



Automotive Ethernet Converter

User Manual



Version: 1.10 / May 2020

© 2020 X2E GmbH

This user manual is protected by copyright; all usual rights reserved. Reproduction of this user manual, even in part, is only permitted with the approval of X2E GmbH. Any infringement will result in liability for damages and may result in criminal prosecution.

All product names and brands used in this user manual are the property of their respective owners.

Table of contents

Introduction	4
Intended use	4
Delivery contents	4
General safety instructions.....	5
Product overview.....	5
Identification	7
Connections and controls	8
Installation.....	11
Mounting	11
Connecting.....	11
Configuration and firmware update	13
Install XORAYASuite.....	13
Start Gateway configuration	14
Connect converter.....	15
Change configuration.....	15
Update firmware.....	16
Disconnect converter	16
Cleaning.....	17
Repair	17
Disposal	17
Appendix.....	18
Technical specifications	18
Pin assignments.....	18

Introduction

Intended use

Automotive Ethernet Converter is a media converter between 100/1000Base-T1 (OABR) and 100/1000Base-T (standard Ethernet). The device is primarily designed to convert Ethernet signals between a car's ECU on one side and a PC or datalogger on the other.

You may only operate the converter within the scope of the technical specifications provided in this user manual. Additionally, the use in hazardous areas is not allowed.

Delivery contents

- Automotive Ethernet Converter
- connection cable (optional)
- user manual
- XORAYASuite
- USB driver

Check to ensure that the delivery is complete and all parts are in sound condition. If the delivery is incomplete or supplied components are damaged, contact X2E immediately. Do not use damaged components.

General safety instructions

The Automotive Ethernet Converter is only intended for use by qualified personnel. Read the user manual and especially this chapter thoroughly before operating.



CAUTION

Electric shock due to damaged components

Damages to the converter or the connection cable can result in electric shock.

- ▶ Check all components regularly for damages.
- ▶ Only connect the converter if all components are undamaged.



CAUTION

Device damage due to vibrations, dirt or liquids

Excessive vibrations, dirt or liquids may result in malfunction or destruction of the converter.

- ▶ Avoid exposing the converter to these influences.
- ▶ Keep the converter clean, especially plugs and sockets to ensure a reliable contact.
- ▶ Never open the converter.



CAUTION

Device damage due to electrostatic discharge

Electronic components can be destroyed by electrostatic discharge.

- ▶ Avoid touching connectors and connector pins.
 - ▶ Ground yourself before carrying the converter in your hands.
 - ▶ Operate the converter in an ESD-compliant environment.
-

FCC notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications made to this equipment not expressly approved by may void the FCC authorization to operate this equipment.

Product overview

Identification

The identification plate is located on the bottom side of the Automotive Ethernet Converter.

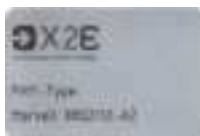


It contains information about:

- Typ device type
- Rev hardware revision
- S/N serial number
- Input maximum current consumption at given standard input voltage
- DMF date of manufacture

Functions described in this user manual correspond to the Automotive Ethernet Converter (AEC) at the following development stage:

- hardware revision 1.03
- firmware version 04.01.00
- XORAYASuite version 03.06.01.03



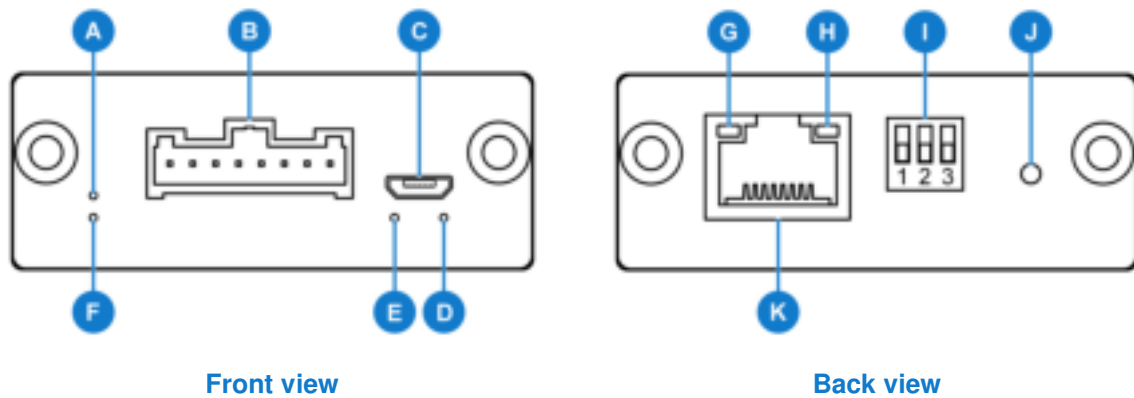
This label indicates the built-in Ethernet PHYs. For type A1, the general compatibility to other automotive Ethernet components cannot be guaranteed. For type A2, you have the option to switch between legacy and compliant mode (see chapter *Configuration and firmware update*).

If the label is missing, then type A1 or an older PHY is used.

Connections and controls

The front side contains LEDs, the service interface and the combined connection for power, 100/1000Base-T1 and CAN.

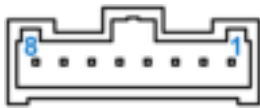
The Ethernet interface and control elements are located on the back side.



Link LED for 100/1000Base-T1 (A)

Colour	Meaning
green	link established (also: USB bootloader mode, depending on version)

Connection for power, 100/1000Base-T1 and CAN (B)



Pin	Function
1	CAN_H
2	CAN_L
5	KL30(Ubatt)
6	KL31(GND)
7	OABR_N
8	OABR_P

Service interface (C)

Use the Micro USB interface to change the configuration and to update the firmware. For further information, refer to the chapter *Configuration and firmware update*.

General status LED (D)

Colour	Meaning
blue	converter in initialisation phase
green	converter ready
red (continuously)	error on Ethernet interface
red (blinking)	error on 100/1000Base-T1 interface
off	USB bootloader mode

LED for CAN (E)

Colour	Meaning
blue	interface in initialisation phase
green	interface ready
green (blinking)	activity on this interface

Activity LED for 100/1000Base-T1 (F)

Colour	Meaning
green	interface ready
green (blinking)	activity on this interface

Activity LED for Ethernet (G)

Colour	Meaning
yellow (blinking)	activity on this interface

Link LED for Ethernet (H)

Colour	Meaning
green	link established

DIP switches (I)

No	Function
1	switch the 100/1000Base-T1 interface between master (up) or slave (down)
2	switch the data rate between 1000 Mbit (up) and 100 Mbit (down)
3	activate (up) or deactivate (down) sleep/wake mode via CAN

Reset button (J)

This button is used to:

- restart the converter
- switch the converter into USB bootloader mode (further information in the chapter *Connect converter*)

Ethernet interface (K)

Connection for a standard Ethernet cable.

Installation

Mounting



CAUTION

Device damage due to overheating

Overheating may result in malfunction or destruction of the converter.

- ▶ Do not operate the converter outside the specified temperature range.
 - ▶ Do not operate the converter in the vicinity of heat sources.
 - ▶ Ensure adequate air circulation.
 - ▶ Do not cover the converter with other objects.
-

- ▶ Mount the converter in such a way that it does not pose a hazard at any time.

Connecting



DANGER

Electric shock due to improper connection

Introducing the 4-mm plugs of the supplied connection cable into low-voltage sockets can be fatal.

- ▶ Never introduce the 4-mm plugs into low-voltage sockets.
-



CAUTION

Device damage due to wrong power supply

A wrong power supply can result in damage or destruction of the converter.

- ▶ Only connect the converter to power supplies that correspond to the technical specifications.
 - ▶ Pay attention to the correct polarity when connecting.
-



Disconnect service interface during standard operating mode

Make sure that the service interface **(C)** is disconnected in standard operating mode. Pull the plug if necessary and connect it again before changing the configuration or updating the firmware.

The following instructions refer to the connection cable provided by X2E. If you use other cables, connect accordingly.

- ▶ Plug the connection cable into the socket **(B)**.
- ▶ Connect the cable labelled **OABR** to the ECU or any other OABR or 100/1000Base-T1 device.
- ▶ To use the sleep/wake mode, connect the cable labelled **CAN** to a CAN bus.
- ▶ Plug a standard Ethernet cable into the socket **(K)**.
- ▶ Connect the Ethernet cable to a PC, switch or datalogger.



Requirements for the DC power supply

The DC power supply must provide a continuous current of 150 mA. Use a regulated power supply or the vehicle battery and pay attention to the required voltage and current levels.

- ▶ Connect the black cable labelled **KL31(GND)** to 0 V or ground.
- ▶ Connect the red cable labelled **KL30(Ubatt)** to a DC power supply in the specified range.
- ▶ Ensure that all connectors are firmly attached and tighten the screws where possible.
- ▶ Turn on the power supply.

The converter indicates its readiness by green illumination of the general status LED **(D)**. As soon as data is received at the 100/1000Base-T1 or the Ethernet interface, the data is converted accordingly and sent in the opposite direction.



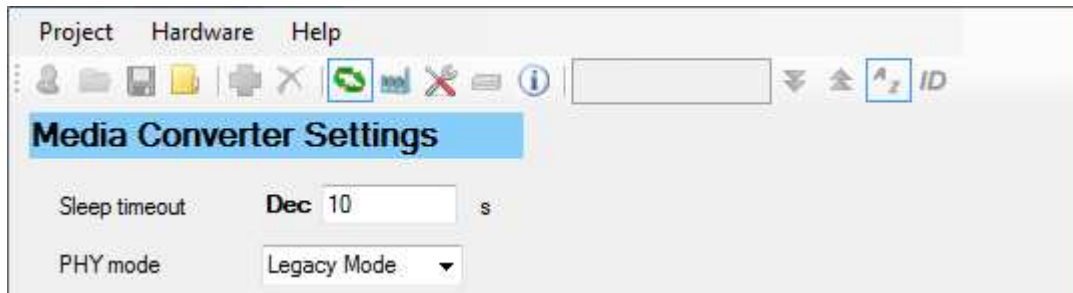
Energy management

The Automotive Ethernet Converter features an intelligent energy management that reduces the current consumption depending on a connected CAN bus.

To activate the sleep/wake mode, DIP switch **(I)** No 3 needs to be in top position.

If there is no activity on the CAN bus within a configurable number of seconds (see chapter *Configuration and firmware update*), the converter switches into sleep mode. If there is activity again, it wakes up back to standard operating mode.

Configuration and firm ware update



In addition to the general converter configuration with DIP switches (I), it is possible to change the following two values with the tool *Gateway configuration*, part of X2E's XORAYA-Suite:

- time in seconds without CAN activity that puts the converter into sleep mode (requirement: DIP switch No 3 is in top position)
- mode of Ethernet PHYs (setting only affects type A2 or newer, see chapter *Identification*)
 - Legacy: fully compatible with older X2E converters, general compatibility with other automotive Ethernet components not guaranteed
 - Compliant: general compatibility with other automotive Ethernet components



Mutual exclusion of PHY modes

Legacy and compliant mode cannot be used together.

Install XORAYASuite

The XORAYASuite is a collection of programs to configure and control XORAYA dataloggers and additional devices like the Automotive Ethernet Converter.

Supported operating systems:

- Microsoft® Windows® 7/8/10 (32 Bit or 64 Bit)

Hardware requirements:

- Processor speed: at least 1 GHz
- RAM: at least 2 GB
- Hard disk space: approx. 170 MB available


Software requirements:

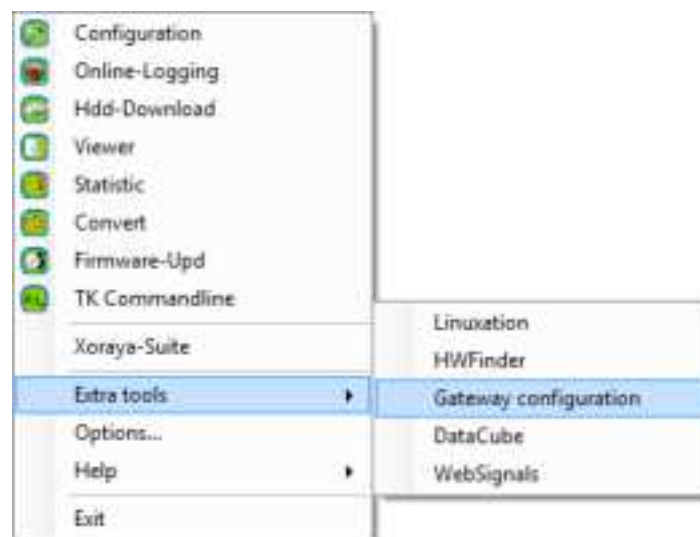
- Microsoft® .NET Framework Version 4.5 or higher

- ▶ Start the XorayaSuite installation wizard and follow the instructions.
- ▶ Make sure that the components *Gateway configuration* and *DFU-Driver* are selected.



Start Gateway configuration


- ▶ Start the XorayaSuite.
- ▶ Click  in the Windows notification area.
- ▶ Select Extra tools > Gateway configuration.





Connect converter

- ▶ Make sure that the correct USB driver is installed.
- ▶ Deactivate sleep mode (DIP switch **(I)** No 3 is in down position).
- ▶ Connect the converter to the power supply (see chapter *Connecting*).
- ▶ Turn on the power supply.
- ▶ Connect the converter via service interface **(C)** to your PC.
- ▶ Press the reset button **(J)** with a pointed object.



The converter indicates USB bootloader mode by turning off the general status LED **(D)**.

- ▶ Click  to connect to the converter.

An established connection is indicated by a blue border around the icon: 

- ▶ Click  to get information about the connected converter (firmware version, current configuration, etc.).

Change configuration

- ▶ Click  to load the current configuration from the converter.
- ▶ Set the **Sleep timeout** (at least 2 s, accuracy ± 20 %).
- ▶ Set the **PHY mode** (see description above).
- ▶ Click  to transfer the configuration onto the converter.




Complete configuration properly

Do not abort the process and do not disconnect the USB cable prematurely. Otherwise, the converter stays in USB bootloader mode and it is not converting data.

After the successful transfer, the converter switches back into standard mode, which is indicated by green illumination of the general status LED **(D)**.

- ▶ Pull the USB cable from the converter.

Update firm ware

- ▶ Click  .
- ▶ Navigate to the directory that contains the firmware file and select the **File name**.
(Never change the file names of the provided firmware archive.)
- ▶ Click **Open**.

The firmware is being updated.



Complete firmware update properly


Do not abort the process and do not disconnect the USB cable prematurely. Otherwise, the converter stays in USB bootloader mode and it is not converting data.

After the successful transfer, the converter switches back into standard mode, which is indicated by green illumination of the general status LED **(D)**.

- ▶ Pull the USB cable from the converter.

Disconnect converter

Manual disconnection of the converter is only necessary if you did not transfer a configuration or update the firmware after connecting.

- ▶ Click  to disconnect the converter.
- ▶ Pull the USB cable from the converter.
- ▶ Press the reset button **(J)** to switch back into standard mode.

Cleaning



CAUTION

Device damage due to entering liquids

Entering liquids may result in malfunction or destruction of the converter.

- ▶ Disconnect the converter from the power supply before cleaning.
- ▶ Make sure that no liquids enter the converter.

- ▶ Clean the converter with a damp, soft cloth as needed.

Repair



CAUTION

Device damage from opening the device

Unauthorised opening may result in malfunction or destruction of the converter.

- ▶ Never open the converter.
- ▶ Maintenance and repair must be carried out by X2E personnel only.

- ▶ In case of malfunctions or damages, please contact X2E via e-mail to get information about returning the converter: xoraya-return@x2e.de

Disposal



Within the European Union, the disposal of electrical devices is determined by national rules that are based on the directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE). Accordingly, electrical and electronic equipment may not be disposed of in household waste.

Outside the European Union, please contact your local authority so as to comply with the correct method of disposal for electrical devices.

Appendix

Technical specifications

Dimensions (H x W x D)	21 mm x 56 mm x 104 mm
Supply voltage	6 V to 28 V
Current consumption	max 150 mA (at 12 V)
Current consumption (standby)	max 1 mA (at 12 V)
Data rate	up to 1000 Mbit/s
Temperature range	-40 °C to +60 °C

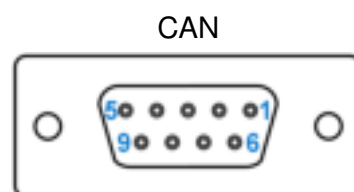
Pin assignments

The connectors of the provided connection cable have the following pin assignments.

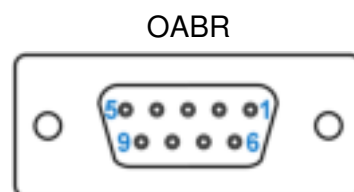


Pin	Function
1	CAN_H
2	CAN_L
5	KL30(Ubatt)
6	KL31(GND)
7	OABR_N
8	OABR_P

Pin	Function
2	CAN_L
7	CAN_H



Pin	Function
2	OABR_N
7	OABR_P



Colour	Function
red	KL30(Ubatt)
black	KL31(GND)

Ubatt/GND





X2E GmbH
Jahnstrasse 2b
76870 Kandel
GERMANY

Phone	+49 7275 9143 100
Fax	+49 7275 9143 109
E-Mail	info@x2e.de
Internet	http://www.x2e.de