



DEWETRON

OXYGEN OBD2 Plugin

TECHNICAL REFERENCE MANUAL

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Table of Content

1	PREFACE.....	4
1.1	INSTALLATION AND LICENSING	4
2	FUNCTIONAL OVERVIEW.....	5
2.1	CONCEPT	5
2.2	SCALING	5
3	GETTING STARTED.....	6
4	CHANNEL SETTINGS	8
4.1	OBD2 CHANNELS GROUP	8
4.2	OBD2 SIGNAL CHANNEL.....	9
5	XML CONFIG FILE	10
5.1	MINIMUM WORKING EXAMPLE	10
5.2	OBD 2 SERVICE	10
5.3	OBD 2 PARAMETER.....	10
5.4	CHANNELS	11
5.4.1	NUMERIC VALUE.....	11
5.4.2	RANGE	12
5.4.3	LINEAR SCALING	12
6	LIST OF FIGURES.....	13

1 PREFACE

On board diagnostics (OBD) is an automotive standard referring to a vehicle's self-diagnostic and reporting capability. Over years the OBD specification has changed from OBD 1 to OBD 2.

Modern OBD implementations use a standardized digital communications port. A basic OBD system consists of an **ECU** (Electronic Control Unit), which uses input from various sensors to control the actuators.

This documentation describes, how to use the OBD 2 Plugin in OXYGEN.

1.1 INSTALLATION AND LICENSING

The sound level option is automatically installed with every OXYGEN R5.7 (September 2021) and above. Once installed, the option needs to be licensed (if not done by DEWETRON factory already) and activated.

The license can be updated under the System Information tab (see Figure 1-1). This requires a *.lic-file provided by DEWETRON. A license update requires a restart of OXYGEN.

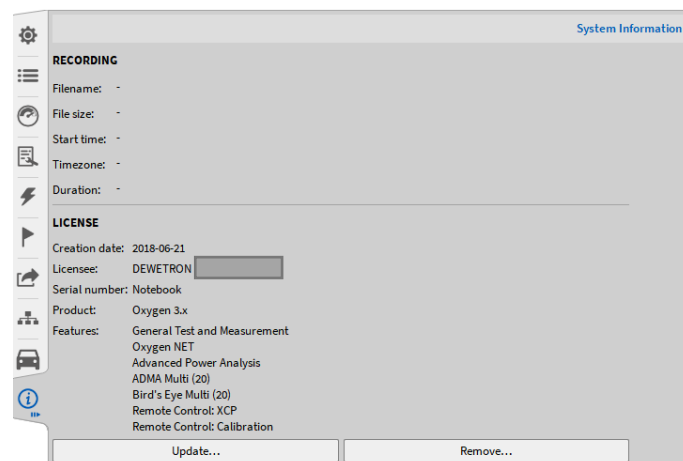


Figure 1-1: Updating the OXYGEN-license

2 FUNCTIONAL OVERVIEW

The OBD 2 Plugin for OXYGEN is an extension to the popular OXYGEN measurement software. The plugin uses a standard CAN communication port channel, to request specific OBD 2 parameters from OBD 2 services (also known as OBD 2 Modes). The response is stored in one or more OXYGEN data channels.

Features:

- Select OBD Parameters from database or user defined xml files.
- Support CAN Standard or CAN Extended requests and responses
- Support variable refresh rates per OBD parameter (from 0.01 to 10 Hz)
- Support additional scaling parameters if necessary

2.1 CONCEPT

For retrieving a specific OBD 2 parameter from an OBD 2 service, a request must be sent over the CAN port communication channel. Each received response includes one or more parameter specific information, which can be stored in OXYGEN data channels. With the configurable refresh rate each data channel can show the value progress over time.

2.2 SCALING

Linear scaling is used to convert the binary data to physical values. For this a linear scaling equation, with the parameters scale factor and offset, is used:

Output Value = received binary value * scale factor + offset

Example:

received binary value = 2314 scale factor = 0.1 offset = 0 output value = $2314 * 0.1 + 0.0 = 231.4$

3 GETTING STARTED

- 1. Start OXYGEN (if not already started)
- 2. Open the channel list
- 3. Select an existing CAN port channel
- 4. Press "+" add channels
- 5. Select "OBD2" in the protocols section to get the "Add OBD2" dialog box

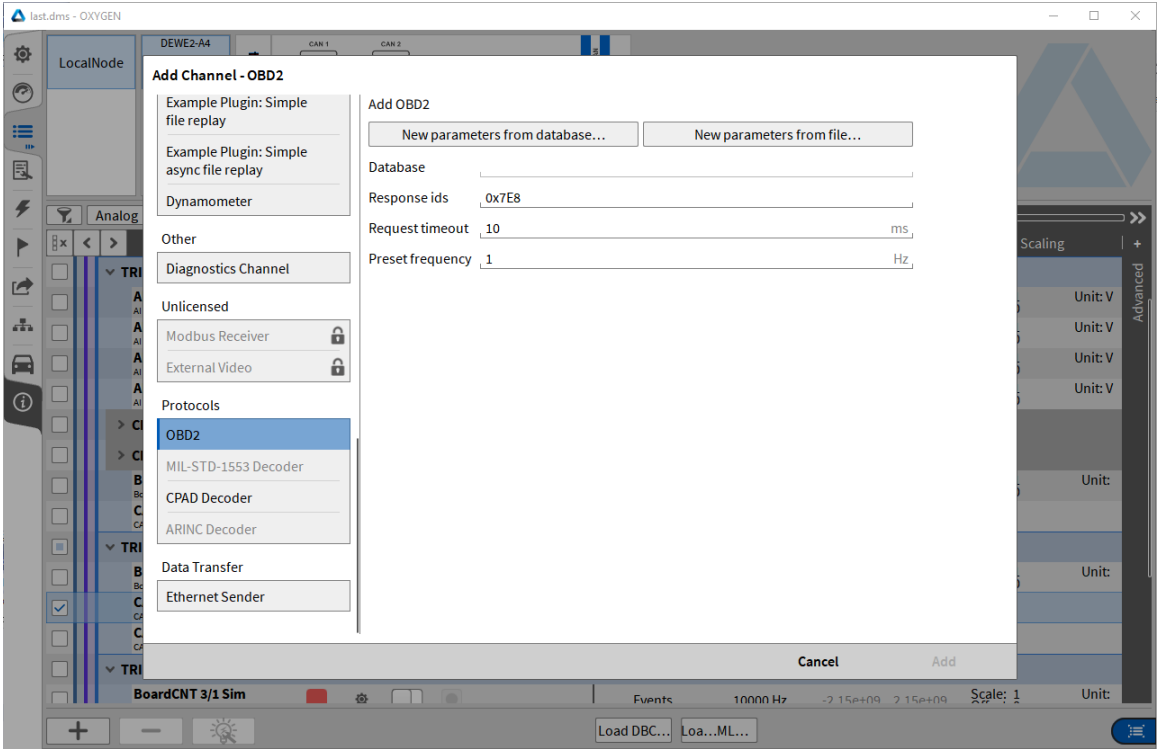


Figure 3-1: Add OBD2 channel

- 6. Select one of the "New parameters ..." buttons to open the "Select Channel" dialog

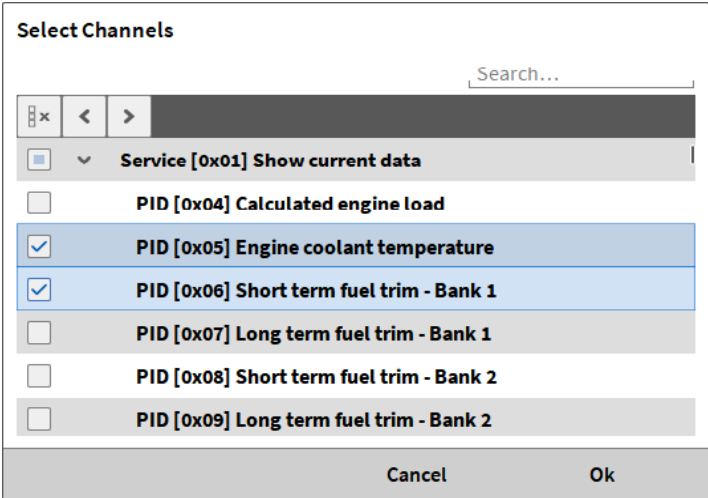


Figure 3-2: Select Channels dialog

Select one or more channels from the channel list and press “Ok”

7. Add or change predefined CAN response ids.

The default parameter for the response id is “0x7E8”, which is the standard response identification of a standard CAN OBD communication (11 bit). Different ECU’s can communicate with another response id. For a CAN extended communication port use a valid CAN extended response id (e.g. “0x18DAF110”).

OBD 2 allows the communication with multiple ECU’s to the same OBD 2 request. For this multiple response ids are allowed (“0x7E8 0x7E9”). A mix of CAN standard and extended response ids is illegal

8. Change the request timeout if necessary. This specifies the minimum time span in milliseconds for requesting different OBD 2 Parameters.
9. Change the preset frequency if necessary. With this item you can set the frequency of selected OBD 2 parameters without a valid frequency attribute loaded from xml file
10. Press Ok

4 CHANNEL SETTINGS

After creation you can find the created OBD channels in section “OBD_Plugin channels” of the OXYGEN channel list (see Figure 4.1). This section will explain the channel settings of the created OBD2 channels.

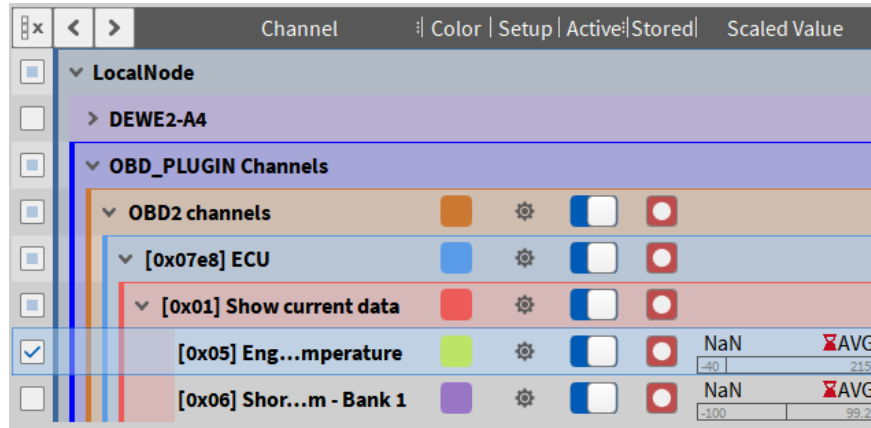


Figure 4-1: Created OBD channels

Each channel can be activated/deactivated with the “Active” switch. To display the individual channel settings click on the “Setup” symbol of the channel. All individual channel settings can be saved in an OXYGEN Setup file (*.dms).

4.1 OBD2 CHANNELS GROUP

All channels for a selected CAN port are summed up in “OBD2 channels” group. With this setup dialog you can change the input channel and the request timeout.

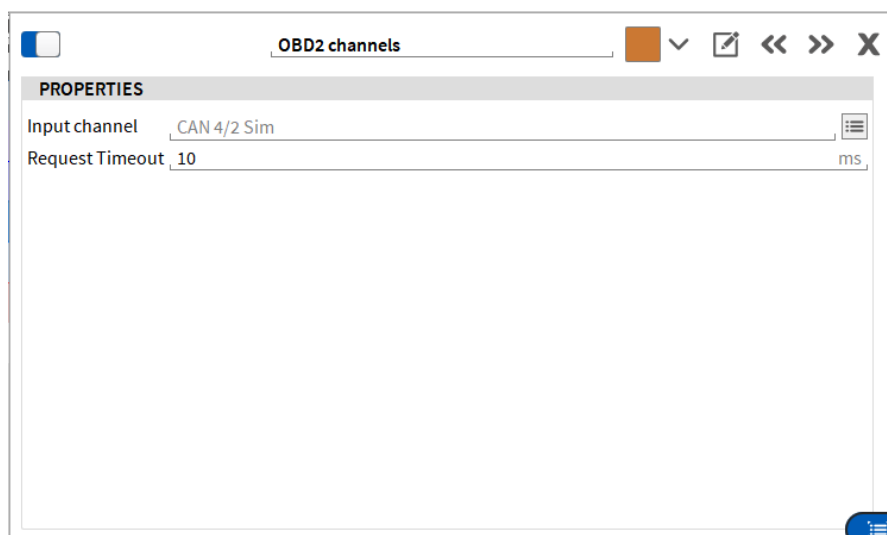


Figure 4-2: OBD2 channels setup

4.2 OBD2 SIGNAL CHANNEL

OBD2 signal channels stores the values from an OBD parameter response. Each signal channel is assigned to a OBD2 Parameter channel (loaded from a file or database). The signal channel name is composed of the hexadecimal OBD2 parameter id, the OBD2 parameter name and the name of the assigned OBD2 Parameter channel.

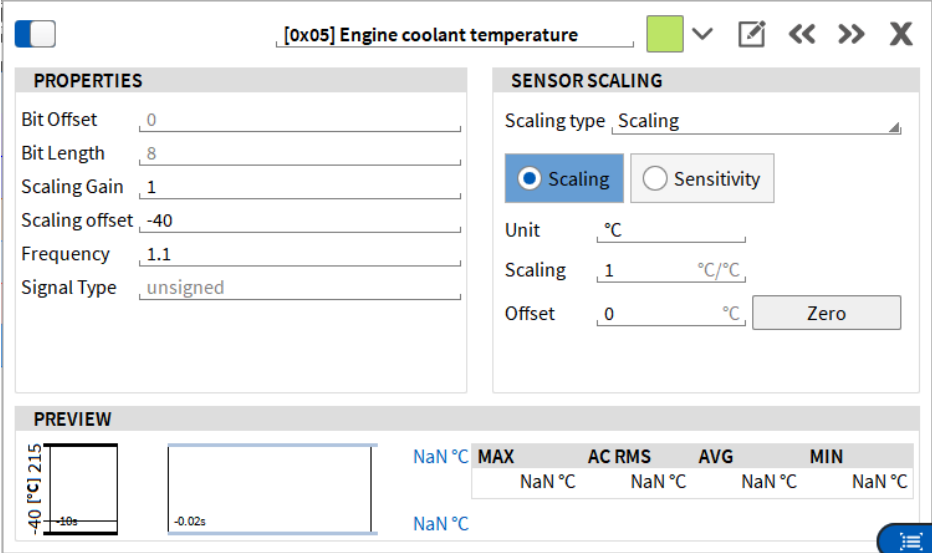


Figure 4-3: Signal channel setup

5 XML CONFIG FILE

Most of the configuration is provided via a XML document. It is designed, to be very flexible in usage as well as easy to create.

5.1 MINIMUM WORKING EXAMPLE

This example consists of OBD Service 01, with Parameter 004 and one channel.

```
<OBD-II version = "1.0">
  <Service id = "001" name = "Show current data">
    <Parameter id = "004" name = "Calculated engine load" frequency = "1">
      <Channel unit = "%">
        <NumericValue bit_length = "8" bit_offset = "0" type = "unsigned"/>
        <LinearScaling offset = "0" scale = "0.39215"/>
        <Range min = "0" max = "100"/>
      </Channel>
    </Parameter>
  </Service>
</OBD-II>
```

5.2 OBD 2 SERVICE

An OXYGEN OBD 2 xml file describes one or more OBD 2 Services. Each Service has its own Service Id and name.

```
<Service id = "001" name = "Show current data">
...
</Service>
<Service id = "005" name = "Oxygen sensor monitor">
...
</Service>
```

Service Property	Value Op-tions	Manda-tory	Example	Description
name	string	yes	"My Endpoint"	Friendly name of the Service
id	number	yes	"1" until "0xff"	Identification of the Service.

5.3 OBD 2 PARAMETER

Each OBD 2 Service includes one or more OBD 2 Parameters. Each Parameter has its a Parameter Id name and polling rate.

```
<Parameter id="004" name="Calculated engine load" frequency="1">
...
</Parameter>
<Parameter id="0xA6" name="Odometer">
...
</Parameter>
```

Parameter Property	Value Options	Mandatory	Example	Description
name	string	yes	"My Endpoint"	Friendly name of the Service
id	number	yes	"1".."255"	Identification of the Service.
frequency	number	no	"0.01" until "10" Hz	Polling rate of the parameters channels

5.4 CHANNELS

A Channel describe one return value of an OBD 2 Parameter request. Since one OBD 2 Parameter can return multiple values, one OBD 2 Parameter can include multiple channel sections.

```
<Parameter id="020" name="Oxygen Sensor 1" frequency="1">
  <Channel name="Voltage" unit = "V">
    ...
  </Channel>
  <Channel name="Short term fuel trim" unit="%">
    ...
  </Channel>
</Parameter>
```

Channel Property	Value Options	Mandatory	Example	Description
name	string	no	"Coolant temperature"	Friendly name of a return value. For identifying OXYGEN data channels the Parameter name and channel name are used, if multiple channels are present.
unit	string	no	"km/h"	Unit of the underlying numeric value.

5.4.1 NUMERIC VALUE

The numeric value entry specifies position and type of the returned value. This is a mandatory entry of an OBD 2 channel.

```
<Channel name="Voltage" unit = "V">
  <NumericValue bit_length="8" bit_offset="0" type="unsigned"/>
  ...
</Channel>
```

Property	Value Options	Mandatory	Example	Description
bit_length	number	yes	"8" "16"	Size of the response value This should be multiple of 8 (number of bits per byte)
bit_offset	number	yes	"0" "8" "16"	Offset of the response values first bit. Since OBD return values always start at the beginning of one byte, this should be 0, 8, 16,
type	string	yes	"signed" "unsigned"	Signed or unsigned number representation of the returned value. Signed specifies the two's complement value representation.

5.4.2 RANGE

The range xml section describes the physical range of the underlying value and is mandatory.

```
<Channel name="Voltage" unit = "V">
  <Range min="0" max="1.275"/>
  ...
</Channel>
```

Property	Value Options	Mandatory	Example	Description
min	number	yes	"-40.0"	Minimum value
max	number	yes	"215"	Unit of the channels underlying numeric value.

5.4.3 LINEAR SCALING

This is an optional xml tag for an OBD 2 Channel. The scaling parameters normally can be computed out of the OBD 2 Channel range entry. But sometimes the returned physical value range differs to the returned computer value range. For this the linear scaling tag specifies the real linear equation parameters.

```
<Channel name="Voltage" unit = "V">
  <LinearScaling offset="0" scale="0.39215"/>
  ...
</Channel>
```

Property	Value Options	Mandatory	Example	Description
offset	number	yes	"-40.0"	Offset of the linear equation
scale	number	yes	"0.39"	Factor of the linear equation

6 LIST OF FIGURES

Figure 1-1: Updating the OXYGEN-license.....	4
Figure 3-1: Add OBD2 channel	6
Figure 3-2: Select Channels dialog.....	6
Figure 4-1: Created OBD channels.....	8
Figure 4-2: OBD2 channels setup	8
Figure 4-3: Signal channel setup.....	9