ETAS

DRIVING EMBEDDED EXCELLENCE

ETAS BR_XETK-S2.0 Emulator Probe for JDP MPC57xx Micro-processor Family

User Guide

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BR_XETK-S2.0 - User Guide R09 EN - 05.2022

Contents

1 About this Document

1.1 Classification of Safety Messages

The safety messages used here warn of dangers that can lead to personal injury or damage to property:

DANGER

indicates a hazardous situation with a high risk of death or serious injury if not avoided.

WARNING

indicates a hazardous situation of medium risk, which could result in death or serious injury if not avoided.

CAUTION

indicates a hazardous situation of low risk, which may result in minor or moderate injury if not avoided.

NOTICE

indicates a situation, which may result in damage to property if not avoided.

1.2 Presentation of Instructions

The target to be achieved is defined in the heading. The necessary steps for his are in a step-by-step guide:

Target definition

1. Step 1
2. Step 2
3. Step 3

> Result

1.3 Presentation of Supporting Information

NOTE

Contains additional supporting information.

2 Basic Safety Notices

This chapter contains information about the following topics:

2.1 General Safety Information

Please observe the Product Safety Notices ("ETAS Safety Notice") and the following safety notices to avoid health issues or damage to the device.

NOTE

Carefully read the documentation (Product Safety Advice and this User Guide) that belongs to the product prior to the startup.

ETAS GmbH does not assume any liability for damages resulting from improper handling, unintended use or non-observance of the safety precautions.

2.2 Requirements for Users and Duties for Operators

The product may be assembled, operated and maintained only if you have the necessary qualification and experience for this product. Incorrect operation or operation by users without sufficient qualification may lead to injuries or death or property damages.

General Safety at Work

The existing regulations for safety at work and accident prevention must be followed. All applicable regulations and statutes regarding operation must be strictly followed when using this product.

2.3 Intended Use

An ETK is an electronic component that is installed in a vehicle control unit (ECU) to read data from the ECU or write data to the ECU.

Application Area of the Product

This product was developed and approved for automotive applications. For use in other application areas, please contact your ETAS contact partner.

Requirements for Operation

The following requirements are necessary for safe operation of the product:

- Use the product only according to the specifications in the corresponding User Guide. With any deviating operation, the product safety is no longer ensured.
- Observe the regulations applicable at the operating location concerning electrical safety as well as the laws and regulations concerning work safety!
- Do not apply any voltages to the connections of the product that do not correspond to the specifications of the respective connection.
- Connect only current circuits with safety extra-low voltage in accordance with EN 61140 (degree of protection III) to the connections of the product.
- The power supply for the product must be safely disconnected from the supply voltage. For example, use a car battery or a suitable lab power supply.
- Use only lab power supplies with double protection to the supply system.
- Ensure that the connections of the power supply are easily accessible.
- The module does not have an operating voltage switch.
  - Switch on the product by connecting the power supply cable with the power supply or by switching on the power supply.
  - Switch off the product by disconnecting it from the power supply or by switching off the power supply.

DANGER

Connect the power cord only with a vehicle battery or with a lab power supply! A connection to power outlets is prohibited.

- Route the power cord in such a way that it is protected against abrasion, damages, deformation and kinking. Do not place any objects on the power cord.
- Never apply force to insert a plug into a socket. Ensure that there is no contamination in and on the connection, that the plug fits the socket, and that you correctly aligned the plugs with the connection.
- Do not use the product in a wet or damp environment.
- Do not use the product in potentially explosive atmospheres.
- Keep the surfaces of the product clean and dry.

Potential Equalization

CAUTION

Danger from inadvertent current flow!

Depending on the design, the shield of the Ethernet cables can be connected with the housing of the module. Install the products only on components with the same electrical potential or isolate the products from the components.

Requirements for the technical State of the Product

The product is designed in accordance with state-of-the-art technology and recognized safety rules. The product may be operated only in a technically flawless condition and according to the intended purpose and with regard to safety and dangers as stated in the respective product documentation. If the product is not used according to its intended purpose, the protection of the product may be impaired.

Maintenance and Cleaning

The product is maintenance-free. Use a lightly moistened, soft, lint-free cloth for cleaning the product. Ensure that no moisture can enter. Never spray cleaning agents directly onto the product. Do not user any sprays, solvents or abrasive cleaners which could damage the product.

Transport and Installation

CAUTION

The ETK can be damaged or destroyed!
Some components of the ETK board may be damaged or destroyed by electrostatic discharges. Please keep the ETK in its storage package until it is installed.
The board should only be taken from its package, configured, and installed at a work place that is protected against static discharge.

CAUTION

During installation and removal, ECU and ETK must be in a de-energized state!

CAUTION

Risk of short circuiting the internal signals of the ETK!
When you mount the ETK to the ECU, you must ensure that the screws and washers used will not penetrate the ETK printed circuit board.

CAUTION

Ensure that the module mounting surfaces are at the same electrical potential or insulate the modules from their mounting surfaces.

Cabling

Use exclusively ETAS cables at the connections of the product! Adhere to the maximum permissible cable lengths! Observe the assignment of the cables to the connectors! Detailed information about cabling is located in the ETK User Guides.

2.4 Identifications on the Product

Fig. 2-1 Adhesive Label (Example: Label for XETK-S14.0)

The following symbols are used for identifications of the product:

Symbol	Description
	The User Guide must be read prior to the startup of the product!
	Symbol for WEEE, see chapter 2.5 on page 12
	Symbol for CE conformity, see chapter 2.6 on page 12
	UKCA conformity symbol (Great Britain), see chapter 2.6.2 on page 12)
	Symbol for China RoHS, see chapter 2.7.2 on page 13
	Symbol for China RoHS, see chapter 2.7.2 on page 13
	Symbol for electrostatic sensitive components
XETK-S14.0A	Product designation (example)
F 00K 110 722	Order number of the product (example)
SN: yyxxxxx	Serial number (7-digit)
XXXX/YY	Product version
ZZZZ	Year of manufacture
ETAS GmbH...	Manufacturer's address

NOTE

For symbols and product information one or several adhesive labels can be used.

2.5 Taking the Product Back and Recycling

The European Union has passed a directive called Waste Electrical and Electronic Equipment, or WEEE for short, to ensure that systems are setup throughout the EU for the collection, treating and recycling of electronic waste.

This ensures that the devices are recycled in a resource-saving way representing no danger to health or the environment.

Fig. 2-2 WEEE-Symbol

The WEEE symbol (see Fig. 2-2 on page 12) on the product or its packaging shows that the product must not be disposed of as residual garbage.

The user is obliged to collect the old devices separately and return them to the WEEE take-back system for recycling. The WEEE directive concerns all ETAS devices but not external cables or batteries.

For more information on the ETAS GmbH Recycling software, contact the ETAS sales and service locations.

2.6 Declaration of Conformity

2.6.1 CE Declaration of Conformity (European Union)

With the CE mark attached to the product or its packaging, ETAS confirms that the product corresponds to the applicable product-specific European Directives. The CE Declaration of Conformity for the product is available upon request.

2.6.2 UKCA Declaration of Conformity (Great Britain)

With the UKCA mark attached to the product or its packaging, ETAS confirms that the product corresponds to the product-specific, applicable standards and directives of Great Britain. The UKCA declaration of conformity for the product is available on request.

2.7 RoHS Conformity

2.7.1 European Union

The EU Directive 2011/65/EU limits the use of certain dangerous materials for electrical and electronic devices (RoHS conformity).

This product does not contain any of the restricted substances specified in the EU Directive 2011/65/EU or exceeds the maximum concentrations stipulated therein. For individual electronic components used in our products, there are currently no equivalent alternative substances, which is why we make use of the exception 7C-I in Annex III of this Directive.

ETAS confirms that the product corresponds to this directive which is applicable in the European Union.

2.7.2 China

ETAS confirms that the product meets the product-specific applicable guidelines of the China RoHS (Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation) applicable in China with the China RoHS marking affixed to the product or its packaging.

2.8 Declarable Substances (European Union)

Some products from ETAS GmbH (e.g. modules, boards, cables) use components with substances that are subject to declaration in accordance with the REACH regulation (EU) no.1907/2006.
Detailed information is located in the ETAS download center in the customer information "REACH Declaration" (www.etas.com/Reach). This information is continuously being updated.

2.9 Use of Open Source Software

The product uses Open Source Software (OSS). This software is installed in the product at the time of delivery and does not have to be installed or updated by the user. Reference shall be made to the use of the software in order to fulfill OSS licensing terms. Additional information is available in the document "OSS Attributions List" at the ETAS website (www.etas.com).

3 Introduction

This section contains information about the basic features and applications of the BR_XETK-S2.0 Interface Board (ETK = Emulator Test Probe), hints to system requirements for operating the BR_XETK-S2.0, and other details.

3.1 Applications

The BR_XETK-S2.0 is an emulator probe for the Freescale MPC57xx and for the STMicroelectronics EM57xx microcontroller family. It is a serial XETK with an Automotive Ethernet (100BASE-T1) interface for use with the JTAG portion of the Nexus debug interface (IEEE/ISTO 5001).

NOTE

For supported MPC57xx microcontrollers, refer to chapter 7.1.3 on page 35.

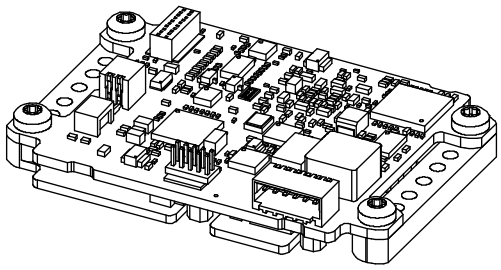


Fig. 3-1 BR_XETK-S2.0

An Automotive Ethernet media converter is required for the access to the BR_XETK-S2.0 by the standard full duplex 100BASE-T Ethernet of the PC.

The BR_XETK-S2.0 can be used for rapid prototyping applications (bypass) as well as for measurement and calibration applications.

	BR_XETK-S2.0
ECU interface connector	10 pin SAMTEC
Power supply connector	6 pin MOLEX
Power supply for ED devices (VDDS-BRAM)	min. 1.25 V
SBRAM sense	Yes, on board or external sense
Pinless triggering	Yes
Timer triggering	Yes

3.2 Features

- Measurement interface:
  - 3.3 V JTAG output levels, 5.0 V tolerant JTAG input
  - Configurable JTAG interface clock speed: 20 MHz, 40 MHz, 50 MHz

> **NOTE**
>
> The max. allowed JTAG clock depends on the core frequency of the microcontroller. Max. clock speed is typically 1/4 of the core frequency.

  - Pinless startup protocol for XETK recognition and data acquisition triggering
- Calibration:
  - Microcontroller capability of internal Flash emulation can be used
  - BR_XETK-S2.0 powers Emulation Device RAM (for calibration purpose)
  - Supports “Start on Any Page”
- Supports special coldstart mechanism (“Calibration Wake Up”):
  - Calibration Wake Up: Wake up mechanism to wake up the power supply of the ECU via the Calibration Wake up pin
  - Pull CalWakeUp until Startup Handshake: duration of the Wake up mechanism is configurable
- ECU flashing via BR_XETK-S2.0
  - Braindead flashing under ProF control
- Permanent storage of configuration in EEPROM
- Automotive Ethernet Interface 100BASE-T1:
  - Connection to PC via Automotive to Standard Ethernet Media Converter or via ES88x ECU and Bus Interface Module
  - Open XCP on Ethernet Protocol
  - Supports a variety of standard applications
- “ETK Drivers and Tools” update to support ETAS software tools (INCA, XCT)
- Firmware update (programming of the logic device) through HSP software service packs; removal of the BR_XETK-S2.0 or ECU is not necessary
- Mounting possibilities inside or on top of ECU
- Temperature range suitable for automotive application

For more technical data on the BR_XETK-S2.0 consult the chapter “Technical Data” on page 34.

4 Hardware Description

In this chapter, the function blocks of the BR_XETK-S2.0 are explained in detail.

4.1 Architecture

Fig. 4-1 shows the block diagram of the BR_XETK-S2.0.

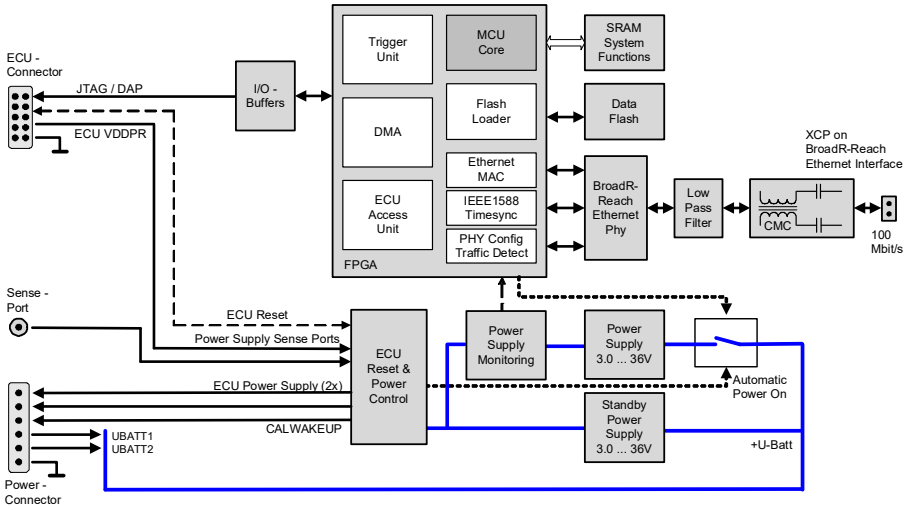


Fig. 4-1 BR_XETK-S2.0 Architecture

While the microcontroller accesses the program data (not the program code) out of the data emulation memory provided by the microcontroller, the content of the data emulation memory can simultaneously be modified by the calibration and development system through the Automotive Ethernet interface. This process enables adjustments of parameters, characteristic lines and maps through the calibration and development system. Using an additional measurement data memory area, the ECU microcontroller can provide data to the calibration and development system by buffering the data (DISTAB13 or DISTAB17) and triggering the BR_XETK-S2.0 to read the data via JTAG. The BR_XETK-S2.0 then reads, buffers, processes and sends this measured data to the PC.

If no additional measurement data memory is available, the BR_XETK-S2.0 can alternatively read the data to be measured directly from the microcontroller's memory. This process is Triggered Direct Measurement (TDM) with DISTAB13 or DISTAB17.

The 100 Mbit/s BR_XETK-S2.0 Ethernet interface provides communication with the PC via an media converter.

ETK Connector	Description
CON1	Automotive Ethernet interface (100BASE-T1 interface)
CON2	ECU Interface
CON3	ECU EDRAM Sense port
CON4	Power supply

4.2 ECU Interface

The BR_XETK-S2.0 is connected via connectors CON2 and CON4 to the ECU with two adapter cables (refer to Fig. 4-2 on page 17). The pin definition depends on the application and the microcontroller type. In general the ECU interface consists of

- 1 ECU voltage line, which is not used for BR_XETK-S2.0 power supply, but only for detection of the ECU status, therefore the power consumption on this line is negligible (refer to chapter 4.4 on page 19)
- 1 Reset line which allows the BR_XETK-S2.0 to control the system reset of the ECU
- 1 Reset line which allows the BR_XETK-S2.0 to monitor the system reset of the ECU
- 5 Debug line interfaces for the communication between the BR_X-ETK-S2.0 and the microcontroller
- 2 ground lines for proper shielding of the ECU interface lines.

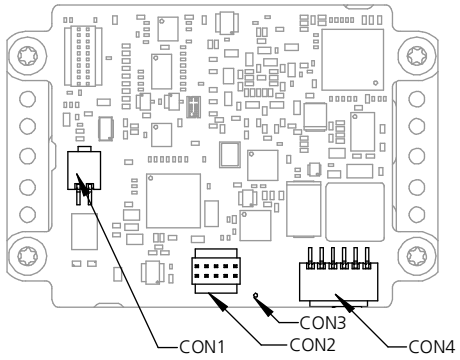


Fig. 4-2 Location of the ECU Interface

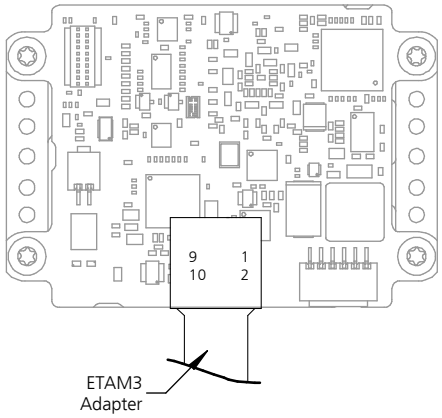


Fig. 4-3 ETAM3 Adapter mounted at CON2

4.3 Automotive Ethernet Interface

The Automotive Ethernet interface (100BASE-T) of the BR_XETK-S2.0 can not be connected to a PC directly, but a media converter or an ES88x ECU and Bus Interface Module has to be inserted in between.

Its purpose is to transform the physical layers of Automotive Ethernet (1 differential pair / 2 wires) into Standard Ethernet (2 differential pairs/ 4 wires) and vice-versa. The media converter has to be connected to CON1 (refer to Fig. 4-4).

The combination of the BR_XETK-S2.0 and the Automotive Ethernet media converter is integrated in the ETAS IP world with automatic IP management and supports the open automotive "Universal Measurement and Calibration" standard "XCP on Ethernet" (TCP/IP, UDP/IP).

The open "XCP on Ethernet" interface allows for connecting to the BR_X-ETK-S2.0 with third party application software.

NOTE

The Automotive Ethernet interface is not compatible with the standard Ethernet interfaces of ETAS modules.

NOTE

Please see chapter 7.1.2 on page 34 for additional information regarding PC requirements for the Ethernet interface.

CAUTION

See chapter “Requirements for failsafe Automotive Ethernet Operation” on page 27 for details on wiring the Automotive Ethernet interface cables.

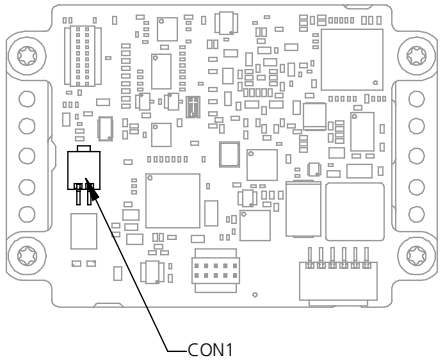


Fig. 4-4 Location of the BR_XETK-S2.0 Ethernet Interface connector (CON1)

4.4 Power Supply

The BR_XETK-S2.0 requires a permanent power supply. It is typically powered directly from the car battery. The input voltage may vary between 4.3 V and 36 V. In case of higher input voltages to the BR_XETK-S2.0, additional voltage protection is required. The BR_XETK-S2.0 will also accept voltage dips down to 3 V, for a maximum duration of 15ms (for additional details of low voltage operation, see ISO standard 16750)

From the input battery voltage, switch-mode power supplies provide all necessary voltages on the BR_XETK-S2.0. The power supply of the ECU is not affected by the BR_XETK-S2.0. An automatic switch ensures that the power supply of the BR_XETK-S2.0 is automatically switched on and off when the BR_XETK-S2.0 enters and leaves its standby (sleep) mode.

The BR_XETK-S2.0 is supplied with power through the connector CON4.

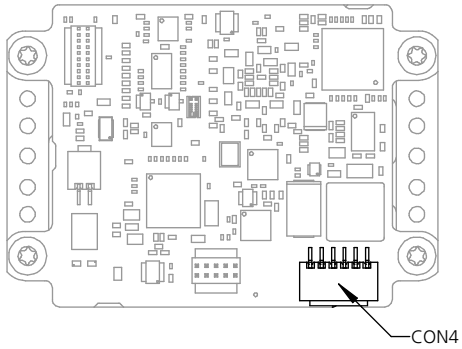


Fig. 4-5 Location of the BR_XETK-S2.0 Power Supply Connectors

4.5 ECU Voltage Supervisor

The ECU voltage (VDDP) is monitored by the BR_XETK-S2.0 to recognize whether the ECU is switched on or off. Additionally the ECU RAM standby voltage (VDDSBRAM) is monitored to determine if the standby RAM content is still valid. These two signals are only used for monitoring therefore the load current is negligible.

NOTE

The BR_XETK-S2.0 only allows switching between reference page and working page if there is a valid voltage at the sense pin and the working page has been initialized by the calibration and development system.

The BR_XETK-S2.0 provides two possibilities to supply and supervise the ECU RAM standby voltage:

A The BR_XETK-S2.0 monitors the VDDSBRAM supply on board the BR_XETK-S2.0. The microcontroller's standby power supply pin must be connected to the XETK pin VDDSBRAM.

B At the through-hole solder pad CON3 the BR_XETK-S2.0 can additionally monitor the VDDSBRAMsense voltage if it is provided by the ECU. The microcontroller's standby power supply pin must be connected to the BR_XETK-S2.0 pin VDDSBRAMsense. The microcontroller's standby power supply may be provided by the ECU or by the XETK.

4.6 Data Emulation and Data Measurement

The BR_XETK-S2.0 is a serial XETK using JTAG as the primary microcontroller interface. Typical of all serial (X)ETKs, the RAM used for data emulation and data measurement is not accessible by the XETK until the microcontroller is powered up and the startup handshake is performed.

Serial XETKs use the ETAS two page concept, consisting of both a Reference and a Working page.

The Reference Page is located in the ECU flash and can not be modified by a simple write access. All changes to the Reference Page must be done via Flash programming.

The Working Page is located within the microcontroller's ED RAM. The Working Page may be a portion of or the entire size of the ED RAM. The ED RAM used for the emulation of calibration data must not be used by the ECU software directly as general purpose RAM. It is recommended that the ED RAM is permanently powered by the XETK or ECU. The XETK/INCA has the complete control over the RAM used as Working Page and it's contents. When enabling data emulation, the XETK establishes a basic start-up configuration of the data in the Working Page by copying the corresponding data in the Flash to the emulation space.

To enable calibration, the Working Page must be activated. The process of switching from the Reference Page to the Working Page and vice versa is known as page switching.

The BR_XETK-S2.0 supports Protocol Based page switching for all supported microcontrollers. Page switching is done in microcontroller software by switching the overlay memory on (Working Page) and off (Reference Page) using microcontroller overlay registers. The BR_XETK-S2.0 does not directly control the microcontroller overlay registers. Instead the BR_XETK-S2.0 and microcontroller software use a simple communication method with a shared mailbox in RAM. The XETK uses this mailbox to request and monitor page switching; the microcontroller software is responsible to service this mailbox and perform the page switches. Using an overlay modification description, also in RAM, the XETK provides the necessary information of how the overlay registers need to be modified to realize the page switch which is requested.

The BR_XETK-S2.0 can access both the Reference Page and the Working Page, regardless of which is active from the microcontroller’s point of view.

Another important restriction is that no access to the memory is possible, while the ECU is not running. To enable a cold start measurement in spite of this restriction, the cold start measurement procedure is defined to give the user the feeling of a parallel XETK.

4.7 JTAG Interface

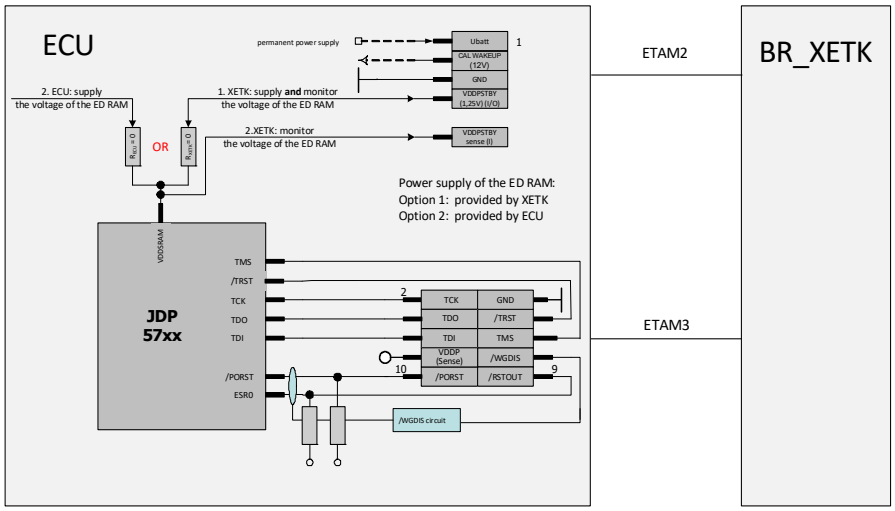


Fig. 4-6 Equivalent Circuitry of the ECU JTAG Interface (ECU)

The ECU part of the JTAG XETK interface is depicted in Fig. 4-6.

The BR_XETK-S2.0 incorporates 22 Ohm series resistors for the TMS, TCK, TDI and /TRST lines on the ECU interface. Hence, no additional termination resistors are required on the ECU for these signals.

4.8 Trigger Modes: Overview

The BR_XETK-S2.0 supports the following trigger modes:

- Pinless triggering
- Timer triggering

The trigger mode "Pinless Triggering" uses the microcontroller's internal Development Trigger Semaphore (DTS) for triggering. See also chapter "Pinless Triggering" on page 23.

The trigger mode "Timer Triggering" uses four internal timers of the XETK for triggering. See also chapter "Timer Triggering" on page 24.

4.9 Pinless Triggering

4.9.1 Startup Handshake

The JTAG Data Communication (JDC) register is used to generate process the XETK startup handshake. The ECU must ensure that all memory ECC initialization has been completed prior to the start-up handshake.

For further information on ECC initialization, please refer to the microcontroller's reference manual.

4.9.2 XETK Trigger Generation

To generate triggers, the ECU software sets bits by writing the associated trigger index in the "DTS_SEMAPHORE" register.

NOTE

The selective setting of trigger bits is accomplished in hardware by the microcontroller and does not require a Read-Modify-Write sequence by the ECU software.

Each bit of the "DTS_SEMAPHORE" corresponds to an XETK hardware trigger. Within the XETK's configuration and/or A2L file, bit 0 corresponds to hardware trigger 1 and bit 31 corresponds to hardware trigger 32.

NOTE

Only the index 0 to 31 corresponding to the first 32 triggers are supported by the BR_XETK-S2.0

The XETK periodically polls (reads) "DTS_SEMAPHORE" via JTAG. The polling rate is configurable, with 50 µs default. The XETK then starts acquisition of appropriate measurement data based on which bits of the register are set.

Active bits in "DTS_SEMAPHORE" are automatically cleared by the microcontroller when the register is read by XETK.

4.10 Timer Triggering

The trigger mode "Timer Triggering" uses four internal timers of the BR_X-ETK-S2.0 for triggering. A configurable period is used for triggering.

The time intervals between trigger events are in accordance with the configured timer values. This values and their resolution have to be defined in the XETK's configuration and/or A2L file. Available settings are:

- Minimum time interval 100 µs
- Maximum period duration 1 s
- Timer resolution 1 µs

The timers trigger the XETK in an asynchronous manner to the microcontroller software. Variables assigned to a measurement raster using a timer trigger are acquired from their original locations in RAM via JTAG.

NOTE

If variables are measured from ECC protected memories, the ECU software must ensure the proper initialization of these locations. A time-out period can be set in the XETK configuration to allow for the ECU to initialize the memories before the measurement begins.

4.11 Reset

The requirement for the BR_XETK-S2.0 reset mechanism is to ensure that power-up and power-down behavior of ECU is clean and smooth. The BR_X-ETK-S2.0 normally drives /PORST low during XETK power up or upon INCA request.

The signals /PORST and /ESR0 of the microcontroller are used by the BR_X-ETK-S2.0 to detect when the ECU is in reset.

The BR_XETK-S2.0 senses the switched ECU power supply. This allows it to detect when the ECU is off and forward this information to INCA. In addition, it allows the XETK to enter the power save mode with the calibration system unplugged.

4.12 Pull CalWakeUp until Startup Handshake

The XETK has the ability to wake up the ECU by applying voltage to the CalWakeUp pin of the ECU connector. This allows the XETK to configure a measurement while the ECU is off.

When waking up the ECU via the CalWakeUp pin, it can be configured if the pin is driven high until the microcontroller core voltage (VDDP) is high or if the pin should be driven high until the start-up handshake between ECU and XETK is complete.

5 Installation

In this chapter, the hardware installation of the BR_XETK-S2.0 is described.

CAUTION

Some components of the interface board may be damaged or destroyed by electrostatic discharges. Please keep the board in its storage package until it is installed.

The board should only be taken from its package, configured, and installed at a work place that is protected against static discharge.

5.1 Connection to the ECU

CAUTION

Risk of short circuiting the internal signals of the XETK!
When you mount the XETK to the ECU, you must ensure that the screws and washers used will not penetrate the XETK printed circuit board.

For connecting the BR_XETK-S2.0 to the ECU two XETK adapter cables are recommended:

- at CON2 adapter ETAM3 and
- at CON4 adapter ETAM2 or ETAM5 or ETAM9 or ETAM10.

The adapter cables are to be ordered separately (refer chapter “Ordering Information” on page 71).

The suitable connectors SAMTEC-10 (CON2) and MOLEX-6 (CON4) should have been populated onto the ECU PCB for adapters ETAM3 and ETAM2/ ETAM5/ ETAM9/ ETAM10 (see Fig. 5-2 for additional connector details).

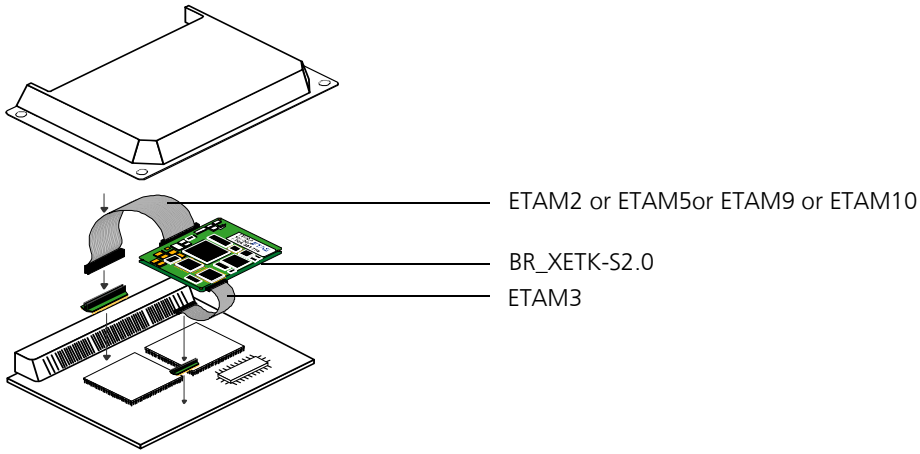


Fig. 5-1 BR_XETK-S2.0 Connection to the ECU

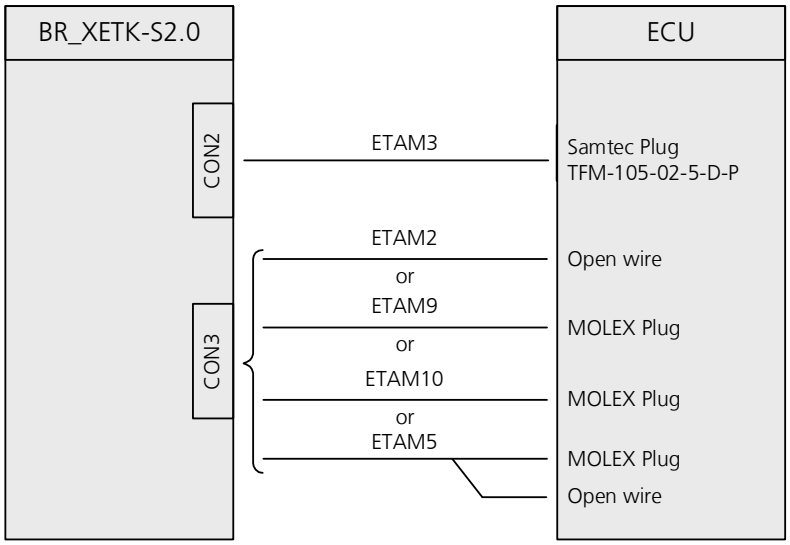


Fig. 5-2 BR_XETK-S2.0 Connection to the ECU

5.2 Wiring

5.2.1 Compatible Hardware

NOTE

The BR_XETK-S2.0 Automotive Ethernet interface is not compatible with the standard Ethernet interfaces of ETAS modules. An CBEB10x Media Converter or an ES88x ECU and Bus Interface Module is required to connect the BR_XETK-S2.0 to the PC (refer to chapter 4.3 on page 18).

5.2.2 Requirements for failsafe Automotive Ethernet Operation

For failsafe operation of the Automotive Ethernet communication channel, all customer specific installations - including cables, connectors and board adaptations - have be compliant to:

- IEEE Std. 802.3bwTM-2015, “Amendment 1: Physical Layer Specifications and Management Parameters for 100 Mb/s Operation over a Single Balanced Twisted Pair Cable (100BASE-T1)”, chapters 96.7 - 96.9
- Open Alliance, “BroadR-Reach® Definitions for Communication Channel, Version 2.0”

NOTE

To achieve an appropriate channel performance all PCB board and cable segments have to be optimized with regard to line impedance matching, length matching within the differential net routing or twisted pair cabling and on the reduction of untwisted regions. Stub segments must be avoided for the Point-to-Point cable connection in favor of inline connectors and shielding measures shall be considered depending on the operation environment.

5.2.3 Automotive Ethernet Media Converter

A Automotive Ethernet media converter or an ES8xx ECU Interface Module is required for the access to the BR_XETK-S2.0 by the PC (refer to chapter 4.3 on page 18).

NOTE

The Automotive Ethernet interface is not compatible with the standard Ethernet interfaces of ETAS modules. An media converter or an ES88x ECU Interface Module is needed to connect the BR_XETK-S2.0 to the PC.

5.2.4 CBEB100.1 Automotive Ethernet Media Converter

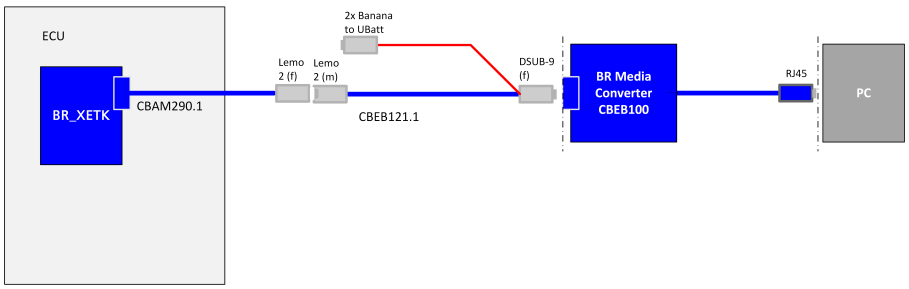


Fig. 5-3 BR_XETK-S2.0 connected to CBEB100.1 with ETAS cables

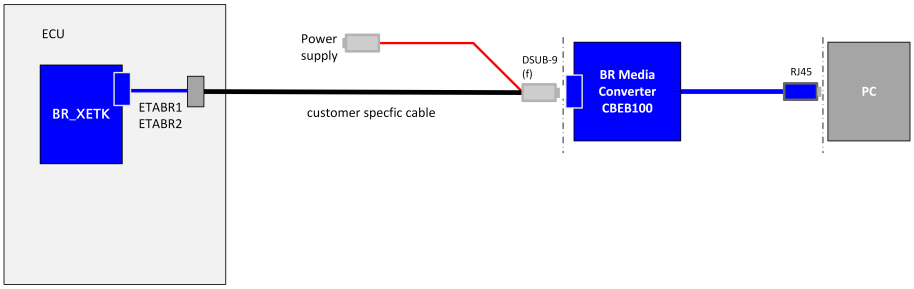


Fig. 5-4 BR_XETK-S2.0 connected to CBEB100.1 with customer specific cable

5.2.5 CBEB105.1 Automotive Ethernet Media Converter

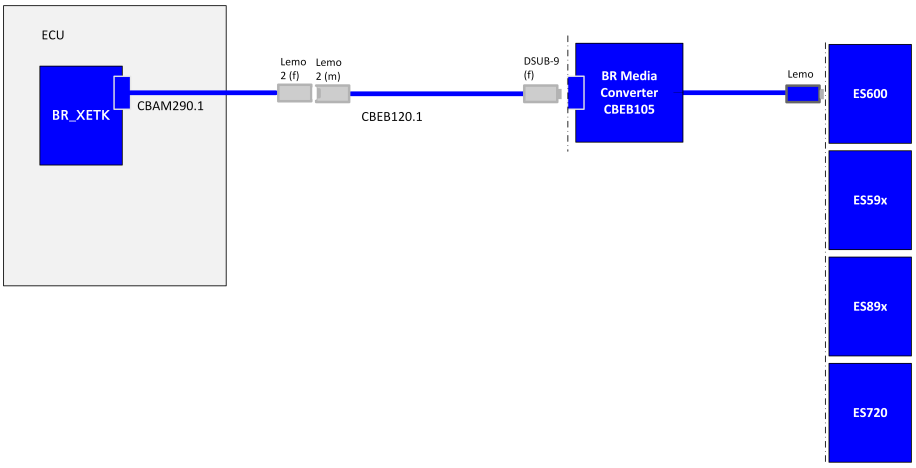


Fig. 5-5 BR_XETK-S2.0 connected to CBEB105.1 with ETAS cables

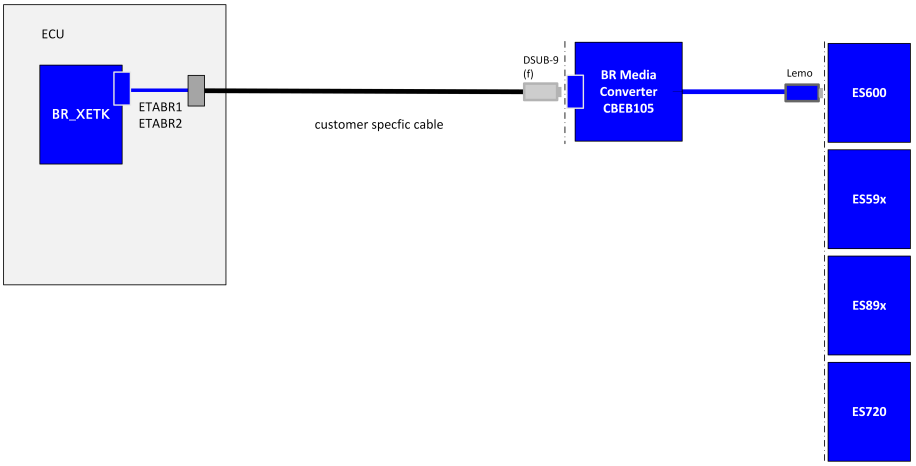


Fig. 5-6 BR_XETK-S2.0 connected to CBEB105.1 with customer specific cable

5.2.6 ES88x ECU and Bus Interface Module

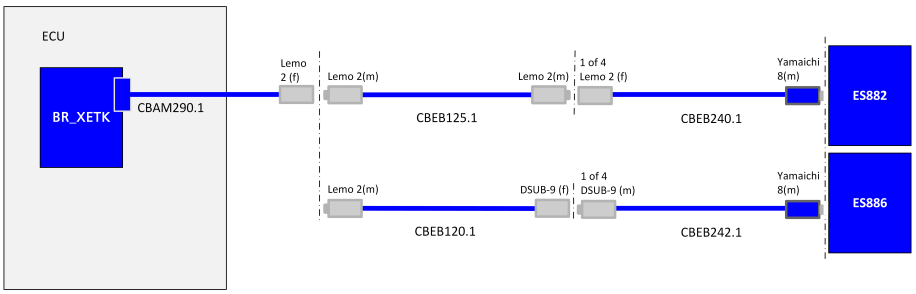


Fig. 5-7 BR_XETK-S2.0 connected to ES88x ECU and Bus Interface Module with ETAS cables

5.2.7 Power Supply

The BR_XETK-S2.0 needs a permanent power supply (refer chapter “Power Supply” on page 19). Refer to figures Fig. 5-8, Fig. 5-9, or Fig. 5-10 for recommendations on permanent power supply connection."Permanent Power Supply inside ECU available

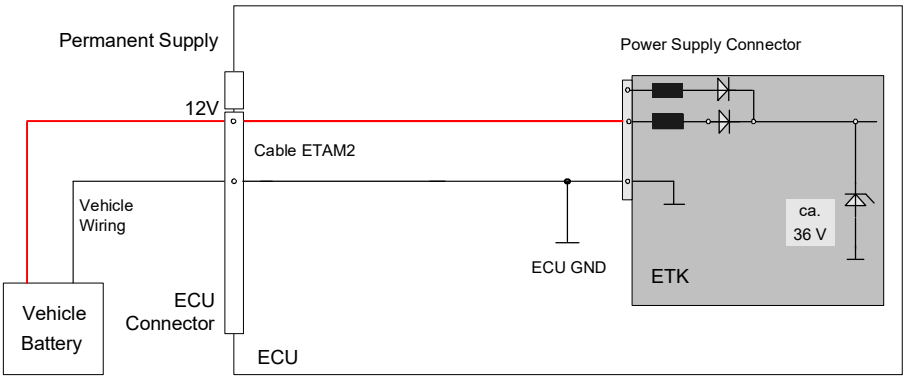


Fig. 5-8 Permanent Power Supply inside ECU available

Permanent Power Supply inside ECU not available

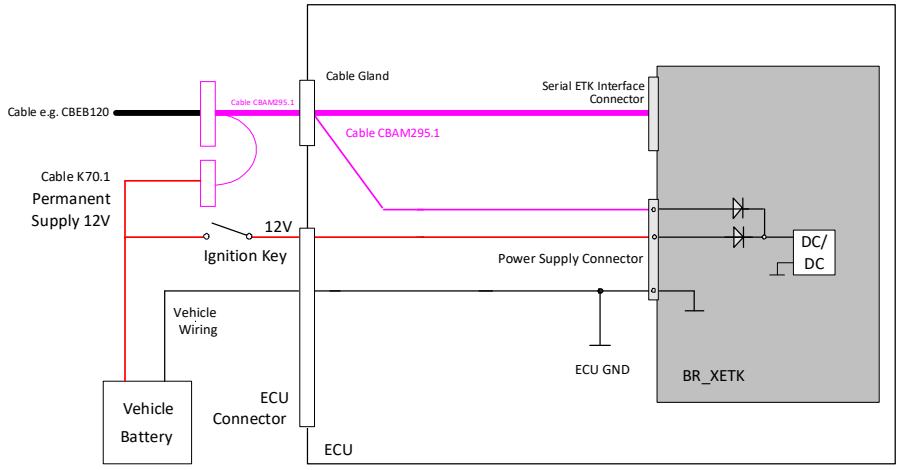


Fig. 5-9 Permanent Power Supply inside ECU not available

Isolated Power Supply inside ECU

The BR_XETK-S2.0 does not require a galvanically isolated power supply. For special applications ETAS offers the isolated power supply ETP2.

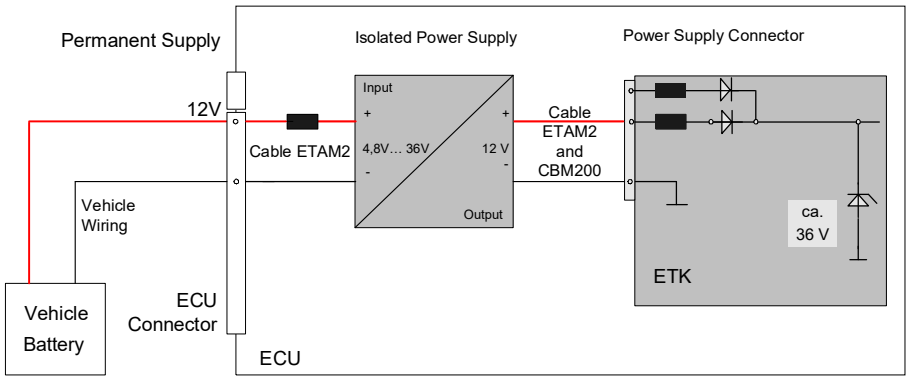


Fig. 5-10 Isolated Power Supply inside ECU

6 XETK Configuration

The "XETK Configuration" chapter describes the BR_XETK-S2.0 hardware configuration.

6.1 Overview

As already mentioned in previous chapters, some project-specific adjustments are necessary. Configuration data is stored permanently in a serial Flash.

Generating a valid configuration data set is supported by the "(X)ETK Configuration Tool" (XCT Tool). The XCT Tool contains information on all available XETKs. The user is supported through a graphical interface.

The configuration is done in two steps:

A Generation of the special address offset for the emulation and measurement data memory.

The location of data areas, measured data output areas, trigger segment addresses etc. are familiar to the ECU software developer, or can be generated automatically. If an ECU description database (ASAP, ...) with the corresponding input exists, these inputs can be downloaded from this database. If necessary, a plausibility check is performed.

B Connection of the XETK to the ECU.

The ECU hardware developer defines the connection of the XETK to the ECU. The corresponding signals usually have to be adjusted for each microcontroller. All inputs are checked for plausibility, to make sure that a valid configuration is generated.

The "(X)ETK Configuration Tool" can create the following output:

A Direct XETK configuration

B Storage of the configuration in a data file

C The corresponding ASAP2 input

The most important outputs are the entries for the ASAP2 file. All A2L definitions necessary for configuring an ETK will be created. These are:

- Overlay Region definitions
- Memory Segment definitions
- XETK configuration features
- Raster definitions

If these parameters are entered correctly in the corresponding ECU description file, it guarantees that every time the calibration system is started, the XETK is checked for the appropriate configuration. If necessary, the XETK will be configured appropriately to the corresponding project.

6.2 Configuration Parameter

The XCT Tool provides support concerning hardware configuration parameters and their possible values.

They are described for the different (X)ETK types in the help document of the "(X)ETK Configuration Tool".

Starting the "XCT Tool" help

- Start the XCT Tool.

  The main window of the XCT tool opens.
- Select in the menu bar ? → **Contents**.

  The XCT Tool help window opens.
- Choose **Reference to User Interface** → **(X)ETK Hardware Configuration Parameters**.
- Choose the topic **BR_XETK-S2.0**.

  The topic **BR_XETK-S2.0** contains information about the BR_XETK-S2.0 hardware configuration parameters and their possible values.

7 Technical Data

This chapter contains information about following topics:

7.1 System Requirements

7.1.1 Compatible Hardware

- ES882.1 ECU Interface Module
- ES886.x ECU Interface Module
- CBEB100.1 Media Converter
- ES16x Media Converter for Gigabit Automotive Ethernet

7.1.2 PC with one Ethernet interface

A PC with one open Ethernet interface (1 Gbit/s or 100 Mbit/s, full duplex) with RJ45 connection is required. Ethernet interfaces that are implemented with an additional network card in the PC must feature a 32-bit data bus.

NOTE

Half Duplex mode and Half Duplex Ethernet interfaces are not supported.

Requirement to ensure successful initialization of the module

NOTE

It is imperative you disable the function which automatically switches to power-saving mode on your PC network adapter when there is no data traffic on the Ethernet interface!

To deactivate the power saving mode

Choose in Windows System Control Center / Device Manager / Network Adapter the used network adapter by double-click. Deactivate the "Allow the computer to turn off this device to save power" option in the "Power Management" register. Confirm your configuration.

The manufacturers of network adapter have different names for this function.

Example:

- "Link down Power saving"
- "Allow the computer to turn off this device to save power".

7.1.3 Software Support

You need following software versions to support the BR_XETK-S2.0:

Use case: Measurement & Calibration, ECU Flash Programming

Microcontroller	INCA	INCA-MCE	HSP	ETK Tools
MPC5744K(-ED), SPC/EMU574K72	V7.1.7	V2.0	V10.7.0	V4.0.3
MPC5746M(-ED), SPC/EMU57EM80	V7.1.7	V2.0	V10.7.0	V4.0.3
MPC5777A(-ED), SPC/EMU57HM90xy	V7.1.7	V2.0	V10.7.0	V4.0.3
MPC5746R(-ED)	V7.1.7	V2.0	V10.7.0	V4.0.3
SPC/EMU58NE84	V7.1.7	V2.0	V10.9.0	V4.0.5
SPC/EMU58NN84	V7.2.2	V2.0	V11.2.0	V4.1.3
MPC5746C	V7.2.6	V2.0	V11.6.0	V4.1.7
SPC58xG	V7.2.13	V2.0	V11.13.0	V4.1.14

Use case: Rapid Prototyping

Microcontroller	INTECRIO	ASCET	HSP	Method
MPC5744K (-ED), SPC/EMU574K72	V4.6	V6.4	V10.11	SBB V2.1
	V4.5	V6.3	V10.7	HBB (DISTAB13)
MPC5746M (-ED), SPC/EMU57EM80	V4.6	V6.4	V10.11	SBB V2.1
	V4.5	V6.3	V10.7	HBB (DISTAB13)
MPC5777M (-ED), SPC/EMU57HM90xy	V4.6	V6.4	V10.11	SBB V2.1
	V4.5	V6.3	V10.7	HBB (DISTAB13)
MPC5746R (-ED)	V4.6	V6.4	V10.11	SBB V2.1
	V4.5	V6.3	V10.7	HBB (DISTAB13)
SPC/EMU58NE84	V4.6	V6.4	V10.11	SBB V2.1
	V4.5	V6.3	V10.9	HBB (DISTAB13)
SPC/EMU58NN84	V4.6	V6.4	V11.2	SBB V2.1
	V4.5	V6.3	V11.2	HBB (DISTAB13)
MPC5746C	V4.6	V6.4	V11.6	SBB V2.1
	V4.5	V6.3	V11.6	HBB (DISTAB13)
SPC58xG	V4.6	V6.4	V11.13	SBB V2.1
	V4.5	V6.3	V11.13	HBB (DISTAB13)

Operating the BR_XETK-S2.0 with older software versions is not possible.

MPC57xx: Freescale microcontroller device

EMU57xx: STMicroelectronics microcontroller device The configuration instructions for the BR_XETK-S2.0 under INCA and HSP are contained in the relevant software documentation.

7.2 Data Emulation and Measurement Memory

7.2.1 Data Emulation Memory and Microcontroller Support

The BR_XETK-S2.0 uses a portion of or up to the entire size of the ED RAM, to emulate data in internal flash. The following table lists the supported microcontrollers, the size of the ED RAM, and states if the ED RAM is capable of being powered using a standby supply.

Microcontroller	Max. ED RAM	Standby powered
MPC5744K (-ED)	1 Mbyte (32 x 32 KByte)	Yes
EMU574K72xy	1 Mbyte (32 x 32 KByte)	Yes
MPC5746M (-ED)	1 Mbyte (32 x 32 KByte)	Yes
EMU57EM80xy	1 Mbyte (32 x 32 KByte)	Yes
MPC5777M (-ED)	2 Mbyte (32 x 64 KByte)	Yes
EMU57HM90xy	2 Mbyte (32 x 64 KByte)	Yes
MPC5746R(-ED)	1 Mbyte (32 x 32 KByte)	Yes
EMU58NE84	2 Mbyte (32 x 64 KByte)	Yes
EMU58NN84	2 Mbyte (32 x 64 KByte)	Yes

7.2.2 Measurement Data Memory

Item	Characteristics
Location	Typically located within the emulation memory when using DISTAB13 or DISTAB17 hooks. Measurement data memory can be located in internal RAM if the entire ED RAM is needed for calibration.

7.3 Configuration

Item	Characteristics
Configuration	Project-specific configuration for - different microcontrollers or - memory configurations stored in EEPROM
Update	Logic devices updated using HSP software

7.4 Automotive Ethernet Interface

Item	Characteristics
Connection	Automotive Ethernet 100BASE-T1
Protocol	XCP on TCP/IP or UDP/IP
IP address	Dynamic (standard, for INCA) or static (e.g. for Rapid Prototyping) by using the XETK Configuration Tool (default IP address: 192.168.40.16)
Cable length	max. 15 m
Ethernet Interface	DC decoupling

NOTE

The Automotive Ethernet interface is not compatible with the standard Ethernet interfaces of ETAS modules. A CBEB10x.1 Media Converter or an ES88x ECU Interface Module is needed to connect the BR_XETK-S2.0 to the PC.

NOTE

To ensure successful initialization of the network card of your PC, refer to chapter 7.1.2 on page 34

7.5 Environmental Conditions

Item	Characteristics
Temperature range (operation)	- 40 °C to +110 °C - 40 °F to +230 °F

7.6 Test Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Reset delay 1 [1)]	t_{Reset1}	U_{Batt} = 12 V, ECU_VDDP = 0 V ↑ 3.3 V/5.0 V without transferring FPGA	29		40	ms
Reset delay 2 [2)]	t_{Reset2}	U_{Batt} = 0 V ↑ 12 V transfer FPGA	200		340	ms

[1)] Delay of ECU reset through the BR_XETK-S2.0 without transferring the FPGA (U_{Batt} present, VDDP will be switched on)

[2)] max. delay of ECU reset through the BR_XETK-S2.0 (U_{Batt} and VDDP will be switched on)

7.7 Power Supply

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Permanent power supply (car battery)	U_{Batt}	Vehicle usage [1)]	6.0 [all values ±0%]	12	36	V
Cranking Voltage	U_{Batt}	< 3 seconds	3			
Standby current [2)]	I_{STBY}	U_{Batt} = 12 V; ECU off; no load from ECU; T = 20 °C	15	30	40	mA
Operating current	I_{Batt}	U_{Batt} = 12 V; no load from ECU; T = 20 °C	70	115	250	mA
Power consumption	P_{Batt}	U_{Batt} = 12 V; I = 0 mA at pin ECU_S-BRAM; T = 20 °C		1.38		W
Power consumption	P_{Batt}	U_{Batt} = 12 V; I = 500 mA at pin VDDSTBY [1.25 V]; I = 80 mA at Pin VDDPSTBY; T = 20 °C		2.76		W

1): The ETK may be used only with central load dump protection.
24 V vehicles require U_{Batt} disturbing pulse reduction to 12 V vehicle system.
12 V vehicles don't require special disturbing pulse reductions.
2) if I = 0 mA at pin VDDSTBY_SENSE

NOTE

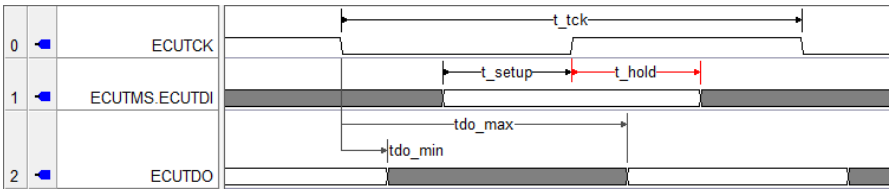
The BR_XETK-S2.0 will accept permanent power supply voltage dips down to 3 V (for additional details of 3 V low voltage operation, see ISO standard 16750).

7.8 JTAG Timing Characteristics

The following diagrams show the timings the BR_XETK-S2.0 can process.

> **NOTE**
>
> JTAG timing parameters in this chapter refer to the JTAG interface (CON2) of the BR_XETK-S2.0. The JTAG wiring to the ECU (ETAM3) must be taken into account additionally.
> All timings are measured at a reference level of 1.5 V. Output signals are measured with 20 pF to ground and 50 Ω to 1.5 V.

7.8.1 JTAG Timing Diagram



7.8.2 JTAG Timing Parameters

Parameter	Symbol	Value [ns]	Comment
JTAG Clock Period (ETK --> Target)	t_{tck}	50	20 MHz Nexus JTAG Clock Frequency
		25	40 MHz Nexus JTAG Clock Frequency
		20	50 MHz Nexus JTAG Clock Frequency
TMS/TDI Set-Up Time (ETK --> Target)	t_{setup}	7 (min.)	Minimum 5 ns required for microcontroller
TMS/TDI Hold Time (ETK --> Target)	t_{hold}	7 (min.)	Minimum 5 ns required for microcontroller
TDO clock-to-out time (Target --> ETK)	t_{do_min}	2.25 (min.)	Minimum 2.25 ns required by microcontroller specification
	t_{do_max}	16 (max)	Maximum 16 ns by microcontroller specification

7.9 Electrical Characteristics

7.9.1 ECU Interface Characteristics

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
ECU Standby RAM Output Voltage (1.25 V selected)	VDDSTBY	max. 500 mA load	1.19	1.25	1.31	V
ECU Standby RAM Output Voltage (1.30 V selected)	VDDSTBY	max. 500 mA load	1.23	1.3	1.34	V
VDDPSTBY Output Voltage	VDDPSTBY	max. 80 mA load	3.14	3.3	3.46	V
Cal_Wakeup Output Voltage	CAL_WAKEUP	Ubatt = 6 V to 36 V, load = 0 to 50 mA	Ubatt - 1 V		Ubatt	V
ECU Power Supply Supervision Voltage (3.3 V selected)	VDDP	ECU on	2.48	2.58	2.68	V
		ECU off	2.33	2.43	2.53	V
	IDDP	VDDP = 3.3 V			200	µA
ECU Power Supply Supervision Voltage (5.0 V selected)	VDDP	ECU on	2.98	3.08	3.18	V
		ECU off	2.83	2,93	3,03	V
	IDDP	VDDP = 5.0 V			300	µA

Parameter	Symbol	Condition [1]	Min	Typ	Max	Unit
ECU Standby RAM Supervision Voltage (1.25 V selected)	VDDSTBY / VDDSTBY_-SENSE	VDDSTBY ↑	1.02	1.12	1.22	V
		VDDSTBY ↓	1	1.1	1.2	V
	IDDSTBY	VDDSTBY = 1.25 V			73	µA

[1]: VDDP ↑: ECU Power Supply off → ECU Power Supply on
VDDP ↓: ECU Power Supply on → ECU Power Supply off
VDDSTBY ↑: ECU Standby RAM Power off → ECU Standby RAM Power on
VDDSTBY ↓: ECU Standby RAM Power on → ECU Standby RAM Power off
[2]: Current drawn from XETK VDDSTBY supply must not exceed 600 mA

7.9.2 ECU Interface Connector CON2

Signal	Pin Type	V_{OL} (max) [V]	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by XETK (typ) [pF] [1]
TCK	XO [2]	0.7	2.3	3.3	-	-	-	+3340/ +2360	15
TMS	XO [2]	0.7	2.3	3.3	-	-	-	+3340/ +2360	15
TDO	I	-	-	-	0.8	2	5.5	+40/ -40	15
/TRST; TDI	XO [2]	0.7	2.3	3.3	-	-	-	+20/ -20	10
/ESR0	IXOD [3]	0.7	-	-	0.8	2	5.5	+25/ -20	22
/PORST	IXOD [3]	0.7	-	-	0.8	2	5.5	+25/ -20	22
WDGDIS	XO [2]	0.7	2.3	3.3	-	-	-	+20/ -20	10

[1] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2] I_{Dmax} = 12 mA
[3] Open Drain FET; I_{Dmax} = 0.2 A
I: Input
X: Tristate
O: Output
OD: Open Drain

7.10 Pin Assignment

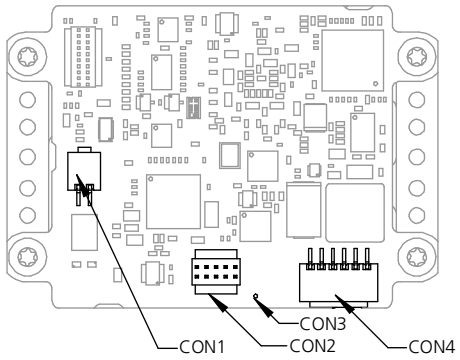


Fig. 7-1 BR_XETK-S2.0 Connectors

7.10.1 Automotive Interface Connector CON1

Pin	Cable Color	Signal	Comment
1	White	BR-	Automotive Ethernet Signal BR-
2	Violet	BR+	Automotive Ethernet Signal BR+

7.10.2 ECU Interface Connector CON2

Pin	Signal	Direction	Comment
1	TCK	Output	JTAG Signal
2	GND	Power	Signal Ground
3	/TRST	Output	JTAG Signal
4	TDO	Input	JTAG Signal
5	WDGDIS	Output	Watchdog disable Signal
6	TMS	Output	JTAG Signal
7	TDI	Output	JTAG Signal
8	VDDP (Sense)	Input	Sense for Switched power supply of ECU (ignition)
9	/ESR0	Bidir	ECU Reset signal (open drain) for Reset assertion and supervision
10	/PORST	Bidir	ECU Power On Reset signal (open drain) for Reset assertion and supervision

7.10.3 VDDSTBY_SENSE Connector CON3 (Soldering Pad)

Pin	Signal	Direction	Comment
1	VDDSTBY_-SENSE	Input	ECU EDRAM Sense Pin

7.10.4 Power Supply Connector CON4

Pin	Signal	Direction	Comment
1	VDDPSTBY (3.3 V supply)	Output	Permanent power supply of ECU JTAG Interface, 3.3 V
2	VDDSTBY (1.25 V/ 1.30 V supply)	Output	Permanent power supply of ECU EDRAM, 1.25 V/ 1.30 V
3	GND	Input	Power GND
4	CalWakeup	Output	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Ubatt2	Input	Vehicle battery
6	Ubatt1	Input	Vehicle Battery

7.11 Mechanical Dimensions

Top View

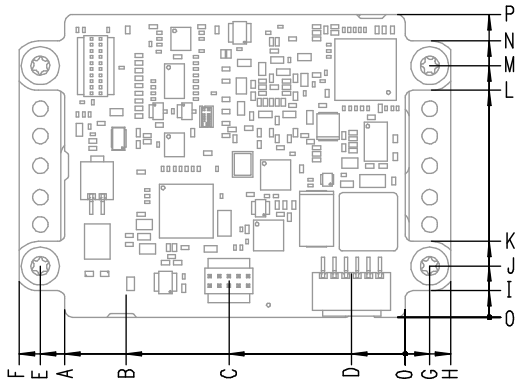


Fig. 7-2 BR_XETK-S2.0 Dimensions - Top View (1)

Item	**Dimension** [mm]	Tolerance [mm]	**Dimension** [in]	Tolerance [in]
A	45.00	+/- 0.20	1.772	+/- 0.008
B	36.90	+/- 0.20	1.453	+/- 0.008
C	23.30	+/- 0.20	0.917	+/- 0.008
D	7.10	+/- 0.20	0.280	+/- 0.008
E	48.25	+/- 0.20	1.900	+/- 0.008
F	51.00	+/- 0.20	2.008	+/- 0.008
G	3.25	+/- 0.10	0.128	+/- 0.004
H	6.00	+/- 0.20	0.236	+/- 0.008
I	3.5	+/- 0.10	0.138	+/- 0.004
J	6.75	+/- 0.20	0.266	+/- 0.008
K	10.00	+/- 0.20	0.394	+/- 0.008
L	30.00	+/- 0.20	1.181	+/- 0.008
M	33.25	+/- 0.20	1.309	+/- 0.008
N	36.50	+/- 0.20	1.437	+/- 0.008
P	40.00	+/- 0.20	1.575	+/- 0.008

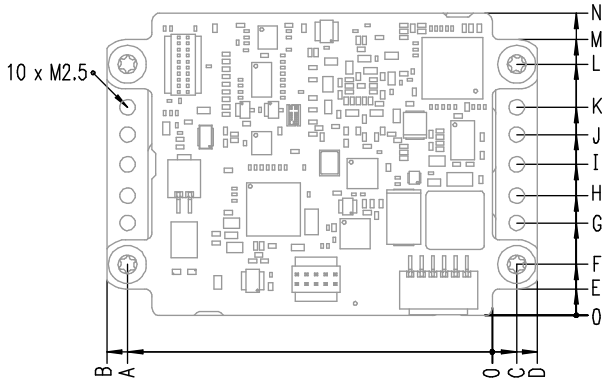


Fig. 7-3 BR_XETK-S2.0 Dimensions - Top View (2)

Item	Dimension [mm]	Tolerance [mm]	Dimension [in]	Tolerance [in]
A	48.25	+/- 0.20	1.900	+/- 0.008
B	51.00	+/- 0.20	2.008	+/- 0.008
C	3.25	+/- 0.10	0.128	+/- 0.004
D	6.00	+/- 0.20	0.236	+/- 0.008
E	3.5	+/- 0.10	1.900	+/- 0.004
F	6.75	+/- 0.20	0.266	+/- 0.008
G	12.25	+/- 0.20	0.482	+/- 0.008
H	15.85	+/- 0.20	0.624	+/- 0.008
I	20.0	+/- 0.20	0.787	+/- 0.008
J	23.95	+/- 0.20	0.943	+/- 0.008
K	27.55	+/- 0.20	1.085	+/- 0.008
L	33.25	+/- 0.20	1.309	+/- 0.008
M	36.50	+/- 0.20	1.437	+/- 0.008
N	40.00	+/- 0.20	1.575	+/- 0.008

Side View

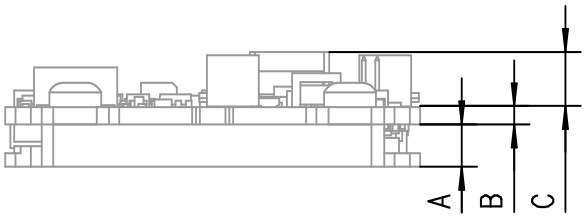


Fig. 7-4 BR_XETK-S2.0 Dimensions - Side View

Item	**Dimension** [mm]	Tolerance [mm]	**Dimension** [in]	Tolerance [in]
A	3.70	+/- 0.10	0.146	+/- 0.004
B	1.50	+/- 0.16	0.059	+/- 0.006
C	4.80	+0.0/- 0.2	0.189	+0.000/- 0.008

8 Cables and Accessories

This chapter contains information about the following cables and accessories:

8.1 Requirements for failsafe Operation

NOTE

We recommend to use ETAS cables or any other cables certified by the standards for the application. Adhere to the maximum permissible cable lengths!

NOTE

Application-specific cables are available from ETAS. Please contact your ETAS contact partner or e-mail sales.de@etas.com.

CAUTION

See chapter "Requirements for failsafe Automotive Ethernet Operation" on page 27 for details on wiring the Automotive Ethernet interface cables.

8.2 Automotive Ethernet Interface Cable

8.2.1 ETABR1 Cable

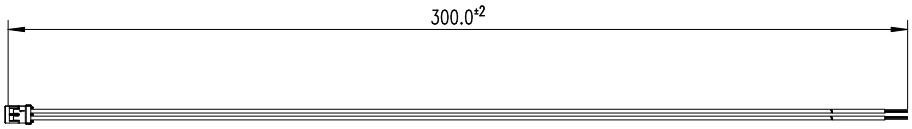


Fig. 8-1 ETABR1 Cable

Usage

The ETABR1 cable is a 100 Mbit/s Automotive Ethernet adapter cable with an 2-pin MOLEX connector (BR_XETK side) and open wires (ECU side).

CAUTION

For failsafe operation of the Automotive Ethernet interface twist the ETA-BR1 cable 5 to 10 times at each 10 cm.

Pin Assignment

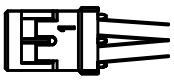


Fig. 8-2 ETABR1 Connector

Connector in Fig. 8-2		Signal
Pin	Color	
1	White	Automotive Ethernet signal AE-
2	Violet	Automotive Ethernet signal AE+

Order Information

Product	Length	Order Number
ETABR1 Automotive Ethernet Interface Cable, MOLEX – open wire (2fc-2c), 0m3	0.3 m	F-00K-109-771

8.2.2 ETABR2 Cable

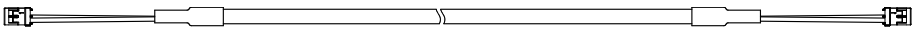


Fig. 8-3 ETABR2 Cable

Usage

The ETABR2 cable is a 100 Mbit/s Automotive Ethernet adapter cable with an 2 pin MOLEX connector (BR_XETK side) and an 2 pin MOLEX connector (ECU side).

The ETABR2 cable requires on the ECU side an 2 pin MOLEX vertical connector (87437-0243) or an 2 pin MOLEX right angle connector (87438-0243).

Mechanical Dimensions

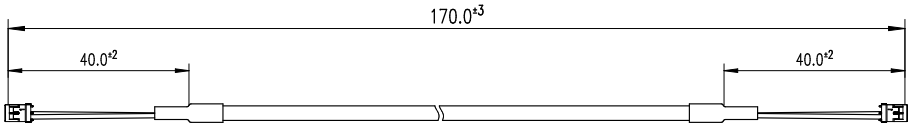


Fig. 8-4 ETABR2 Dimensions

Pin Assignment

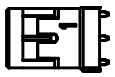


Fig. 8-5 ETABR2 Connector

Connector in Fig. 8-5		Signal
Pin	Color	
1	White	Automotive Ethernet signal AE-
2	Green	Automotive Ethernet signal AE+

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +105 °C

Order Information

Product	Length	Order Number
ETABR2 Automotive Ethernet Interface Cable, MOLEX – MOLEX (2fc-2fc), 0m2	0.17 m	F-00K-111-118

8.2.3 ETABR3 Cable

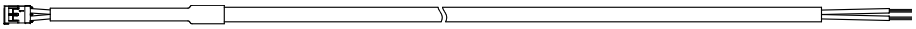


Fig. 8-6 ETABR3 Cable

Usage

The ETABR3 cable is a 100 Mbit/s Automotive Ethernet adapter cable with an 2 pin MOLEX connector (BR_XETK side) and open wires (ECU side).

Mechanical Dimensions

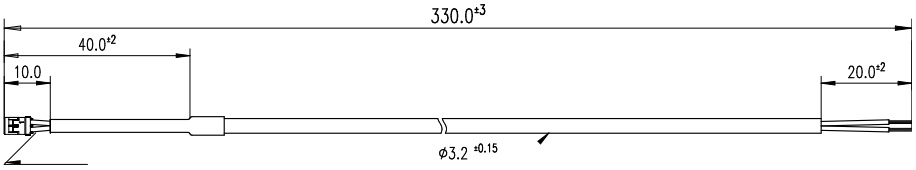


Fig. 8-7 ETABR3 Dimensions

Pin Assignment

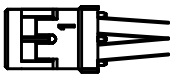


Fig. 8-8 ETABR3 Connector

Connector in Fig. 8-8		Signal
Pin	Color	
1	White	Automotive Ethernet signal AE-
2	Green	Automotive Ethernet signal AE+

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +105 °C

Order Information

Product	Length	Order Number
ETABR3 Automotive Ethernet Interface Cable, MOLEX – open wire (2fc-2c), 0m33	0.33 m	F-00K-111-964

8.2.4 CBAM290 Cable

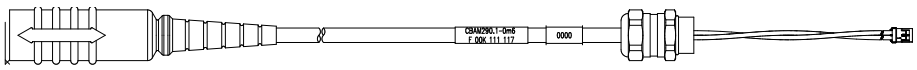


Fig. 8-9 CBAM290.1 Cable

Usage

The CBAM290.1 cable is a 100 Mbit/s Automotive Ethernet cable adapter for BR_XETKs. The cable is passed through a M10 screw connection, the shield is connected to the screw.

Mechanical Dimension

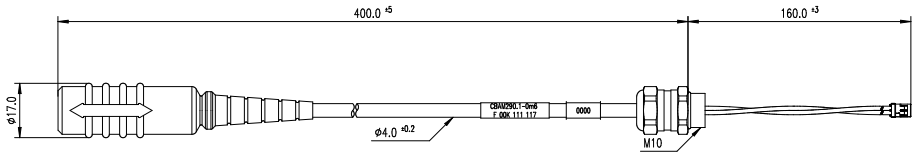


Fig. 8-10 CBAM290.1 Dimension

Tightness

Condition	Degree of Protection
M10 screwing	IP67
CON1 (plugged)	IP65

Mounting

For thin walled housings, use a through boring with 10.2 mm in the housing and mount the cable with a nut. Cable delivery not includes the nut. The nut must be ordered separately by AGRO (AGRO order number 8000.10.1). For wall thickness more than 2.5 mm cut a thread into the housing.

The minimum bending radius for the cable is 16 mm.

Pin Assignment

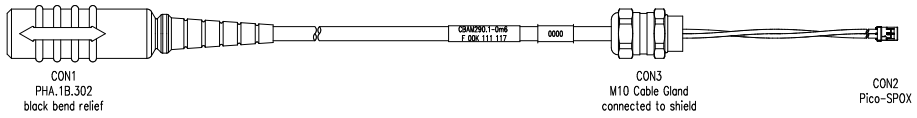


Fig. 8-11 CBAM290.1 Connectors

Connector in Fig. 8-11		Target
No.	Color	
CON1	Black	Cable to Media Converter, e.g. CBEB120.1
CON2	White	BR_XETK interface connector
CON3	-	ECU housing shield

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +105 °C

Order Information

Product	Length	Order Number
CBAM290.1 Automotive Ethernet ECU Adapter Cable, Lemo 1B PHA - MOLEX (2fc-2fc), 0m60	0.60 m	F-00K-111-117

8.2.5 CBAM295 Cable

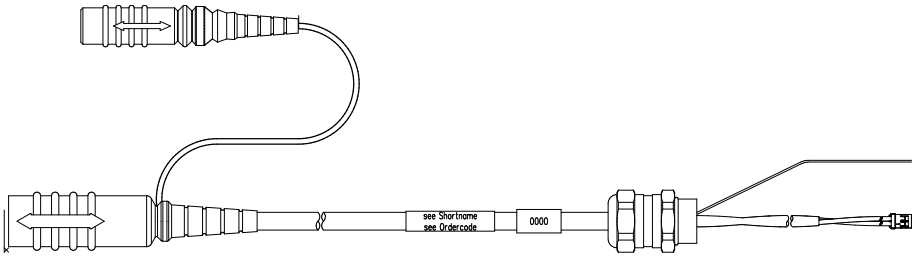


Fig. 8-12 CBAM295 Cable

Usage

BR_XETK ECU adapter and power supply cable for 100 Mbit/s Automotive Ethernet and BR_XETKs with external power supply. Usable for ECUs without permanent power supply inside.

Mechanical Dimension

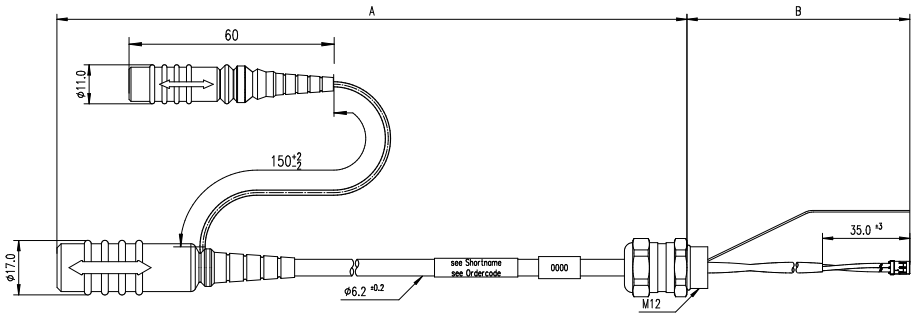


Fig. 8-13 CBAM295 Dimension

Product	Length (see Fig. 8-13)	
	A [mm]	B [mm]
CBAM295.1-0m6	400	160
CBAM295.1-1m8	1500	250

Tightness

Condition	Degree of Protection
M12 screwing	IP67
CON1, CON4 (plugged)	IP65

Mounting

The CBAM295.1 cable is passed through a pre-assembled M12 screw connection. The shield is connected to the screw. For thin walled housings, use a through boring with 12.2 mm in the housing and mount the cable with a nut. Cable delivery not includes the nut. The nut must be ordered separately by AGRO (AGRO order number 8000.12). For wall thickness more than 2.5 mm cut a thread into the housing.

The minimum bending radius for the cable is 20 mm.

Pin Assignment

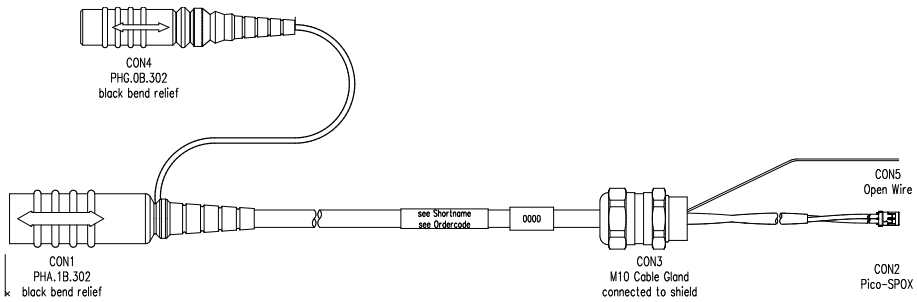


Fig. 8-14 CBAM295 Connectors

Connector in Fig. 8-14		Target
No.	Color	
CON1	Black	Cable to Media Converter, e.g. CBEB120.1
CON2	White	BR_XETK interface connector
CON3	-	ECU housing shield
CON4	Black	Cable to connect permanent power supply, e.g. KA70
CON5	Red wire	BR_XETK UBATT pin

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +105 °C

Order Information

Product	Length	Order Number
CBAM295.1-0m6 BR_XETK ECU Adapter and Power Supply Cable, pre-assembled into M12 screwing, shield on ECU housing, Lemo 1B PHA - MOLEX (2fc-2fc) / Lemo 1B PHG - open wire (2fc-1c), 0m6	0.60 m	F-00K-111-656
CBAM295.1-1m8 BR_XETK ECU Adapter and Power Supply Cable, pre-assembled into M12 screwing, shield on ECU housing, Lemo 1B PHA - MOLEX (2fc-2fc) / Lemo 1B PHG - open wire (2fc-1c), 1m8	1.80 m	F-00K-111-657

8.2.6 CBEB120 Cable

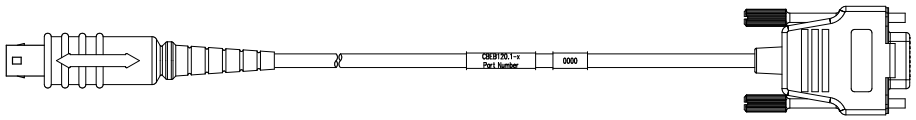


Fig. 8-15 Automotive Ethernet Cable CBEB120.1

Usage

The CBEB120.1 cable is a 100 Mbit/s Automotive Ethernet cable to connect a CBEB105.1 Media Converter with a BR_XETK cable adapter (e.g. CBAM290.1).

Order Information

Product	Length	Order Number
CBEB120.1-3 100 Mbit/s Automotive Ethernet Interface Cable for CBEB105, Lemo 1B FGA - DSUB (2mc-9fc), 3 m	3 m	F-00K-111-111
CBEB120.1-5 100 Mbit/s Automotive Ethernet Interface Cable for CBEB105, Lemo 1B FGA - DSUB (2mc-9fc), 5 m	5 m	F-00K-111-112

8.2.7 CBEB121 Cable

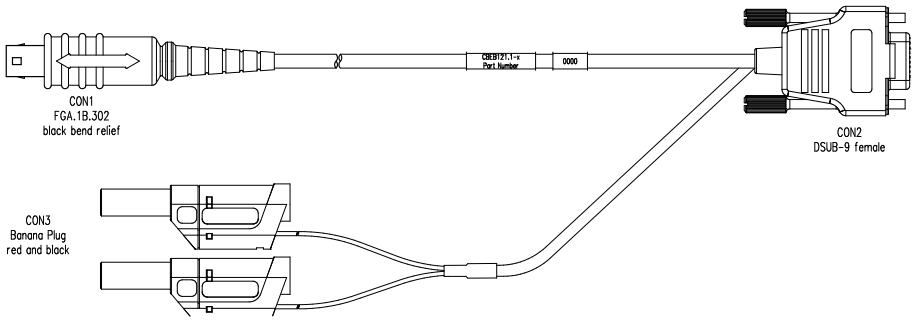


Fig. 8-16 Automotive Ethernet Cable CBEB121.1

Usage

The CBEB121.1 cable is a 100 Mbit/s Automotive Ethernet cable to connect a CBEB100.1 Media Converter with a BR_XETK cable adapter (e.g. CBAM290.1).

Pin Assignment

Connector	Target
CON1	BR_XETK cable adapter
CON2	CBEB100.1 Media Converter
CON3	Power supply

Mounting

Minimum cable bending radius: 16 mm

Order Information

Product	Length	Order Number
CBEB121.1-3 100 Mbit/s Automotive Ethernet Interface Cable plus Power for CBEB100, Lemo 1B FGA - DSUB plus banana connector (2mc-9fc), 3 m	3 m	F-00K-111-113
CBEB121.1-5 100 Mbit/s Automotive Ethernet Interface Cable plus Power for CBEB100, Lemo 1B FGA - DSUB plus banana connector (2mc-9fc), 5 m	5 m	F-00K-111-114

8.2.8 CBEB125 Cable

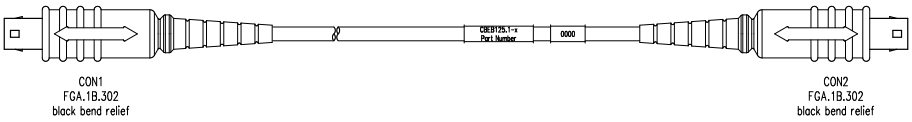


Fig. 8-17 Automotive Ethernet Cable CBEB125.1

Usage

The CBEB125.1 cable is a 100 Mbit/s Automotive Ethernet cable (1:1) for connecting an BR_XETK to the ES88x module.

Order Information

Product	Length	Order Number
CBEB125.1 100 Mbit/s Automotive Ethernet Interface Cable for ES88x, Lemo 1B FGA - Lemo 1B FGA (2mc-2mc), 3 m	3 m	F-00K-111-115
CBEB125.1 100 Mbit/s Automotive Ethernet Interface Cable for ES88x, Lemo 1B FGA - Lemo 1B FGA (2mc-2mc), 5 m	5 m	F-00K-111-116

8.2.9 CBEB240 Cable

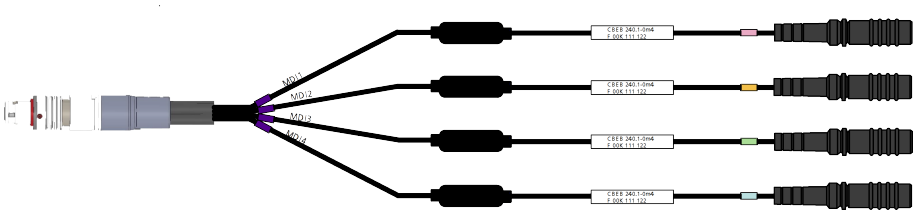


Fig. 8-18CBEB240.1 Cable

Usage

Cable for connecting the Automotive Ethernet interface (AE) of an ES800 module to BR_XETKs, ECUs with Automotive Ethernet interfaces or Ethernet-based vehicle buses.

Assignment of the Automotive Ethernet Channels to the Cable Sections

The CBEB240.1 cable consists of four identical cable sections [n], each mapped to an Automotive Ethernet channel [n] of the Automotive Ethernet interface (AE) and wired in accordance with the same pattern. Each of the cable section is equipped with a LEMO connector.

Labeling of the Automotive Ethernet Channels and the Cable Sections

The cable sections are labeled n=1 to n=4 and are also marked with the color of the LEDs corresponding to the channels [n] at the AE connection of the module. The colors of the channels [n] at the AE connection of the module and the cable sections are identical.

ES800 module	Color	Automotive Ethernet channel	
"AE" LED	"AE" LED/cable	ES882.x	ES886.x
1	Purple	AE 1	AE 1
2	Orange	AE 2	AE 2
3	Green	AE 3	AE 3
4	Blue	-	AE 4

When using the CBEB240.1 cable at the AE interface of the module ES882.x (three Automotive Ethernet channels), three of the four cable sections are used in accordance with the assignment in the table.

Assignment of the Automotive Ethernet Signal to the LEMO Connectors

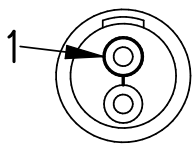


Fig. 8-19"AE" connection (one cable section)

The assignment of the connections of the LEMO connector of a cable section to the signals of an Automotive Ethernet channel [n] is represented in the table.

Pin	Signal	Meaning
1	AE [n]+	Automotive Ethernet, channel [n], BI_DA+
2	AE [n]-	Automotive Ethernet, channel [n], BI_DA-

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +85 °C/ -40 °F to +185 °F

Order Information

Product	Length	Order Number
CBEB240.1-0m4 Automotive Ethernet splitter cable 100 Mbit/s, Yamaichi YCP - 4x Lemo PHA 1B (8mc -4x 2fc), 0m4	0.4m	F-00K-111-122

8.2.10 CBEB242 Cable

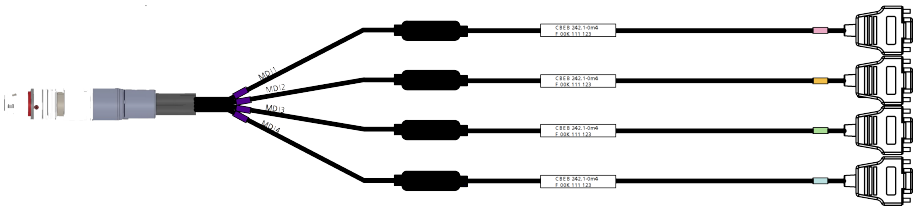


Fig. 8-20CBEB242.1 cable

Usage

Cable for connecting the Automotive Ethernet interface (AE) of an ES800 module to BR_XETKs.

> **NOTE**
>
> The CBEB242.1 cable is designed for directly connecting BR_XETKs. For other areas of application, ETAS recommends the CBEB240.1 Automotive Ethernet cable (see chapter 8.2.9 on page 60).

Assignment of the Automotive Ethernet Channels to the Cable Sections

The CBEB242.1 cable consists of four identical cable sections [n], each mapped to an Automotive Ethernet channel [n] of the Automotive Ethernet interface (AE) and wired in accordance with the same pattern. Each of the cable section is equipped with a DSUB9 connector.

Labeling of the Automotive Ethernet Channels and the Cable Sections

The cable sections are labeled [n]=1 to [n]=4 and are also marked with the color of the LEDs corresponding to the channels [n] at the AE connection of the module. The colors of the channels [n] at the AE connection of the module and the cable sections are identical.

ES800 module	Color	Automotive Ethernet channel	
"AE" LED	"AE" LED/cable	ES882.x	ES886.x
1	Purple	AE 1	AE 1
2	Orange	AE 2	AE 2
3	Green	AE 3	AE 3
4	Blue	-	AE 4

When using the CBEB242.1 cable at the AE interface of the module ES882.x (three Automotive Ethernet channels), three of the four cable harnesses are used in accordance with the assignment in the table.

Assignment of the Automotive Ethernet Signal to the DSUB9 Connectors

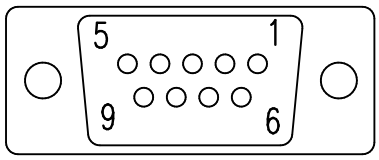


Fig. 8-21 "AE" connection (one cable section)

The assignment of the connections of the DSUB9 connector of a cable section to the signals of an Automotive Ethernet channel [n] is represented in the table.

Pin	Signal	Meaning
4	AE [n]+	Automotive Ethernet, channel [n], BI_DA+
5	AE [n]-	Automotive Ethernet, channel [n], BI_DA-

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +85 °C/ -40 °F to +185 °F

Order Information

Product	Length	Order Number
CBEB242.1-0m4 Automotive Ethernet splitter cable 100 Mbit/s, Yamaichi YCP - 4x Lemo PHA B (8mc - 4x 9fc), 0m4	0.4m	F-00K-111-123

8.3 ECU Interface Adapter

NOTE

See chapter 5.2 on page 27 for details on wiring the interface adapters.

8.3.1 ETAM2 ECU Adapter

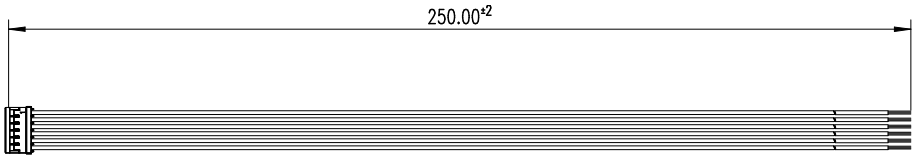


Fig. 8-22 FETK/ XETK - ECU Adapter ETAM2

Pin Assignment

Fig. 8-23 ETAM2 Connector

ECU Signals

Pin	Color	Signal	Description
1	Blue	VDDPSTBY (Supply)	Permanent power to supply ECU interface (optional)
2	Yellow	VDDSTBY (Supply)	Permanent power to supply ECU ED-RAM
3	Brown	GND	Power ground
4	Green	CAL_Wakeup	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Red	SGUBATT2	Car battery
6	Red	SGUBATT1	Car battery

Order Information

Product	Length	Order Number
ETAM2 XETK/FETK ECU Adapter, MOLEX - open wires (6fc - 6c), 0m25	0.25 m	F-00K-109-306

8.3.2 ETAM3 ECU Adapter

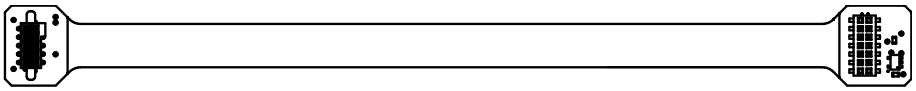


Fig. 8-24 ETAM3 ECU Adapter

Usage

The ETAM3 adapts a ECU with an 10 pin SAMTEC TFM-105 connector to an ETK. The ETABR3 cable requires on the ECU side an 10 pin SAMTEC connector (e.g. TFM-105-02-S-D-P).

Mechanical Dimensions

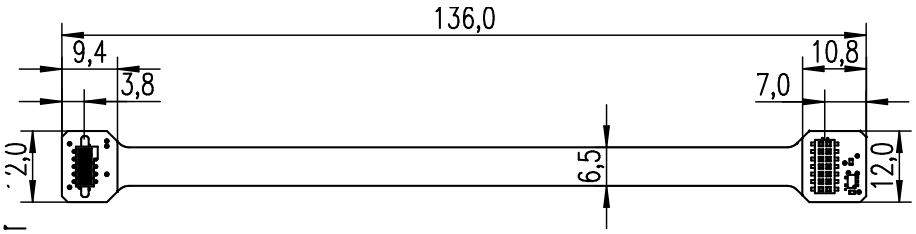


Fig. 8-25 ETAM3 Adapter (top view)

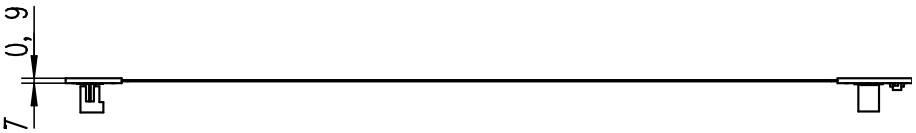


Fig. 8-26 ETAM3 Adapter (side view)

> **NOTE**
>
> Please note that the ETAM3 flex foil has an minimum bending radius of 3 mm.

Pin Assignment

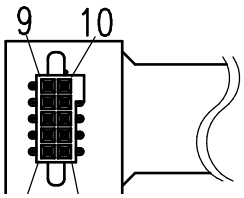


Fig. 8-27 ETAM3 Adapter (pin numbering)

ECU Signals

NOTE

LFAST mode is not possible with the ETAM3 adapter.

Pin	JTAG Mode	DAP Mode
1	GND	GND
2	TCK	DAP0
3	/TRST	/TRST
4	TDO	DAP2
5	TMS	DAP1
6	TDI	-
7	WDGDIS	WDGDIS
8	VDD (Sense)	VDD (Sense)
9	/RESETOUT	/RESETOUT
10	/PORESET	/PORESET

/TRST Signal Characteristics

A buffer in the /TRST line increases the signal-noise ratio in this line. It is supplied by the VDD(Sense) voltage.

/TRST buffer supply

Signal	Condition	VIHmin	VIHmax
VDD(Sense)	ECU on	3.0V	5.5V

/TRST output signal

Signal	Condition	VOHmin	VOHmax	VOLmax
/TRST	VDD(Sense) = 3 V, IOH = 4mA	2.34 V	VDD(Sense)	0.52 V
/TRST	VDD(Sense) = 4.5 V, IOH = 8mA	3.66 V	VDD(Sense)	0.52 V

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +110 °C

Order Information

Product	Length	Order Number
ETAM3 XETK/FETK ECU Adapter, SAMTEC FFSD - SAMTEC SFM (10fc - 10fc), 0m11	0.11 m	F-00K-109-673

8.3.3 ETAM5 ECU Adapter

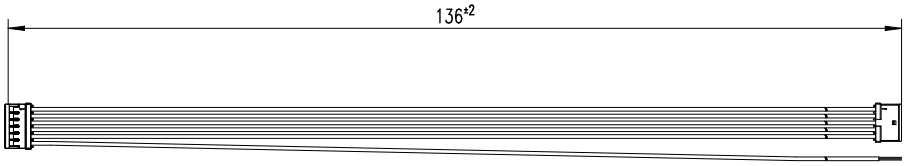


Fig. 8-28 FETK/ XETK - ECU Adapter ETAM5

Order Information

Product	Length	Order Number
ETAM5 FETK ECU Adapter, MOLEX - MOLEX (6fc - 5fc+1c), 0m136	0.136 m	F-00K-110-101

8.3.4 ETAM9 ECU Adapter

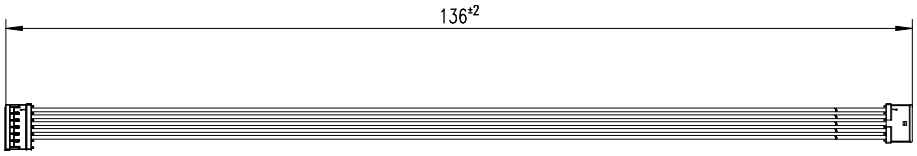


Fig. 8-29 FETK/ XETK - ECU Adapter ETAM9

Usage

The ETAM9 adapts the FETK/ XETK power signals (Molex 6 pin connector) to the ECU with an 5 pin Molex PicoSpox connector.

The ETAM9 cable requires on the ECU side an Vertical SMT Header connector [87437-0543] or an Right Angle SMT Header connector [87438-0543].

ECU Signals

Pin	Color	Signal	Description
1	Blue	VDDPSTBY (Supply)	Permanent power supply of ECU interface
2	Yellow	VDDSTBY (Supply)	Permanent power supply of ECU ED RAM
3	Brown	GND	Power ground
4	Green	Cal_Wakeup	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Red	SGUBATT1	Car battery
6	-	-	No Connect

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +110 °C

Order Information

Product	Length	Order Number
ETAM9 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 5fc), 0m136	0.136 m	F-00K-111-043

8.3.5 ETAM10 ECU Adapter

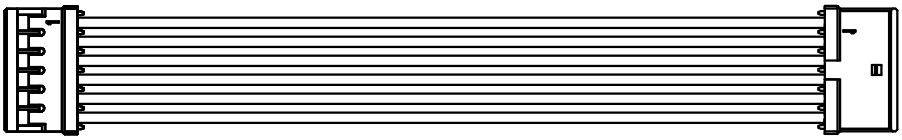


Fig. 8-30 FETK/ XETK - ECU Adapter ETAM10

MOLEX - MOLEX (6fc - 6fc) adapter cable for connecting an F/XETK to the ECU.

Usage

ETAM10 adapts the ETK power signals (Molex 6 pin connector) to an ECU with a 6 pin Molex PicoSpox connector.

The ECU connector is available as Vertical SMT Header [87437-0643] or Right Angle SMT Header [87438-0643].

Mechanical Dimensions

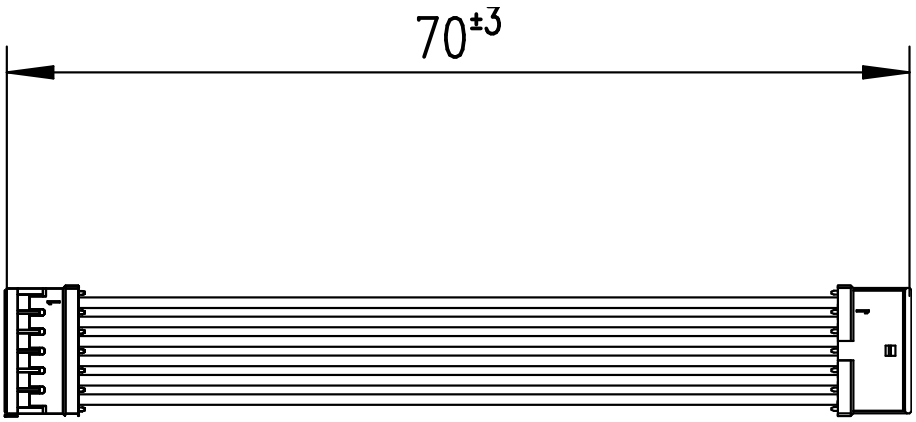


Fig. 8-31 ETAM10 Adapter Dimensions

ECU Signals

Pin	Color	Signal	Description
1	Blue	VDDPSTBY (Supply)	Permanent power supply of ECU interface
2	Yellow	VDDSTBY (Supply)	Permanent power supply of ECU ED RAM
3	Brown	Ground	Power ground
4	Green	Cal_Wakeup	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Red	SGUBATT2	Car battery
6	Red	SGUBATT1	Car battery

Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +110 °C

Order Information

Product	Length	Order Number
ETAM10 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 6fc), 0m07	0.07 m	F-00K-111-814

9 Ordering Information

9.1 BR_XETK-S2.0

Order Name	Short Name	Order Number
BR_XETK-S2.0A Emulator Probe for the Infineon AURIX microprocessor family	BR_XETK-S2.0	F 00K 109 477
Package Contents		
BR_XETK-S2.0 Emulator Probe for JDP MPC57xx Microprocessor Family List "Content of this Package", ETK Safety Advice, China-RoHS-leaflet_Compact_green_cn		

9.2 Cable and Adapter

NOTE

We recommend to use ETAS cables or any other cables certified by the standards for the application. Adhere to the maximum permissible cable lengths!

NOTE

Application-specific cables are available from ETAS. Please contact your ETAS contact partner or e-mail sales.de@etas.com.

9.2.1 XETK - ECU Adapter

Order Name	Short Name	Order Number
ETAM2 XETK/FETK ECU Adapter, MOLEX - open wires (6fc - 6c), 0m25	ETAM2	F 00K 109 306
ETAM3 XETK/FETK ECU Adapter, SAMTEC FFSD - SAMTEC SFM (10fc - 10fc), 0m11	ETAM3	F 00K 109 673
ETAM5 FETK ECU Adapter, MOLEX - MOLEX (6fc - 5fc+1c), 0m136	ETAM5	F 00K 110 101
ETAM9 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 5fc), 0m136	ETAM9	F 00K 111 043
ETAM10 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 6fc), 0m07	ETAM10	F 00K 111 814

9.2.2 Automotive Ethernet Cable

Order Name	Short Name	Order Number
Automotive Ethernet Interface Cable, MOLEX – open wire (2fc-2c), 0m3	ETABR1	F 00K 109 771
Automotive Ethernet Interface Cable, MOLEX – MOLEX (2fc-2fc), 0m2	ETABR2	F 00K 111 118
Automotive Ethernet Interface Cable, MOLEX – open wire (2fc-2c), 0m33	ETABR3	F 00K 111 964
Automotive Ethernet ECU Adapter Cable, Lemo 1B PHA - MOLEX (2fc-2fc), 0m60	CBAM290.1-0m6	F 00K 111 117
BR_XETK ECU Adapter and Power Supply Cable, pre-assembled into M12 screwing, shield on ECU housing, Lemo 1B PHA - MOLEX (2fc-2fc) / Lemo 1B PHG - open wire (2fc-1c), 0m6	CBAM295.1-0m6	F 00K 111 656
BR_XETK ECU Adapter and Power Supply Cable, pre-assembled into M12 screwing, shield on ECU housing, Lemo 1B PHA - MOLEX (2fc-2fc) / Lemo 1B PHG - open wire (2fc-1c), 1m8	CBAM295.1-1m8	F 00K 111 657
100 Mbit/s Automotive Ethernet Interface Cable for CBEB105, Lemo 1B FGA - DSUB (2mc-9fc), 3 m	CBEB120.1-3	F 00K 111 111
100 Mbit/s Automotive Ethernet Interface Cable for CBEB105, Lemo 1B FGA - DSUB (2mc-9fc), 5 m	CBEB120.1-5	F 00K 111 112
100 Mbit/s Automotive Ethernet Interface Cable plus Power for CBEB100, Lemo 1B FGA - DSUB plus banana connector (2mc-9fc), 3 m	CBEB121.1-3	F 00K 111 113
100 Mbit/s Automotive Ethernet Interface Cable plus Power for CBEB100, Lemo 1B FGA - DSUB plus banana connector (2mc-9fc), 5 m	CBEB121.1-5	F 00K 111 114
100 Mbit/s Automotive Ethernet Interface Cable for ES88x, Lemo 1B FGA - Lemo 1B FGA (2mc-2mc), 3 m	CBEB125.1-3	F 00K 111 115
100 Mbit/s Automotive Ethernet Interface Cable for ES88x, Lemo 1B FGA - Lemo 1B FGA (2mc-2mc), 8 m	CBEB125.1-8	F 00K 111 116
Automotive Ethernet Splitter Cable 100 Mbit/s, Yamaichi YCP - 4x Lemo PHA 1B (8mc -4x 2fc), 0m4	CBEB240.1-0m4	F 00K 111 122
Automotive Ethernet Splitter Cable 100 Mbit/s, Yamaichi YCP - 4x DSUB (8mc - 4x 9mc), 0m4	CBEB242.1-0m4	F00K 111 123

9.2.3 Media Converter

Order Name	Short Name	Order Number
Media Converter Cable, DSUB - RJ45 (9mc-8mc), 1m	CBEB100.1-1m0	F 00K 110 094
Media Converter Cable, DSUB - Lemo (9mc-8mc), 1m	CBEB105.1-1m0	F 00K 110 321

9.2.4 Power Supply

Order Name	Short Name	Order Number
Isolated Power Supply Interface for XETK	ETP2	F 00K 104 010

10 Contact Information

ETAS Headquarters

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