAN / CAN FD 3 H
Pin 17	Analog Input 0 - do not apply voltages outside of the -10 to +10V range
Pin 18	Analog Ground
Pin 19	CAN Bus 1 (Medium Speed Bus) High Signal
Pin 20	CAN Bus 0 (High Speed Bus) High Signal
Pin 21	Ground
Pin 22	Power Ground
Pin 23	Digital Input or Output 3 (can also be used as a switched power supply +Vd)
	Digital Input or Output 1 - When used as Input, do not apply voltages outside the 0 to

Pin 24

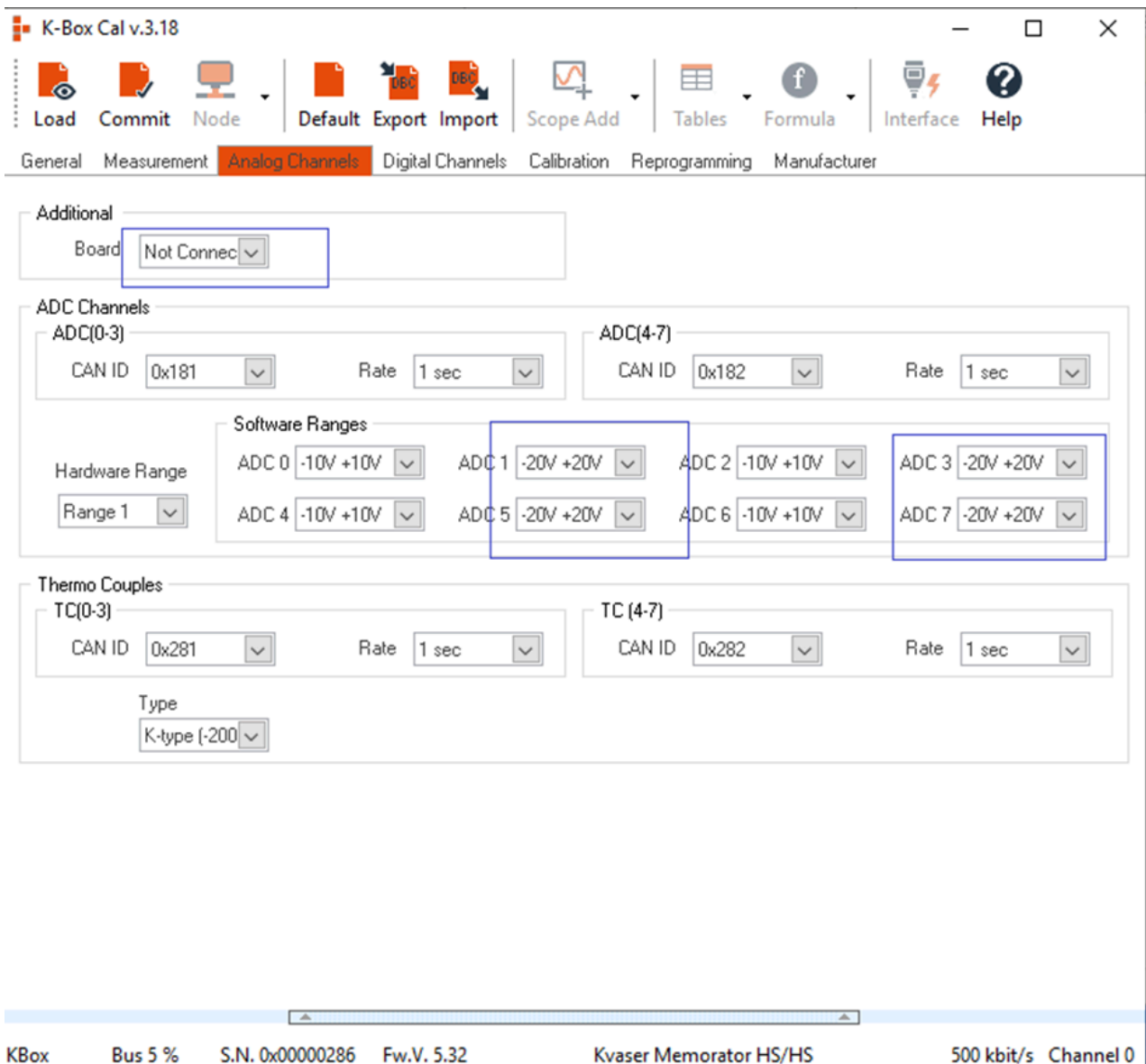
+12V range. When used as an Output, ensure that the current drawn is not more than 100mA. More information on the use of this pin can be found in Appendix 2 and 3

Pin 25

CAN /CAN FD Bus 2 (Instrumentation Bus)

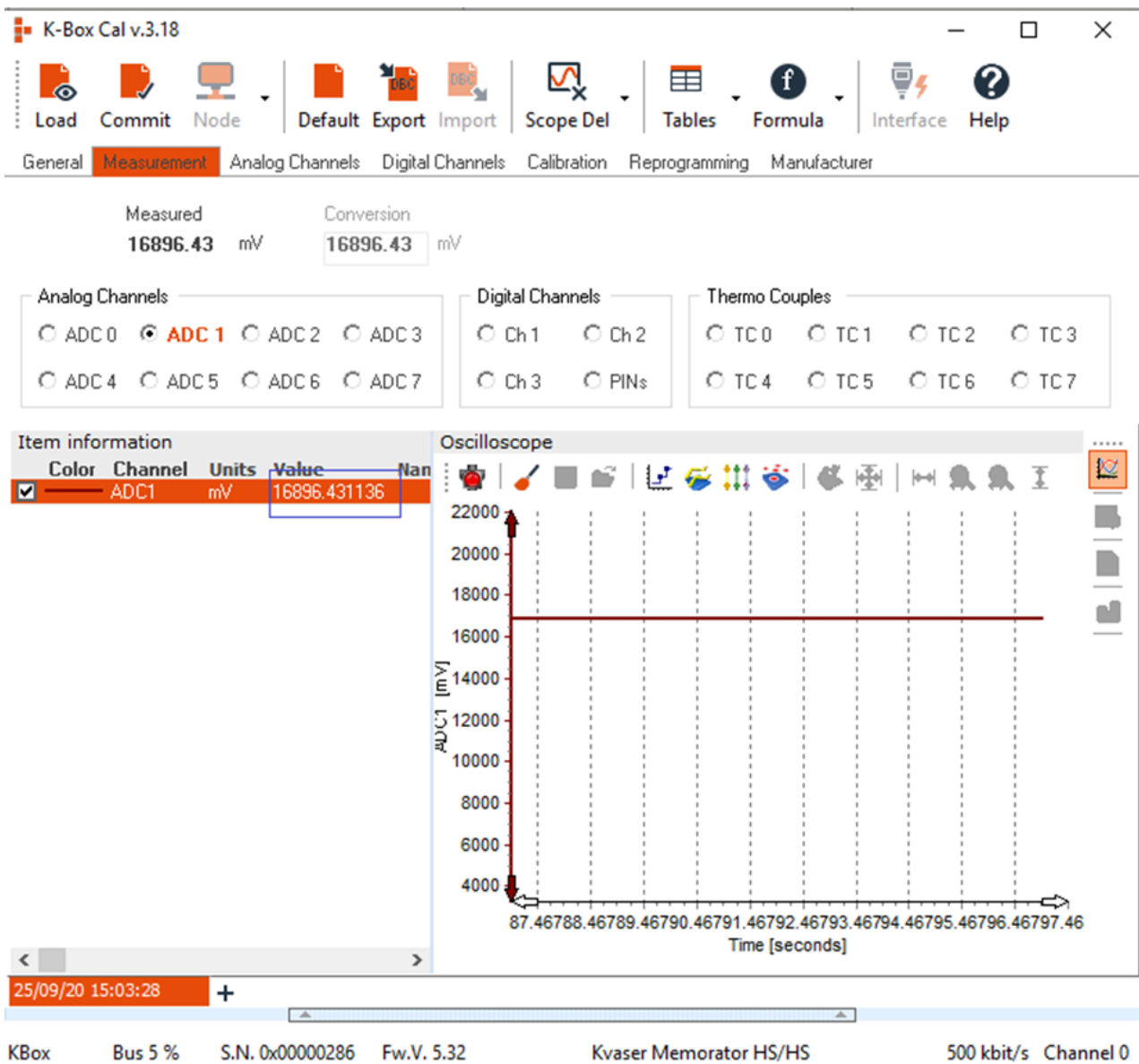
Measurement IEPE procedure

1. Connect the K-Box and IEPE devices. Connect the IEPE sensors to the IEPE0-3 channel.
2. Set the Additional board to Not Connected, Software ranges of odd channels to $\pm 20V$.



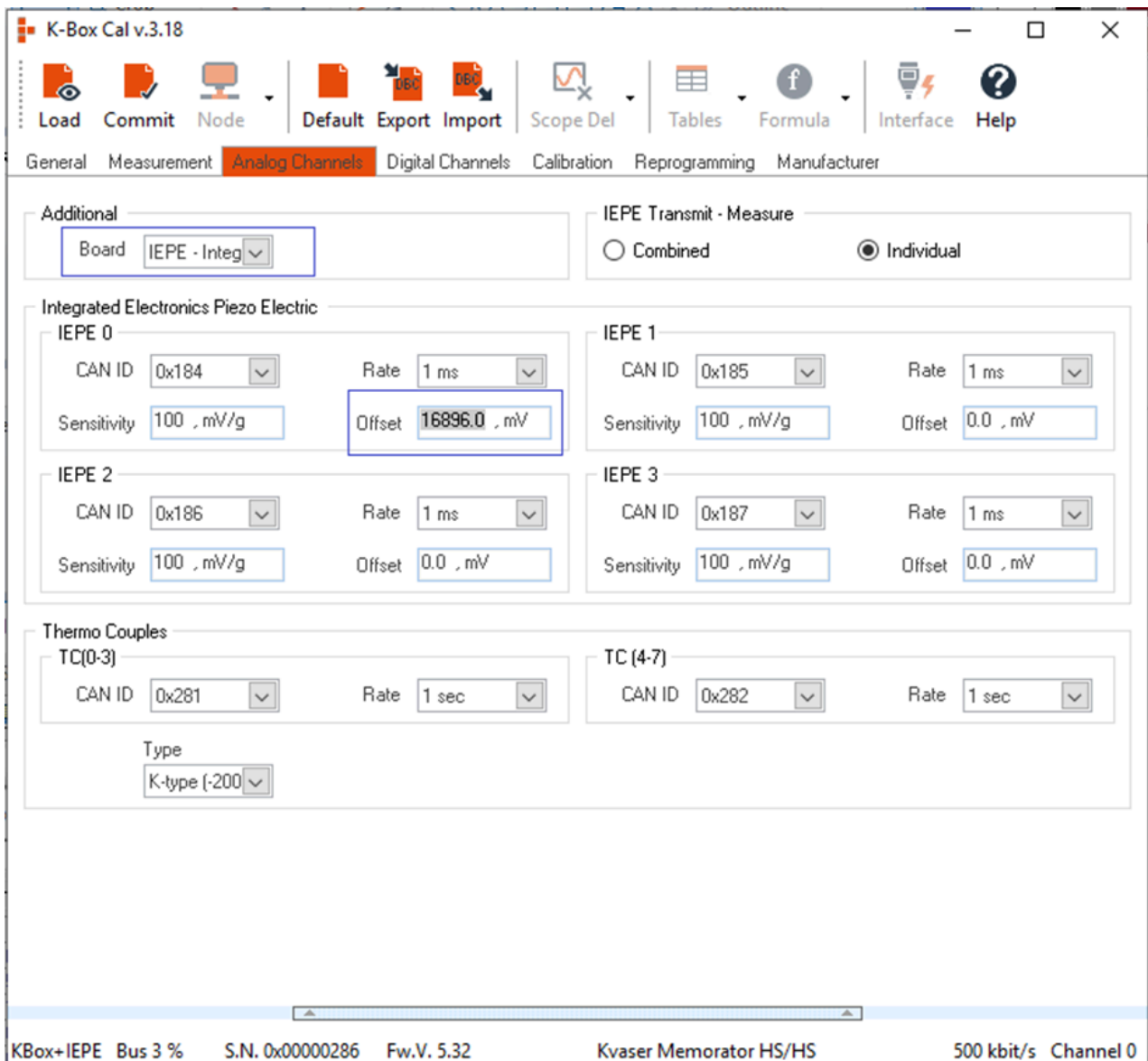
3. Connect the IEPE sensors, Keep the sensor in idle conditions, and Go to measurement mode.

Note down the measured value for ADC1 (IEPE 0), ADC3 (IEPE 1), ADC5 (IEPE 2) and ADC7 (IEPE 3) channels in mV.

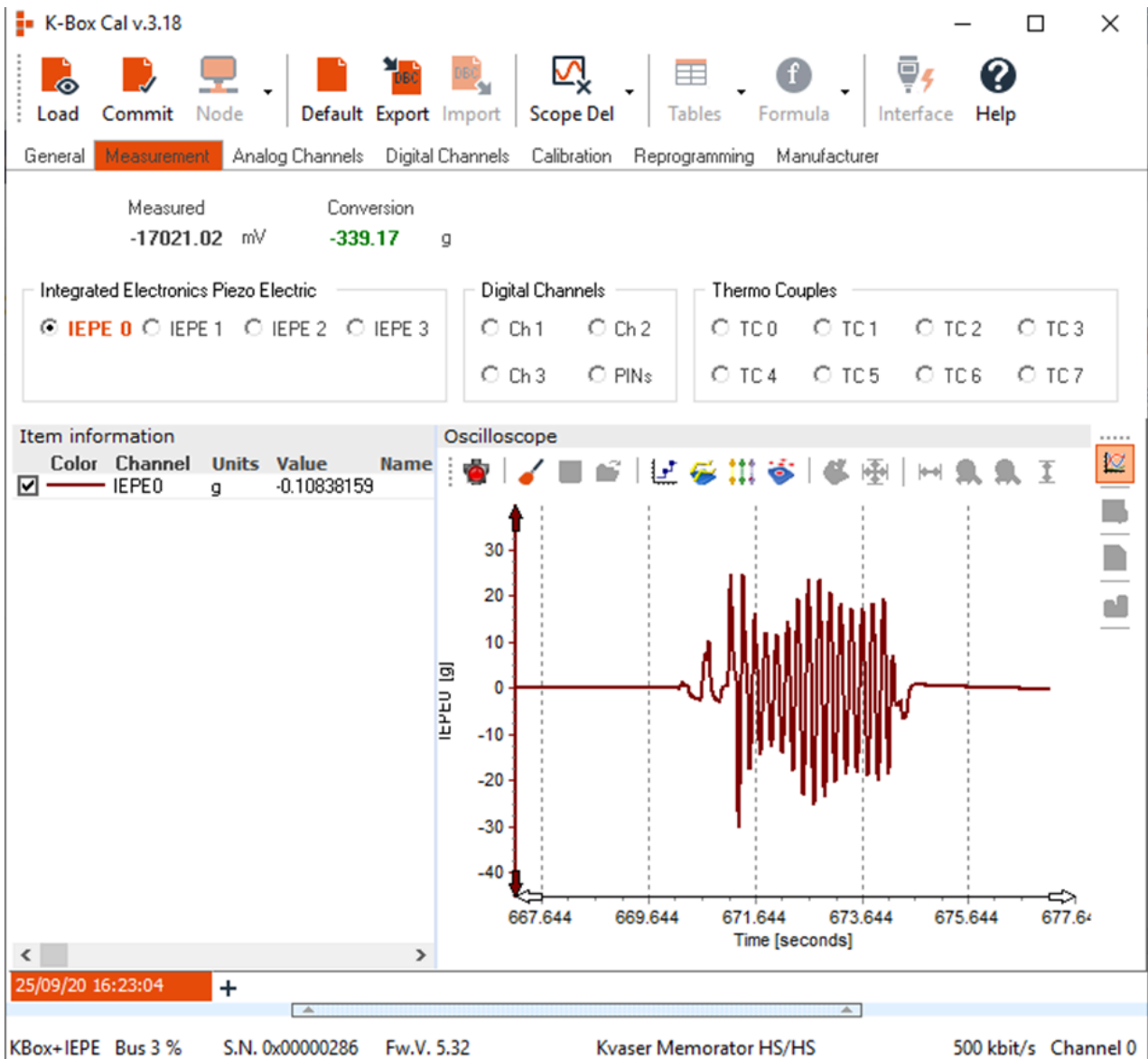


IEPE & Analog channel links: ADC1-IEPE0, ADC3-IEPE1, ADC5-IEPE2, ADC7-IEPE3

4. Go to the Analog channel tab. Change the Additional board to IEPE, copy remembered values to the Offset edit box of each IEPE channel, and enter the sensitivity of the sensors.



5. Go to Measurement mode.



Then, export the DBC and import it into DiaLog software.

Make sure you select the combined option in the IEPE Transmit – Measure option.

