

# OneEye\_UART\_Oscilloscope\_1 for KIT\_AURIX\_TC275\_LK

Oscilloscope over UART using OneEye

AURIX™ TC2xx Microcontroller Training  
V1.0.0



[Please read the Important Notice and Warnings at the end of this document](#)

## Scope of work

---

### **Demonstrate how to implement the OneEye oscilloscope over the UART (USB) interface**

After configuring the OneEye UART interface, a OneEye oscilloscope is created. The signals are updated and sampled every millisecond. OneEye is used to visualize the signal values.

# Introduction

- › **OneEye** is a GUI that enables the creation of interactive Graphical User Interface. Graphical elements can be drag from a toolbox and drop onto the GUI. The behavior of the created GUI can be customized. Different communication interfaces like UART, Ethernet, CAN, DAS can be used to interact with the embedded system
- › **SyncProtocol / ProtocolBB** is a synchronous protocol that enables data streaming between the target microcontroller and OneEye. It enables to open multiple communication channels, provide packet acknowledge and packet checksum. Data are transported within a message with a message ID and a message payload. See the OneEye help for more information.

Single frame

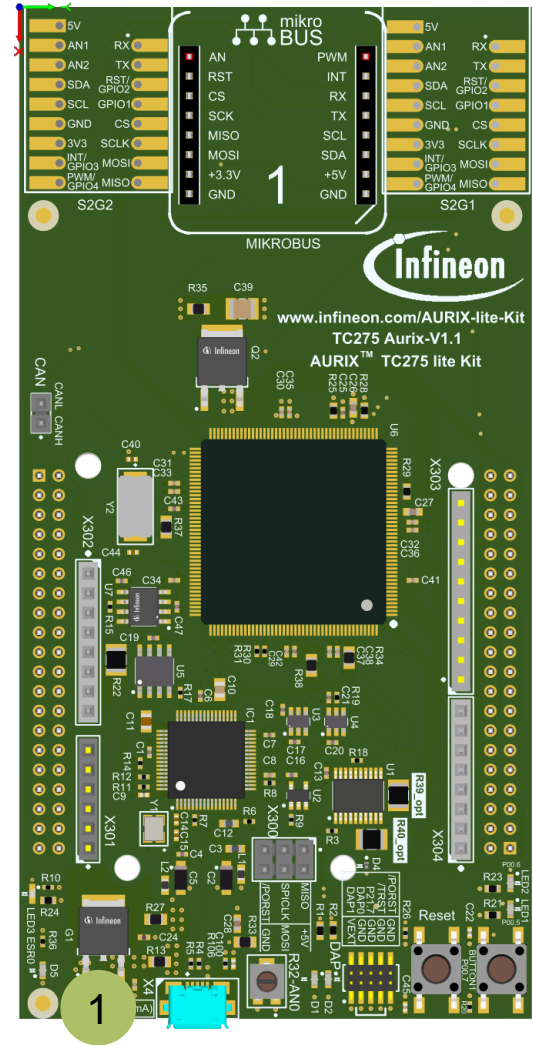
Offset	0	1	2	3
0	Start Byte	Sender	Receiver	Payload length
4	Flags (frameType=data)		Checksum payload	Checksum header
8	Message ID		(Reserved)	
12	Message length			
16	Message payload			
...	... (Message payload)			

- › **Note:** It is recommended to go through some of the **basic tutorials** listed in the help embedded in OneEye (Menu: Help -> OneEye help). This enables a quicker ramp-up in the OneEye concept and ensures a nice journey with OneEye

# Hardware setup

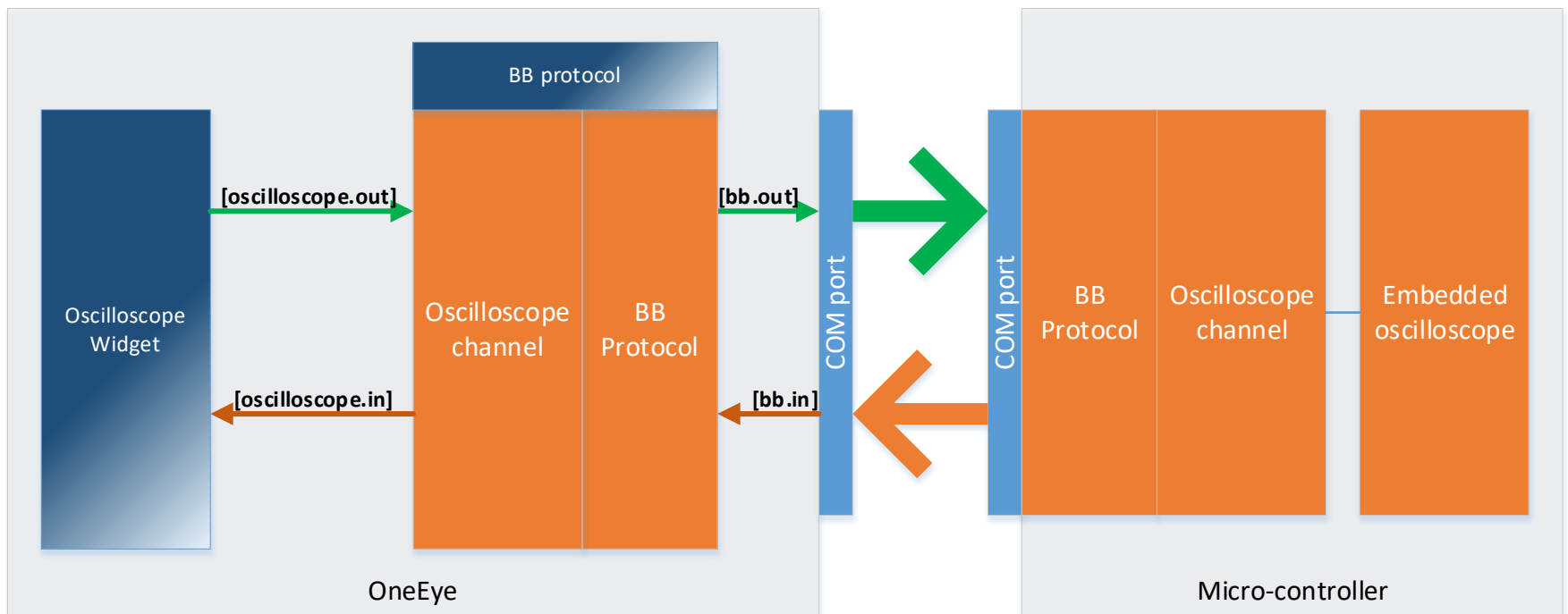
This code example has been developed for the board KIT\_AURIX\_TC275\_LITE.

The board should be connected to the PC through the USB port **1**



# Configuration overview

In this configuration an oscilloscope running on the microcontroller is connected to the COM port.  
 In OneEye, two signals **bb.in** and **bb.out** are used to connect the COM port data stream to the BB protocol.  
 The BB protocol is configured to open a channel reserved for the oscilloscope. This channel connects to the oscilloscope with the **oscilloscope.in** and **oscilloscope.out** signals.



# Implementation - AURIX

---

## Enabling the OneEye library

The OneEye library must be enabled by adding the following line to *lfx\_Cfg.h*:  
***#define IFX\_OE\_AL\_USE\_AURIX\_ILLD***

## Configuring the OneEye Oscilloscope

A OneEye oscilloscope (*lfx\_Oe\_Osci*) is an object that enable data sampling and provide triggering functionality.

The OneEye oscilloscope communication interface (*lfx\_Oe\_OsciBb*) enables streaming of data and control of the oscilloscope using the BB protocol (*lfx\_Oe\_SyncProtocol*).

The OneEye oscilloscope is initialized with *initOscilloscope()* / *lfx\_Oe\_Osci\_init()*.

The ***autoAddChannels*** parameter enables to automatically add channels for each created oscilloscope signal.

The sample period (***samplePeriod***) is set to 1ms and provides OneEye information about sample timing.

The ***triggerMode*** is set to automatic, note that this value can be changed from the OneEye oscilloscope interface later.

The *lfx\_oe\_osci.h* file can be found in the Libraries\OneEye directory.

## Adding signals to the oscilloscope

Oscilloscope signals are mainly pointers that the oscilloscope can use for data sampling. The signals are added using *lfx\_Oe\_Osci\_addSignal()*. The function takes as parameter the signal **name** displayed by the oscilloscope, with an optional unit string in parenthesis, the signal **type** which informs the oscilloscope how to read the pointer value and a **source** pointer to the data. The last parameter corresponds to the **q format** used in case of fix point data, or 0 if not used.

# Implementation - AURIX

---

## Starting the oscilloscope

The oscilloscope is started with the function *lfx\_Oe\_Osci\_start()*.

## Configuring the signal generator

A signal generator is used to provide the user with some value to read / write. The signal generator does nothing more than incrementing two signals, *signalA* and *signalB*, stored in the structure *g\_signalGenerator* up to a maximum value before resetting them.

The initialization of the signal generator is done with *initSignalGenerator()*.

## Running the signal generator and the oscilloscope

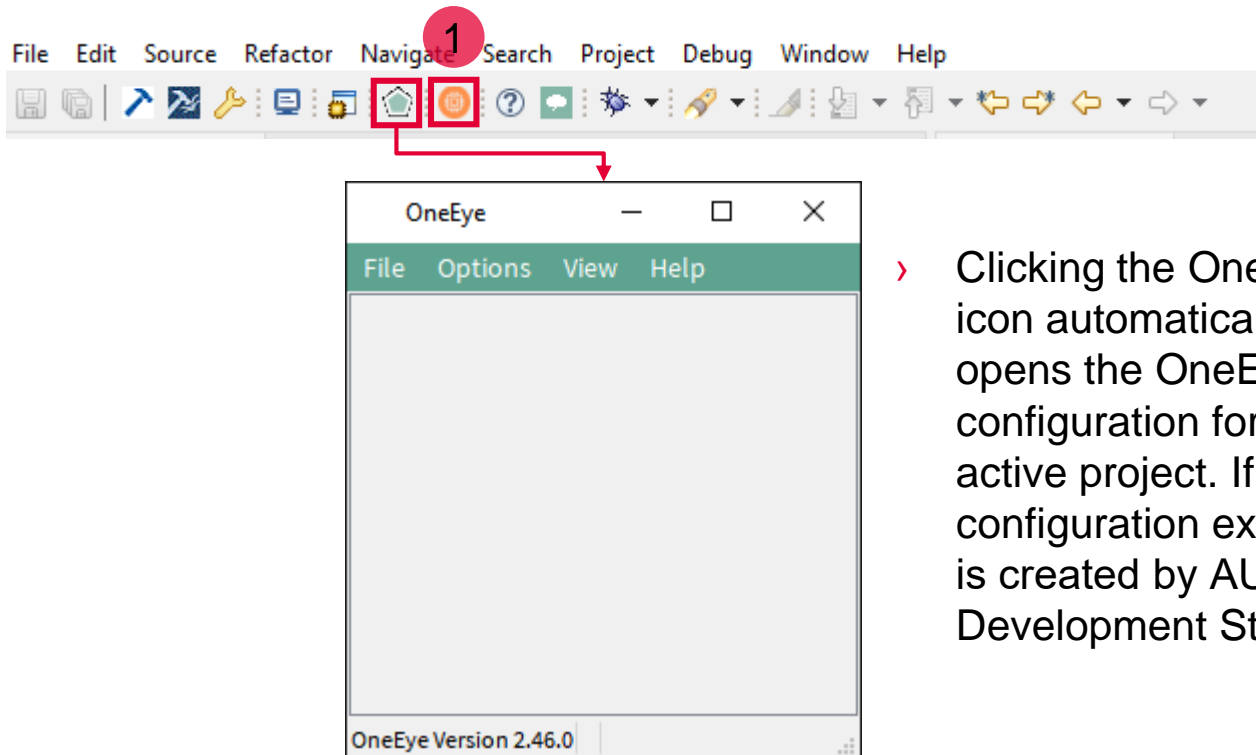
The signal generator is executed in the background loop every 1ms with *processSignalGenerator()*. To ensure the timing, a **deadline** variable is periodically updated with *lfx\_Oe\_Time\_add()* to obtain the 1ms period.

The oscilloscope runs in the same background loop with *sampleOscilloscope() / lfx\_Oe\_Osci\_step()*. This function handles the triggering and sampling of data.

**Note:** the call to *lfx\_Oe\_Osci\_step()* can be moved to an interrupt service routine if required by the application use case.

# Run and Test

- › After code compilation, flash the device using the Flash button **1** to ensure that the program is running on the device
- › For this training, the OneEye application is required for visualizing the values. OneEye can be opened inside the AURIX™ Development Studio using the following icon:



- › Clicking the OneEye icon automatically opens the OneEye configuration for the active project. If no configuration exists, it is created by AURIX™ Development Studio

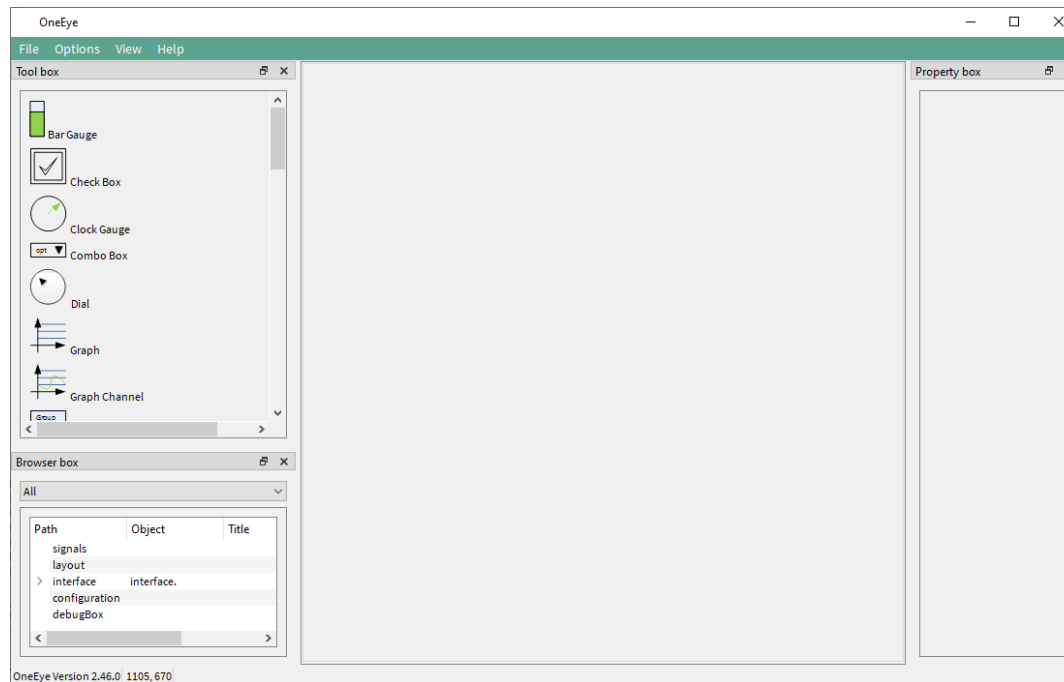


# Implementation - OneEye

In this training, the OneEye configuration is provided inside the Libraries folder. The following steps are needed to configure the oscilloscope from a brand-new configuration.

## Setup OneEye for editing

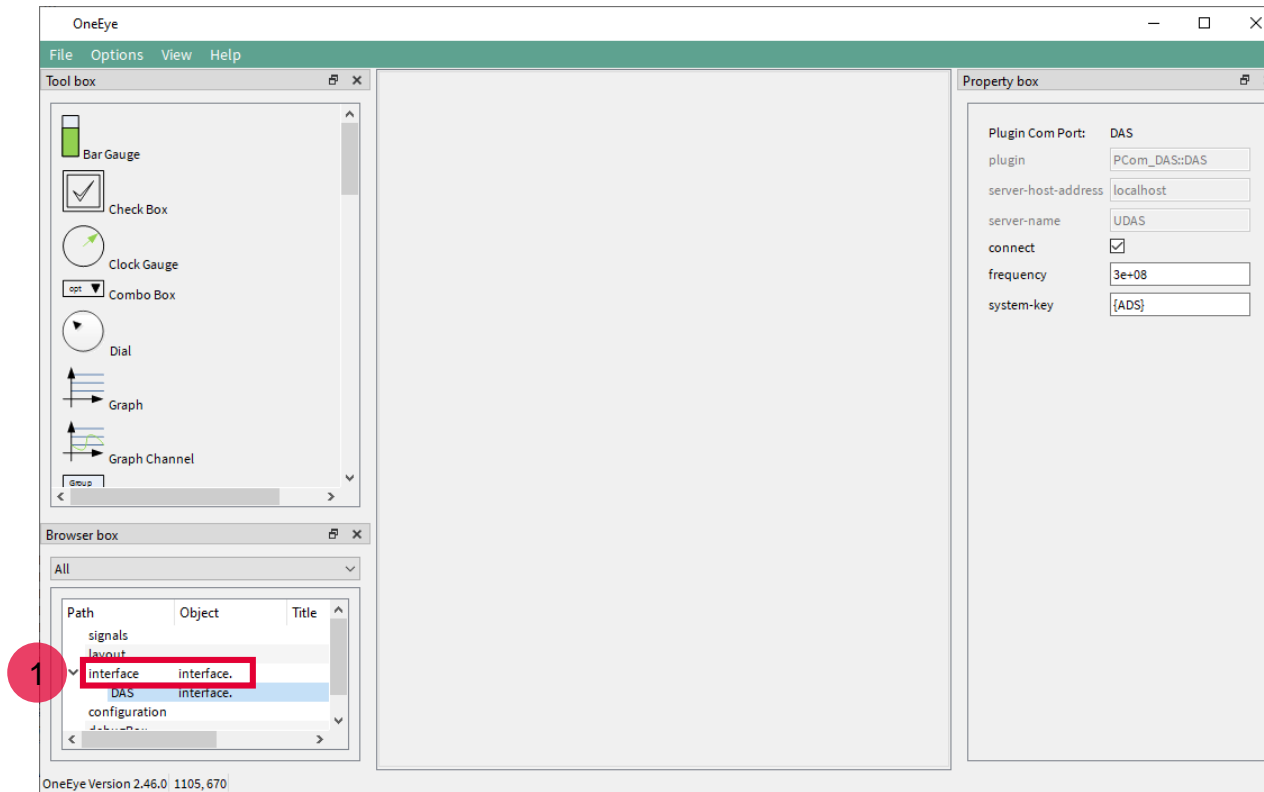
Select the OneEye menu **“Options -> Edit mode”** (if not already checked) to enable the edit mode. Select the OneEye menu **“View -> Browser box”**, **“View -> Property box”**, **“View -> Tool box”** (if not already checked) to display the browser, property box and tool box. Note that the box can be moved around.



# Implementation - OneEye

## Removing the default DAS interface

When the OneEye configuration is created by ADS, it is already setup with a DAS interface. Select the interface in the Browser box **1** and delete it with “right click and remove” as it is not required in this example.

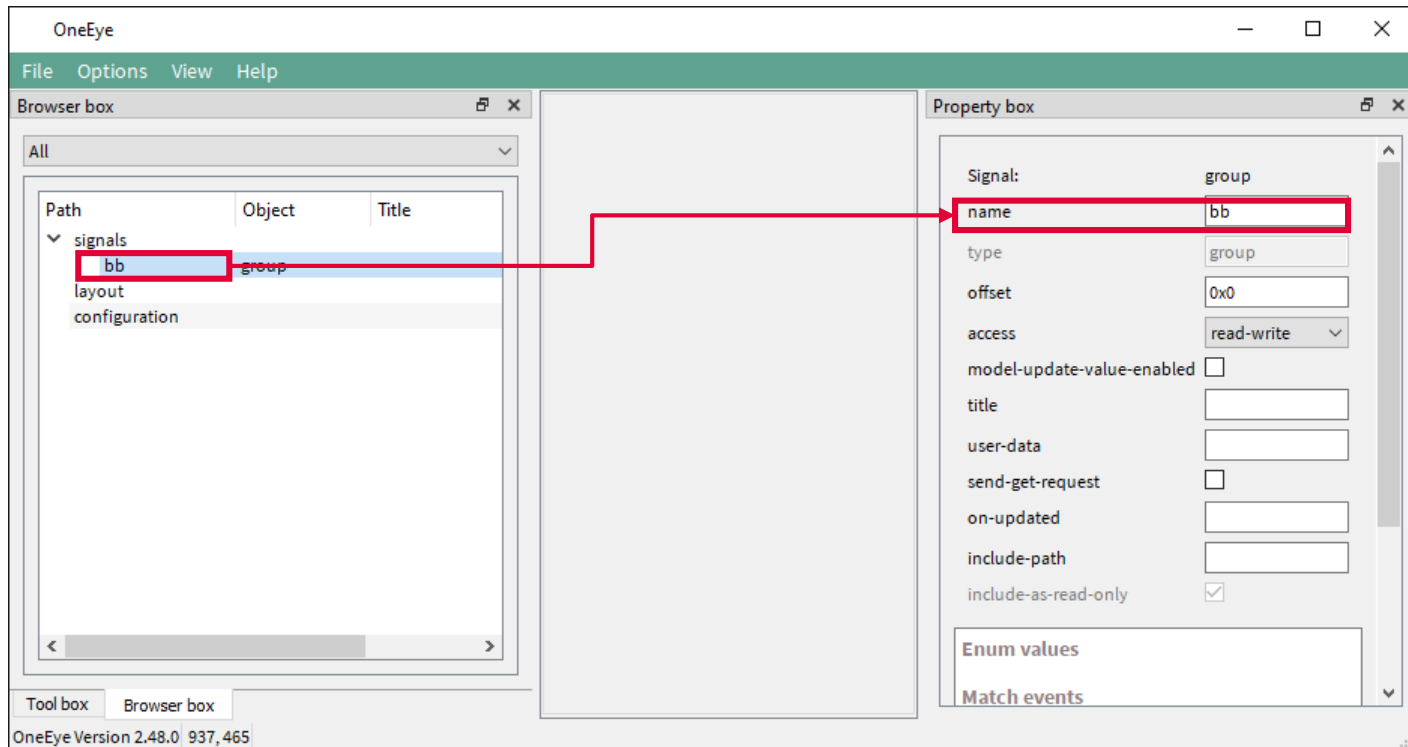


# Implementation - OneEye

## Configuring the UART interface: Signal creation

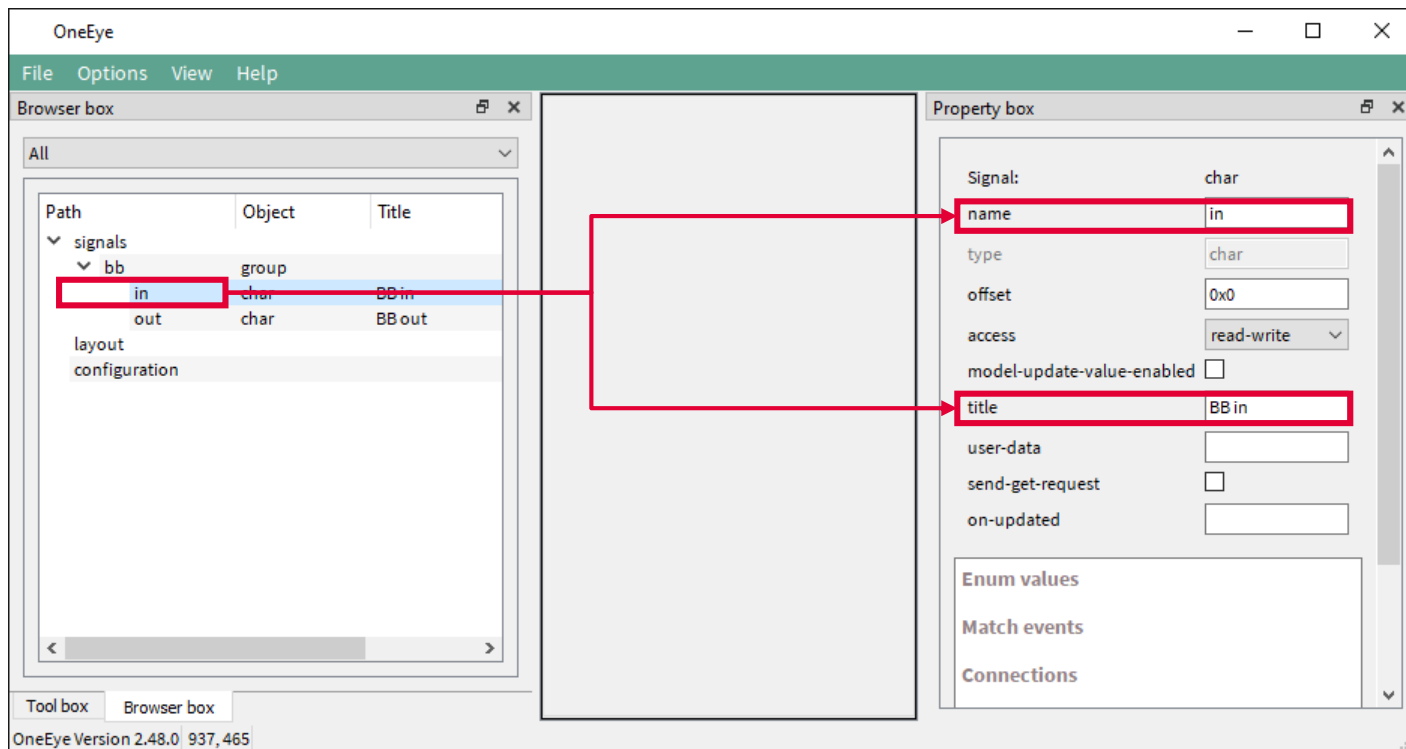
The first step is to create 2 signals to connect the received and transmit data over the UART.

Create a signal group and set its **name** property to **bb**.



# Implementation - OneEye

Add two signals of type **char** into the **bb** group, name them **in** and **out**, and set their **title** property to respectively **BB in** and **BB out**.

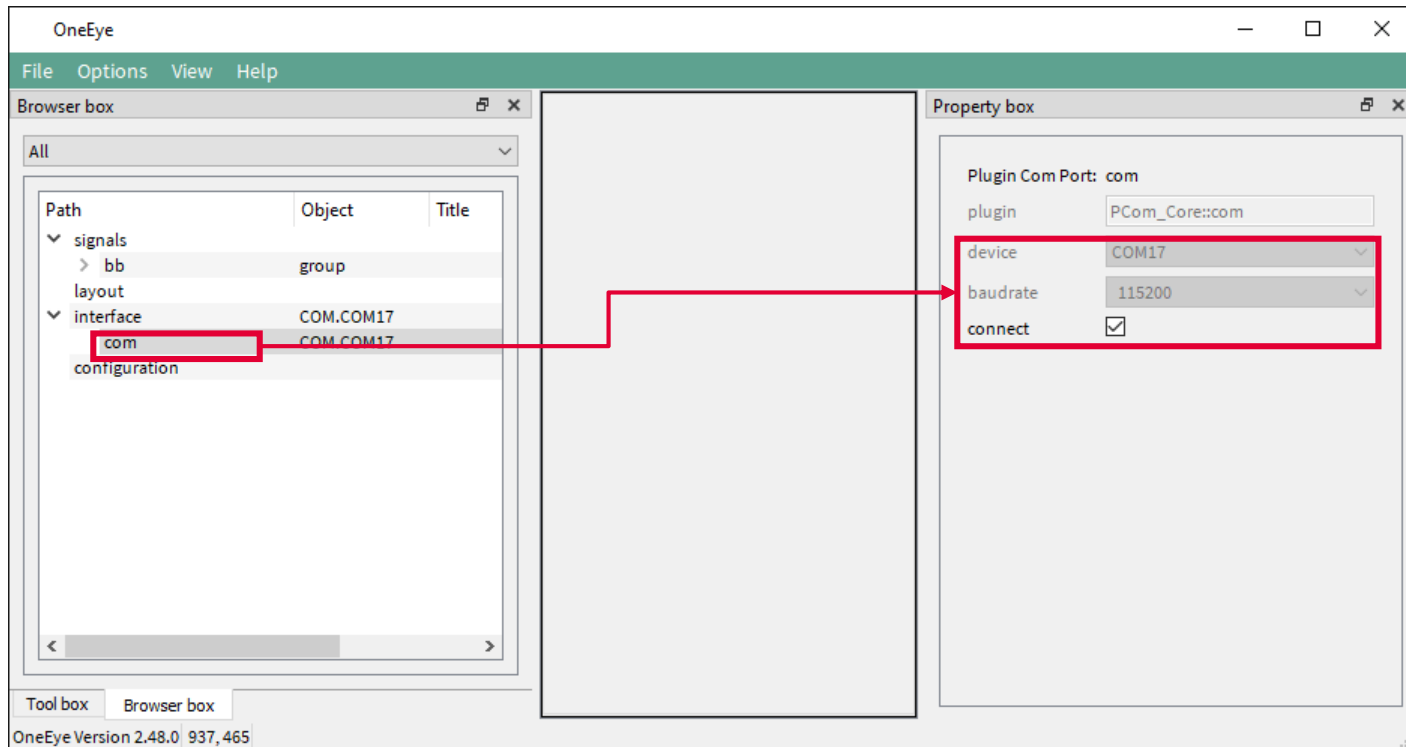


# Implementation - OneEye

## Configuring the UART interface: COM port

Right click in an empty area of the Browser box, and select **Add child -> Interface**. Then right click on the created interface and select **Add child -> com**. Select the **com** item and set its **device** property to the COM port connected to the AURIX board. Set the **baudrate** property to **115200** and click **connect**.

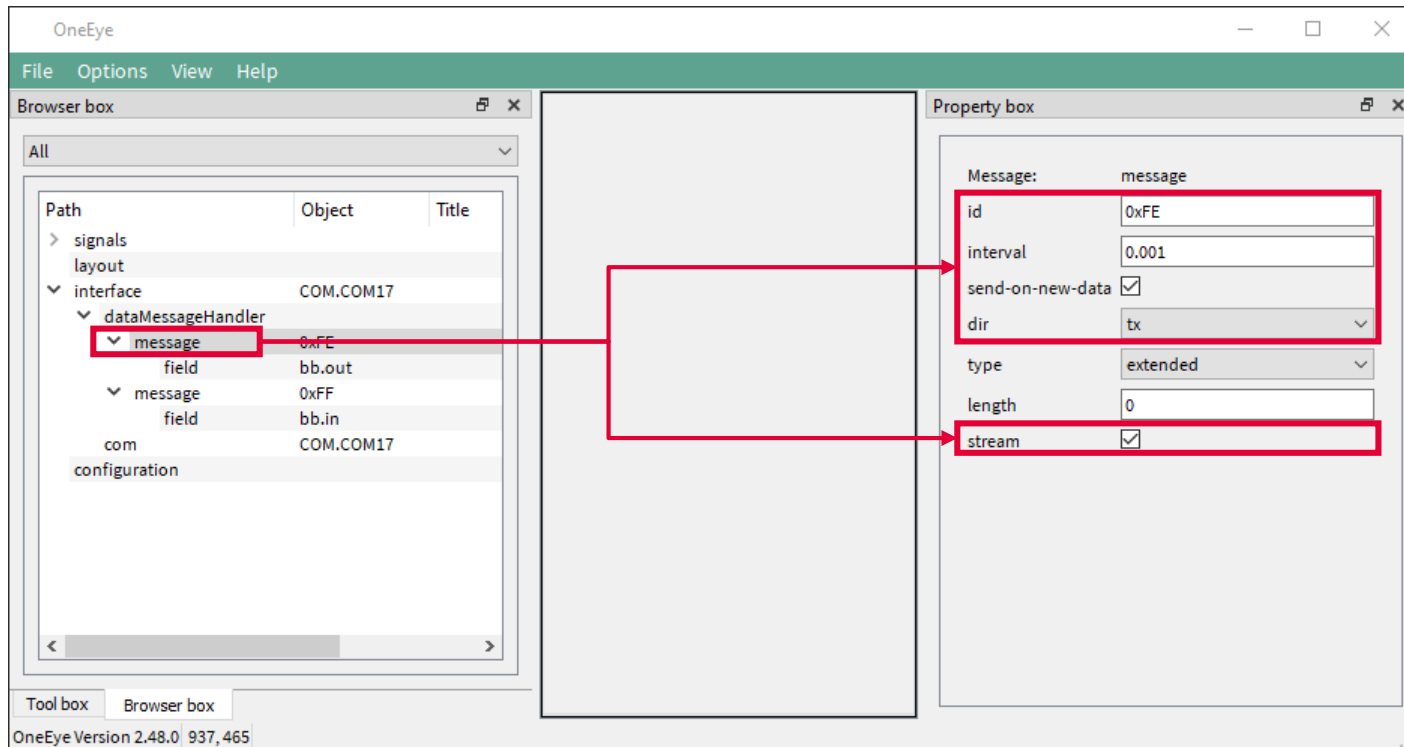
The COM port is now opened and ready for communication.



# Implementation - OneEye

## Configuring the UART interface: Transmit stream

Right click on the **interface** in the Browser box, and select **Add child -> dataMessageHandler**. Then right click on the created **dataMessageHandler** and select **Add child -> message** to create a message item. Configure the **message** with the **id=0xFE**, **interval=0.001**, **send-on-new-data** checked, **dir=tx**, **stream** checked.



The screenshot displays the OneEye software interface with the following configuration details:

Property	Value
Message:	message
id	0xFE
interval	0.001
send-on-new-data	<input checked="" type="checkbox"/>
dir	tx
type	extended
length	0
stream	<input checked="" type="checkbox"/>

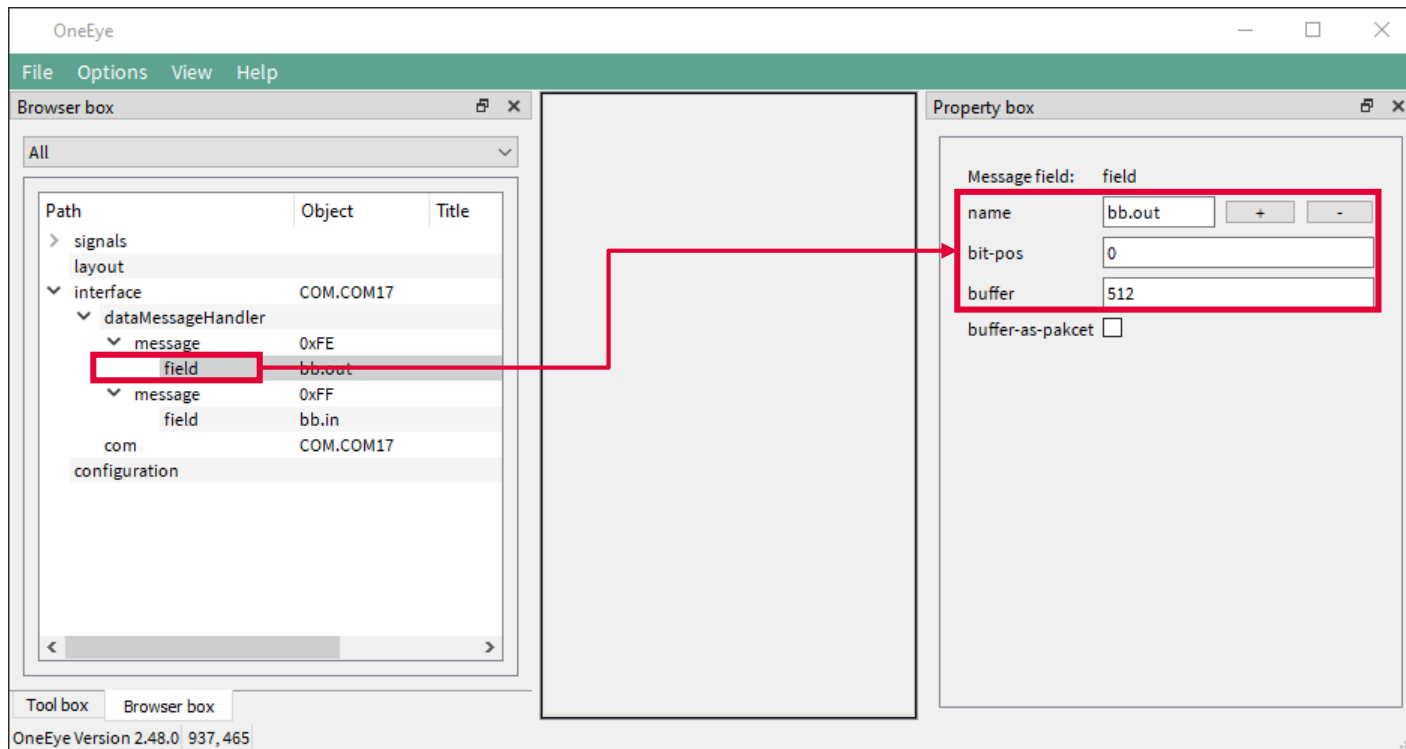
The Browser box shows the following tree structure:

- signals
  - layout
  - interface (COM.COM17)
    - dataMessageHandler
      - message (0xFE)
        - field (bb.out)
        - message (0xFF)
          - field (bb.in)
      - com (COM.COM17)
  - configuration

# Implementation - OneEye

Right click on the **message**, and select **Add child -> field**.  
Configure the field with **name=bb.out**, **bit-pos=0**, **buffer=512**.

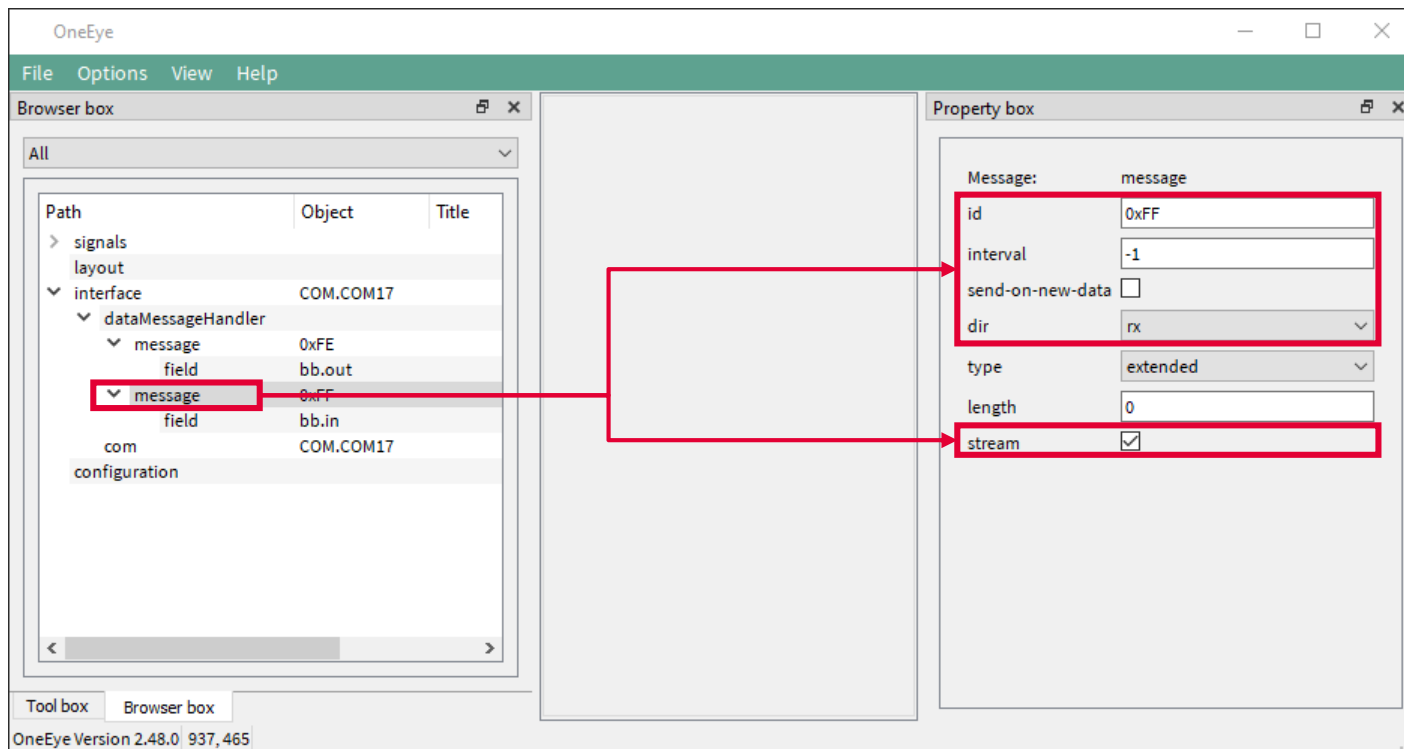
Now, data will be transmitted over the UART each time the **bb.out** signal is written with some data.



# Implementation - OneEye

## Configuring the UART interface: Receive stream

Right click on the **dataMessageHandler** and select **Add child -> message** to create a second message item. Configure the message with the **id=0xFF**, **interval=-1**, **dir=rx**, stream checked.

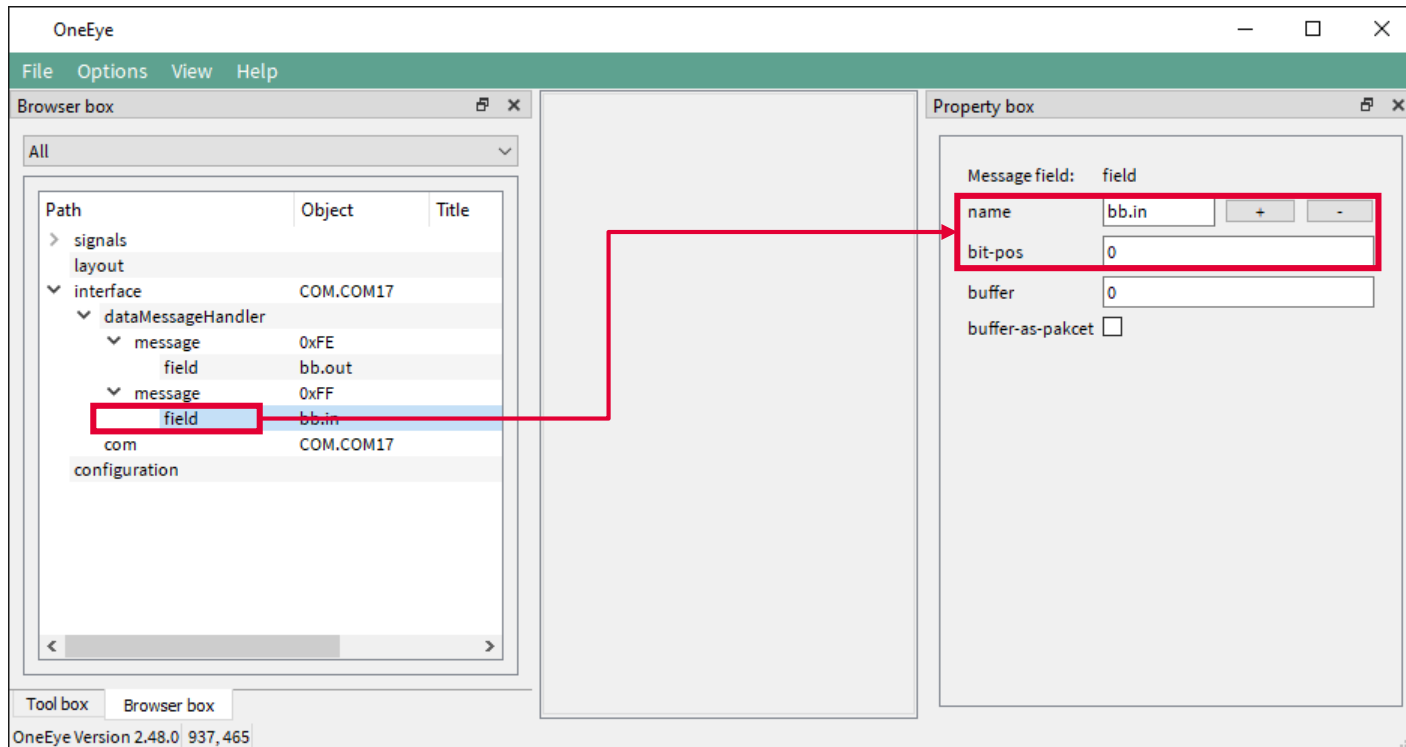




# Implementation - OneEye

Right click on the **message**, and select **Add child -> field**.  
Configure the field with **name=bb.in**, **bit-pos=0**.

Now each time data are received over the UART, the **bb.in** signal will be updated.

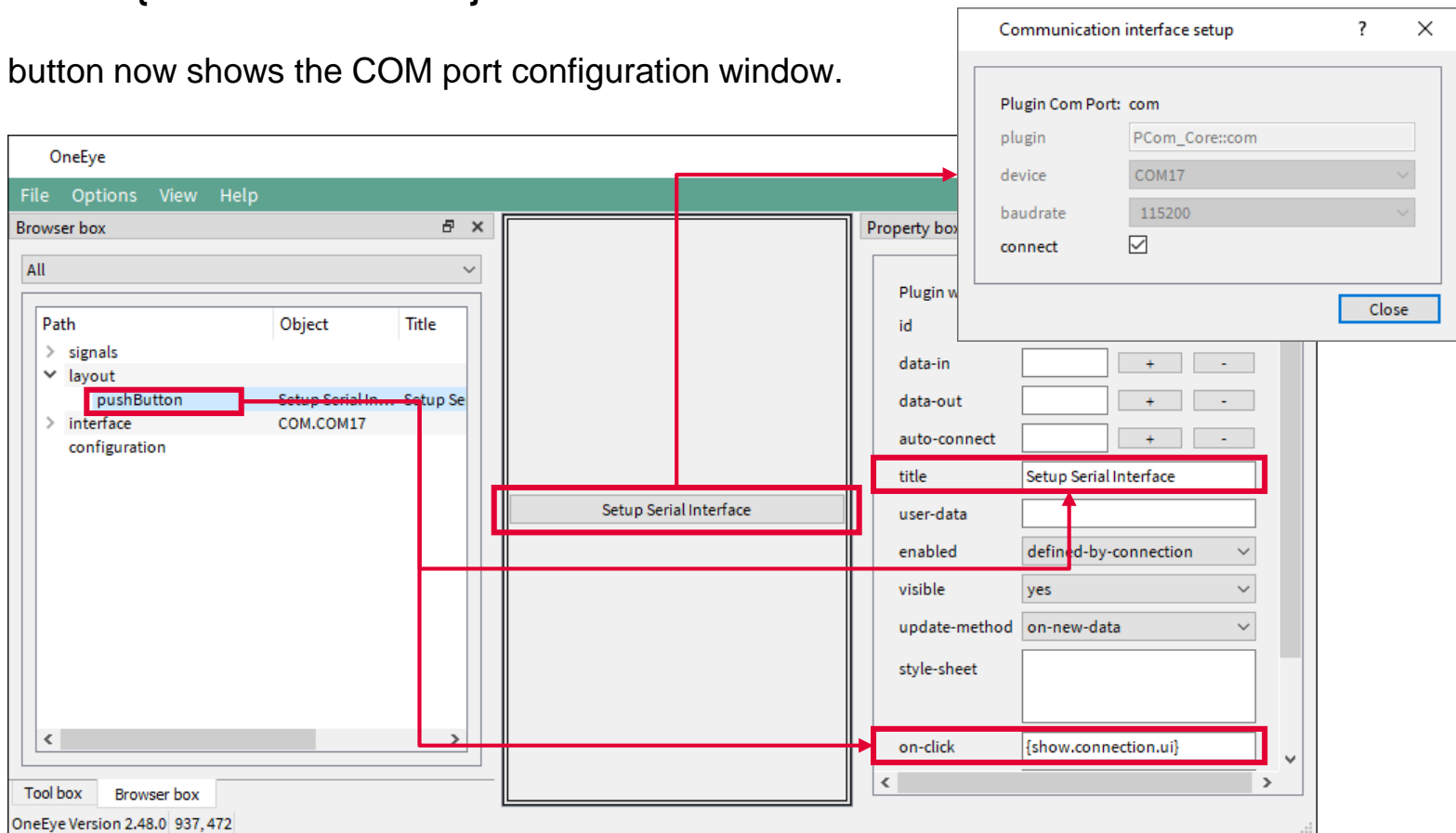


# Implementation - OneEye

## Configuring the UART interface: Push button

Drag and drop a **pushButton** widget from the toolbox onto the layout, configure it with **title=Setup Serial Interface**, **on-click={show.connection.ui}**.

Clicking the button now shows the COM port configuration window.

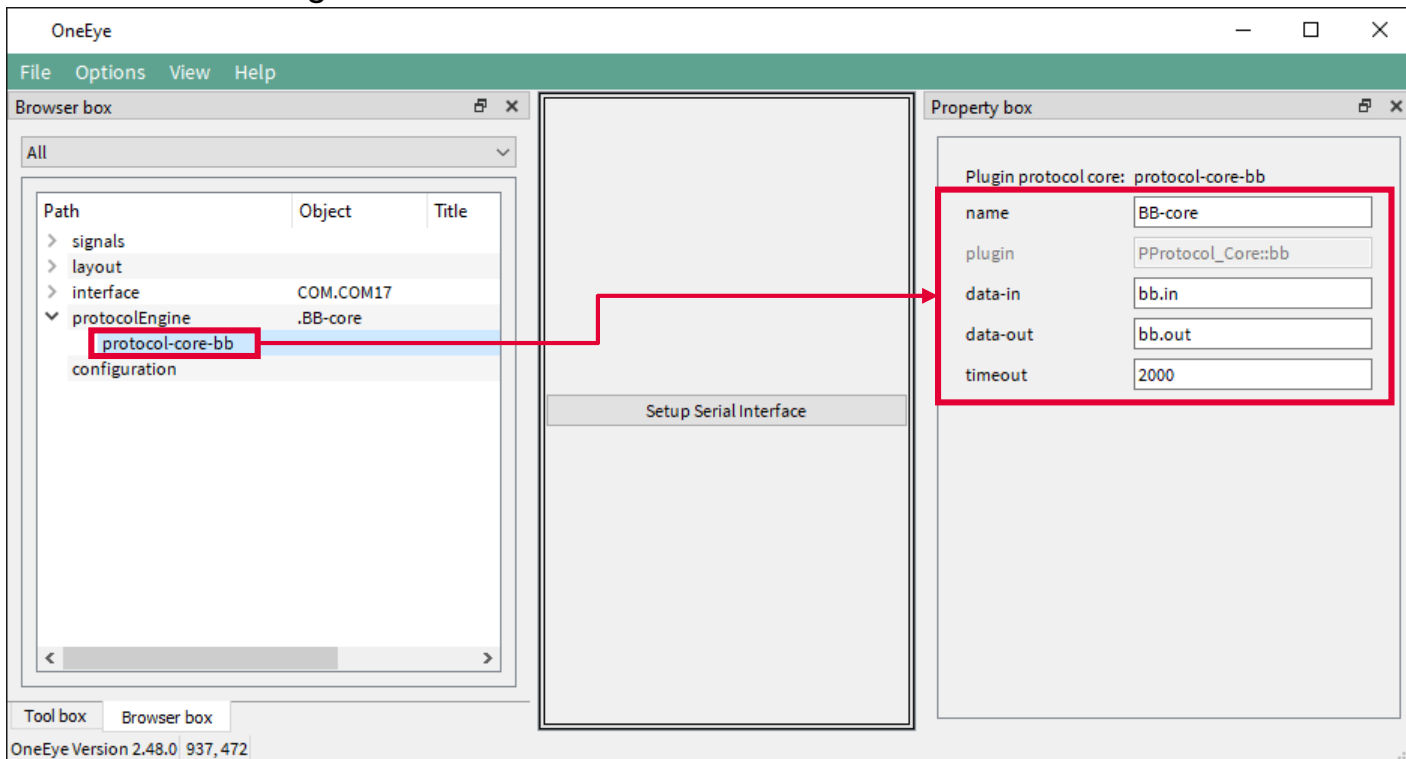


The screenshot illustrates the configuration process in the OneEye software. On the left, the 'Browser box' shows a tree view with 'layout' expanded, containing a 'pushButton' widget. This widget is highlighted with a red box, and a red arrow points from it to the 'Setup Serial Interface' button in the main layout area, which is also highlighted with a red box. To the right, the 'Property box' shows the configuration for this button, with 'title' set to 'Setup Serial Interface' and 'on-click' set to '{show.connection.ui}', both fields highlighted with red boxes. A red arrow points from the 'on-click' property to the 'Communication interface setup' dialog box that appears when the button is clicked. This dialog box shows the configuration for the communication interface, including 'Plugin Com Port: com', 'plugin: PCom\_Core::com', 'device: COM17', 'baudrate: 115200', and 'connect' checked. A red arrow points from the 'device' dropdown in the dialog to the 'COM17' entry in the 'Browser box' tree view.

# Implementation - OneEye

## Configuring the BB protocol

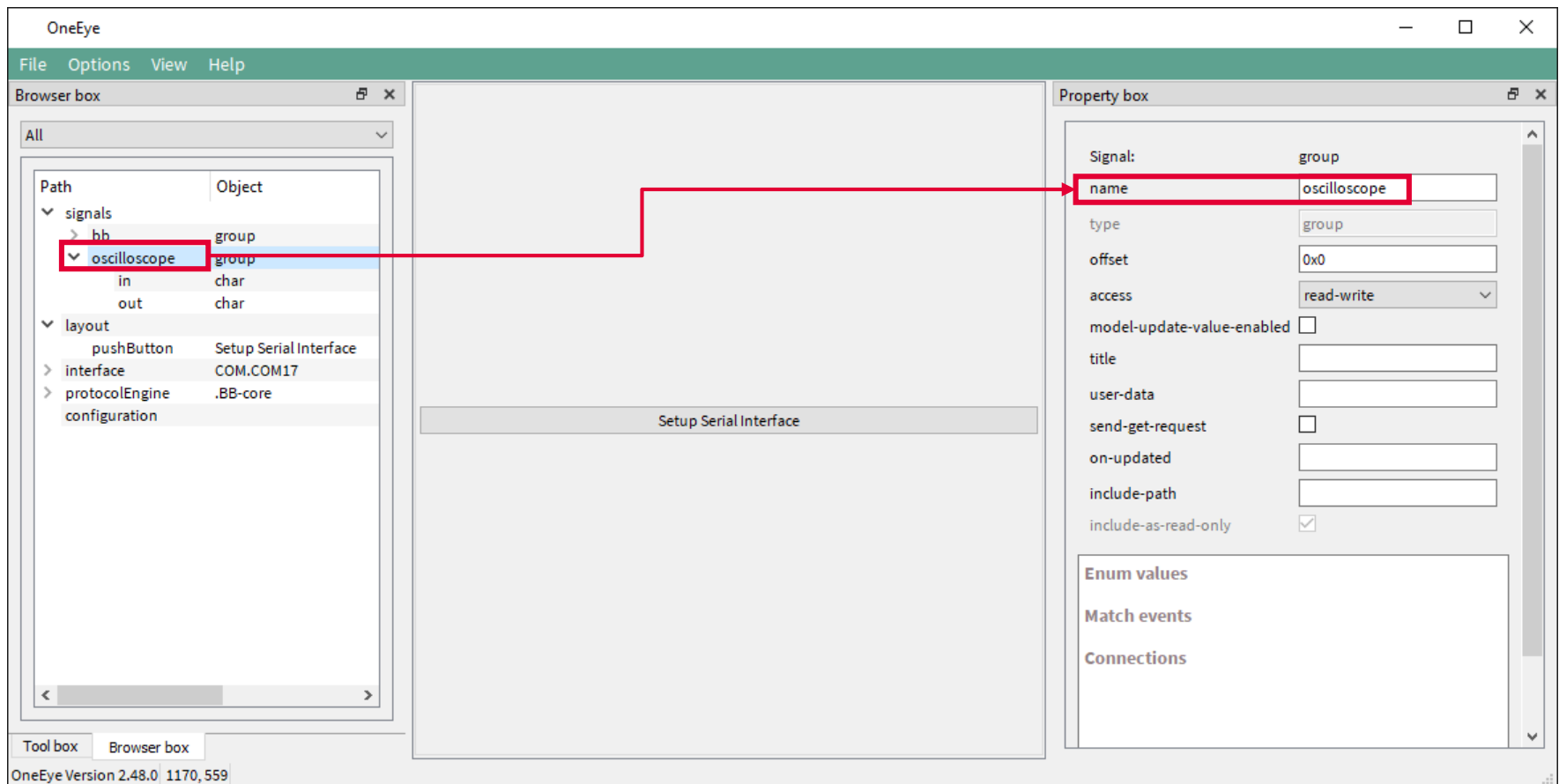
Right click in an empty area of the Browser box, and select **Add child -> protocolEngine**. Then right click on the created **protocolEngine** and select **Add child -> protocol-core-bb**. Connect the BB protocol stream to the **bb.in** and **bb.out** signals by setting respectively the **data-in** and **data-out** properties. Set the **name** property to **BB-core**. And set the **timeout** to **2000** ms so that frames are dropped after 2 seconds in case the microcontroller is not answering.



# Implementation - OneEye

## Configuring the Oscilloscope: signals creation

Create a signal group and set its **name** property to **oscilloscope**.

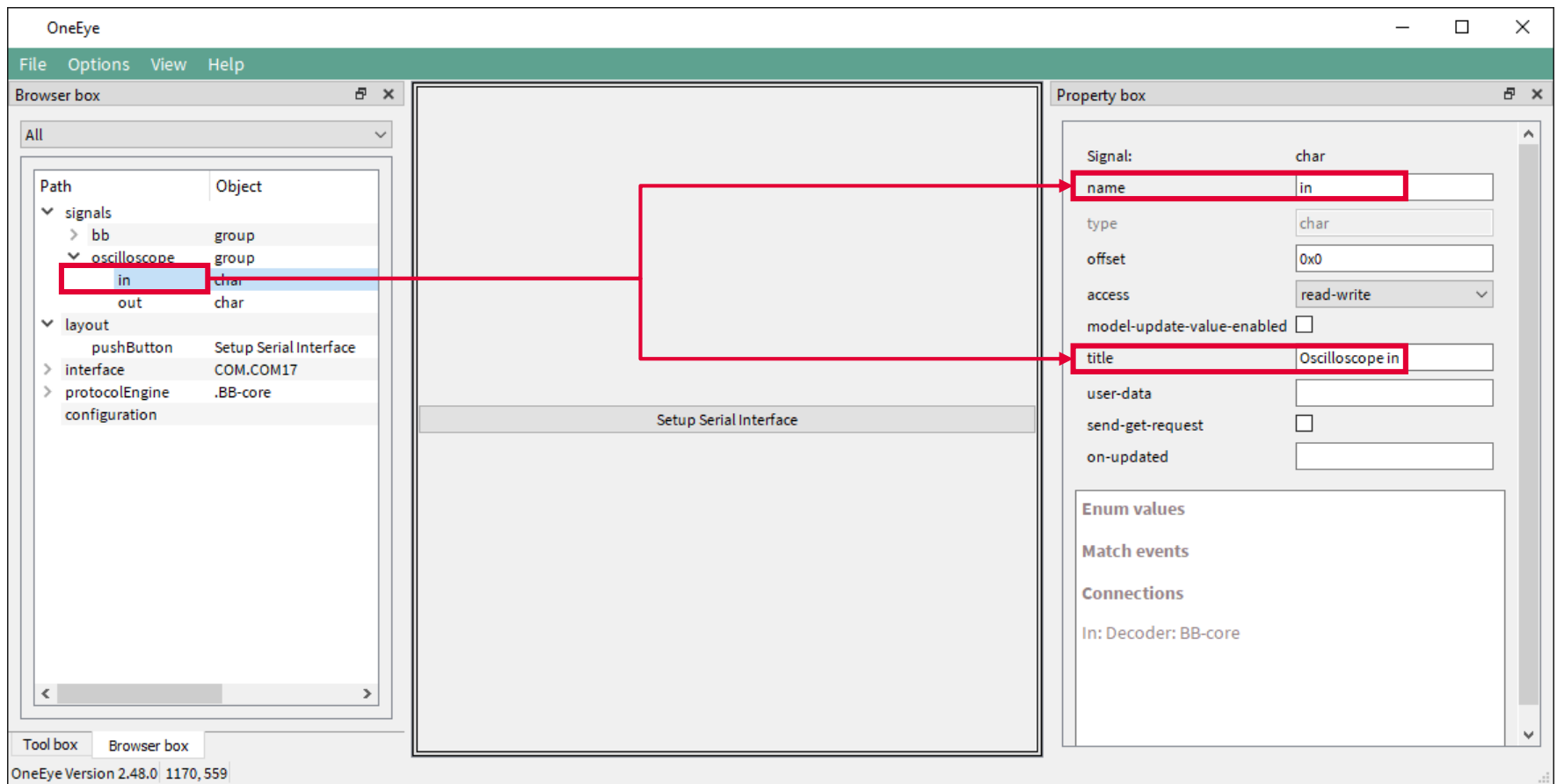


The screenshot shows the OneEye software interface with the following components:

- Browser box:** A tree view showing the project structure. The 'signals' folder is expanded, and the 'oscilloscope' group is selected and highlighted with a red box. A red arrow points from this box to the 'name' property in the Property box.
- Property box:** A panel on the right showing the properties of the selected 'oscilloscope' group. The 'name' property is set to 'oscilloscope' and is highlighted with a red box. Other properties include 'type' (group), 'offset' (0x0), 'access' (read-write), and 'include-as-read-only' (checked).
- Central Canvas:** A large area in the center showing a 'Setup Serial Interface' component.
- Bottom Bar:** Shows 'Tool box' and 'Browser box' tabs, and the version information 'OneEye Version 2.48.0 1170, 559'.

# Implementation - OneEye

Add two signals of type **char** into the **oscilloscope** group, name them **in** and **out**, and set their **title** property to respectively **Oscilloscope in** and **Oscilloscope out**.



# Implementation - OneEye

## Create the oscilloscope widget

Drag and drop an **oscilloscope** widget from the toolbox onto the layout, set the oscilloscope properties **data-in** and **data-out** to respectively **oscilloscope.in** and **oscilloscope.out**. Set the **protocol-type** property to **ProtocolBB**. Set the **unit-x** property to **s**.

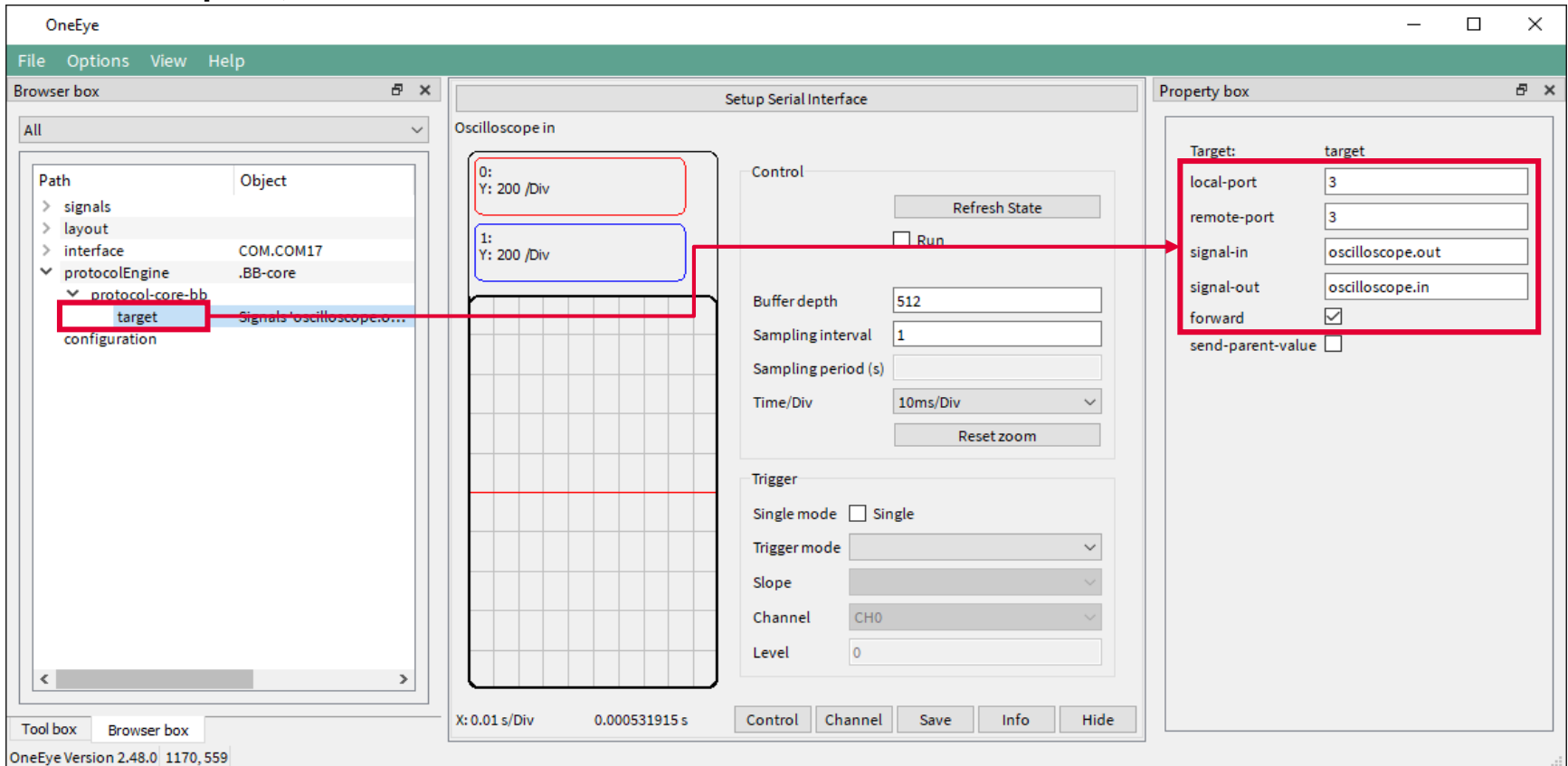
The screenshot shows the OneEye software interface with the following components and configurations:

- Browser box:** A tree view showing the project structure. The **oscilloscope** widget is selected under the **layout** folder.
- Setup Serial Interface:** A control panel for the oscilloscope. Key settings include:
  - Control: Refresh State button
  - Run: Disabled
  - Buffer depth: 512
  - Sampling interval: 1
  - Sampling period (s): 0.001
  - Time/Div: 10ms/Div
  - Trigger mode: Automatic
  - Slope: Rising edge
  - Channel: CH0: Signal A (V)
  - Level: 0
- Property box:** A list of properties for the **oscilloscope** widget. The following properties are highlighted with red boxes and arrows:
  - data-in:** Set to `oscilloscope.in`
  - data-out:** Set to `oscilloscope.out`
  - protocol-type:** Set to `ProtocolBB`
  - unit-x:** Set to `s`
- Oscilloscope Plot:** Shows two signals:
  - 0: Signal A (V) with Y: 200 (V)/Div and Value: 865 (V)
  - 1: Signal B with Y: 200 /Div and Value: 088

# Implementation - OneEye

## Connect the oscilloscope widget to the BB protocol

Right click on the **protocol-core-bb** and select **Add child -> target**. Select the **target** item and set **local-port** and **remote-port** to **3** to match the AURIX settings, **set signal-in=oscilloscope.out, signal-out=oscilloscope.in, forward=checked**.



The screenshot displays the OneEye software interface with three main panels: Browser box, Setup Serial Interface, and Property box.

- Browser box:** Shows a tree view of the project structure. The path is expanded to `protocol-core-bb > target`, which is highlighted with a red box. A red arrow points from this box to the Property box.
- Setup Serial Interface:** Contains an oscilloscope widget with two channels:
  - Channel 0: Y: 200 /Div
  - Channel 1: Y: 200 /Div
 A red box highlights the channel settings. A red arrow points from this box to the Property box. Below the oscilloscope is a grid and a red horizontal line.
- Property box:** Shows the configuration for the selected `target` object. The following properties are highlighted with a red box:
  - local-port: 3
  - remote-port: 3
  - signal-in: oscilloscope.out
  - signal-out: oscilloscope.in
  - forward:

At the bottom of the interface, the status bar shows `X: 0.01 s/Div` and `0.000531915 s`. Buttons for `Control`, `Channel`, `Save`, `Info`, and `Hide` are visible.

OneEye Version 2.48.0 1170, 559

# Implementation - OneEye

## Test the oscilloscope

The oscilloscope Control tab provides configuration for the trigger and information about the oscilloscope state (armed, triggered, uploading).

Click on the **Control** button **1** and the **Refresh State** button to retrieve the oscilloscope settings (channels, timings, ...).

The screenshot shows the OneEye software interface. The main window is titled "OneEye" and contains several panes:

- Tool box:** Contains various components like Label, Line Edit, Logger, Logger Channel, Mux-Demux, Named Pipe Client, Named Pipe Server, Oscilloscope, and Oscilloscope Channel.
- Browser box:** Shows a tree view of the project structure with "signals" and "bb" folders.
- Setup Serial Interface:** A central panel with a grid for the oscilloscope. Below the grid, the "Control" tab is active, showing settings for Buffer depth (512), Sampling interval (1), Sampling period (0.01), Time/Div (1s/Div), and Trigger mode (Automatic). The "Refresh State" button is highlighted with a red box.
- Property box:** Shows configuration for the target, including local-port (3), remote-port (3), signal-in (oscilloscope.out), signal-out (oscilloscope.in), forward (checked), and send-parent-value (unchecked).

At the bottom of the oscilloscope grid, the "Control" button is highlighted with a red box and a red circle containing the number "1". Other buttons like "Channel", "Save", "Info", and "Hide" are also visible.

OneEye Version 2.48.0 1310, 645



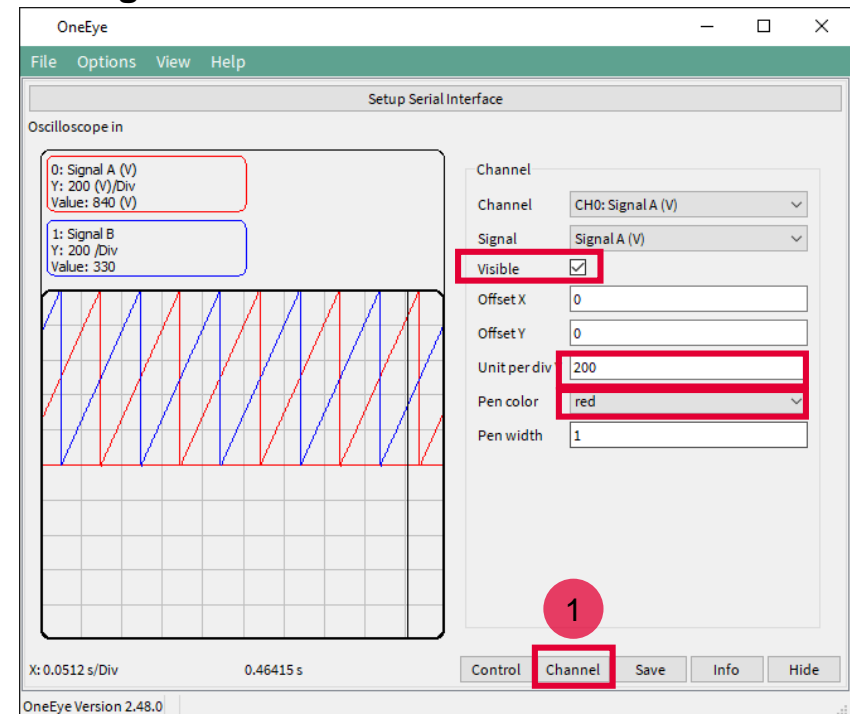
# Implementation - OneEye

## Test the oscilloscope

In the oscilloscope Channel tab, click on the Channel button **1** and check the **visible** check box for both **CH0: Signal A** and **CH1: Signal B** to display the two channels.

Set the **Unit per div Y** to **200** for both **CH0: Signal A** and **CH1: Signal B**.

Select the **Pen color red** for **CH0: Signal A** and **blue** for **CH1: Signal B**.



The screenshot shows the OneEye software interface with the 'Setup Serial Interface' dialog box open. The 'Oscilloscope in' section displays two channels: '0: Signal A (V)' and '1: Signal B'. The 'Channel' settings on the right are as follows:

Channel	Signal	Visible	Offset X	Offset Y	Unit per div	Pen color	Pen width
CH0: Signal A (V)	Signal A (V)	<input checked="" type="checkbox"/>	0	0	200	red	1
CH1: Signal B	Signal B	<input checked="" type="checkbox"/>	0	0	200	blue	1

The 'Channel' button at the bottom of the dialog is highlighted with a red circle and the number '1'. The 'Visible' checkbox, 'Unit per div' field, and 'Pen color' dropdown are also highlighted with red boxes. The oscilloscope display shows two channels: a red signal (Signal A) and a blue signal (Signal B), both showing a sawtooth waveform. The x-axis is labeled 'X: 0.0512 s/Div' and the y-axis is labeled 'Y: 200 (V)/Div'. The current time is '0.46415 s'. The version number 'OneEye Version 2.48.0' is visible at the bottom left.

# Implementation - OneEye

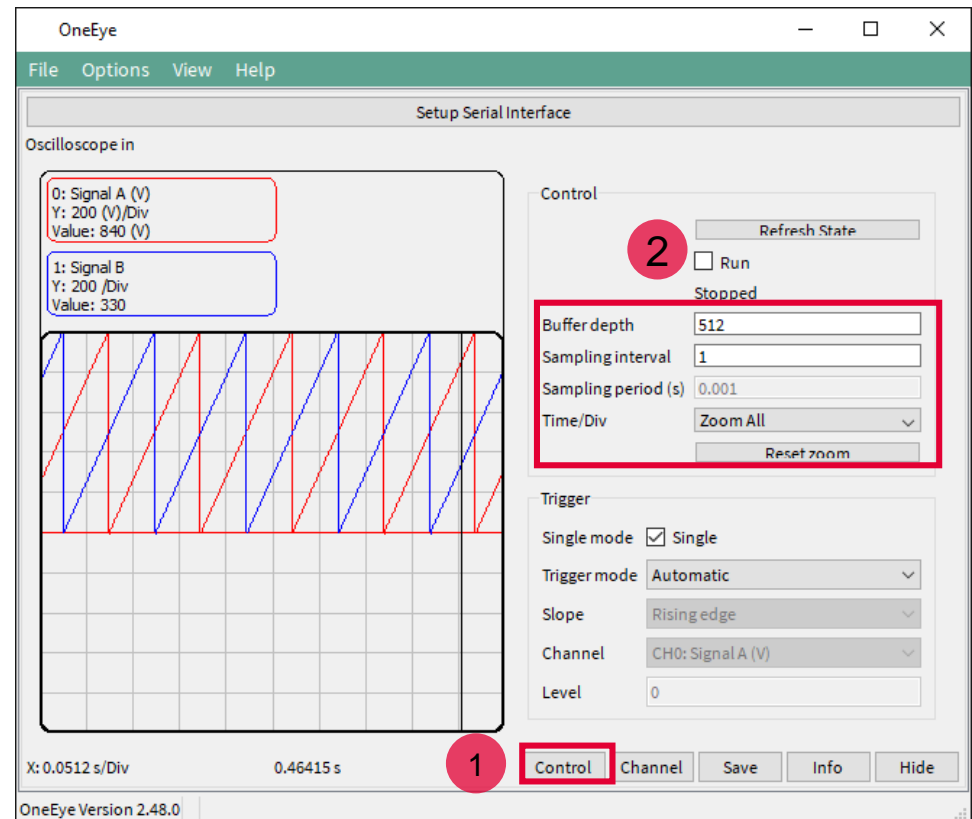
## Test the oscilloscope

Click on the Control button **1**, check the run button **2**, the values for **signalA** and **signalB** should be updating in the oscilloscope.

Set the **Time/Div** value to **Zoom All** to configure the horizontal scale to use the full screen of the oscilloscope window.

The **Buffer depth** configures the oscilloscope buffer depth, here 512 points are used to fill the buffer. This value can be changed within the limit set by the software.

The **Sampling interval** provides the information whether to sample at each interval (1) or not (>1) to the oscilloscope.



# Implementation - OneEye

---

## Advanced options

Advanced configuration can be added to the file *Ifx\_Cfg.h* or *ifx\_oe\_cfg.h* to tune the oscilloscope capabilities, this includes:

- › ***IFX\_CFG\_OE\_OSCI\_MAX\_NUM\_OF\_SIGNALS***: the maximum number of signals that can be declared by the user
- › ***IFX\_CFG\_OE\_OSCI\_MAX\_NUM\_OF\_CHANNELS***: the maximum number of channels that can be buffered
- › ***IFX\_CFG\_OE\_OSCI\_NUM\_OF\_SAMPLES***: the maximum number of sample per channel

**Note:** the memory used by the oscilloscope is mainly defined by

***IFX\_CFG\_OE\_OSCI\_MAX\_NUM\_OF\_CHANNELS \* IFX\_CFG\_OE\_OSCI\_NUM\_OF\_SAMPLES \* 4***

Default values for the above mentioned macros are provided in *ifx\_oe\_oscicfg.h* under Library/OneEye.

# References



- › AURIX™ Development Studio is available online:
- › <https://www.infineon.com/aurixdevelopmentstudio>
- › Use the „*Import...*“ function to get access to more code examples.



- › More code examples can be found on the GIT repository:
- › [https://github.com/Infineon/AURIX\\_code\\_examples](https://github.com/Infineon/AURIX_code_examples)



- › For additional trainings, visit our webpage:
- › <https://www.infineon.com/aurix-expert-training>



- › For questions and support, use the AURIX™ Forum:
- › <https://www.infineonforums.com/forums/13-Aurix-Forum>

## Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

**Edition 2022-06**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**

**© 2021 Infineon Technologies AG.**

**All Rights Reserved.**

**Do you have a question about this document?**

**Email: [erratum@infineon.com](mailto:erratum@infineon.com)**

**Document reference**

**OneEye\_UART\_Oscilloscope\_1**

**\_KIT\_TC275\_LK**

## IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics (“Beschaffenheitsgarantie”).

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer’s compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer’s products and any use of the product of Infineon Technologies in customer’s applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer’s technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office ([www.infineon.com](http://www.infineon.com)).

## WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies’ products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.