ETAS

ES910.3-A
Prototyping and Interface Module
User's Guide

Copyright

Contents

1   About this Manual

This chapter contains information about the following topics:

- "Identification of Safety Notices" on page 8,
- "Presentation of Information" on page 8,
- "Scope of Supply" on page 9,
- "Additional Information" on page 9.

1.1   Identification of Safety Notices

The safety notices contained in this manual are identified with the danger symbol shown below:

The safety notices shown below are used for this purpose. They provide notes to extremely important information. Please read this information carefully.

DANGER!

indicates an immediate danger with a high risk of death or serious injury, if not avoided.

WARNING!

indicates a possible danger with moderate risk of death or (serious) injury, if not avoided.

CAUTION!

identifies a hazard with low risk that could result in minor or medium physical injuries or property damages if not avoided.

1.2   Presentation of Information

All activities to be performed by the user are presented in a "Use Case" format. That is, the goal to be accomplished is briefly defined in the heading, and the respective steps required for reaching this goal are then presented in a list. The presentation looks as follows:

Goal definition:

any advance information...

- Step 1

    Any explanation for step 1...

- Step 2

    Any explanation for step 2...

- Step 3

    Any explanation for step 3...

Any concluding comments...

Typographical conventions

The following typographical conventions are used:

| **Bold** | Labels of the device |
| *Italic* | Particularly important text passages |

Important notes for the user are presented as follows:

> **<u>Note</u>**
>
> *Important note for the user.*

1.3   Scope of Supply

Prior to the initial commissioning of the module, please check whether the module was delivered with all required components and cables (see chapter 9.1 on page 105).

Additional cables and adapters can be obtained separately from ETAS. A list of available accessories and their order designation is located in chapter "Cables and Accessories" on page 106 of this manual or in the ETAS product catalog.

1.4   Additional Information

The configuration instructions for the module under INCA can be found in the corresponding software documentation.

2   Basic Safety Notices

This chapter contains information about the following topics:

- "General Safety Information" on page 10,
- "Requirements for Users and Duties for Operators" on page 10,
- "Intended Use" on page 10.

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's 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. Improper use or use by a user without sufficient qualification can lead to damages or injuries to one's health or damages to property.
The assembler of the system is responsible for the safety of any system incorperating the equipment.

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

The ES910.3-A has a simulation controller and the ECU interfaces CAN, LIN, ETK and XETK and also one interface for Daisy Chain modules (ES4xx/ES63x/ES93x modules). If additional interfaces are required, the extension slot of the ES910.3-A can be used with the ES920.1 FlexRay module, the ES921.1 CAN module or with the ES922.1 CAN FD module.

Application area of the product

This product was developed and approved for applications in the automotive sector. The module is suitable for use in interiors, in the passenger cell or in the trunk of vehicles. The module is not suitable for installation in the engine compartment and similar environments. For use in other application areas, please contact your ETAS contact partner.

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.

Requirements for operation

- Use the product only according to the specifications in the corresponding User's Guide. With any deviating operation, the product safety is no longer ensured.
- Observe the requirements on the ambient conditions.
- Do not use the product in a wet or damp environment.
- Do not use the product in potentially explosive atmospheres.

Electrical safety and power supply

- Observe the regulations applicable at the operating location concerning electrical safety as well as the laws and regulations concerning work safety!
- Connect only current circuits with safety extra-low voltage in accordance with EN 61140 (degree of protection III) to the connections of the module.
- Ensure that the connection and setting values are being followed (see the information in the chapter "Technical data").
- Do not apply any voltages to the connections of the module that do not correspond to the specifications of the respective connection.

Power supply

- 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 network (with double insulation/reinforced insulation (DI/ RI)).
- The lab power supply must be approved for an operating altitude of 5000 m and for an ambient temperature of up to 70 °C.
- In regular operation of the modules as well as very long standby operation, a discharge of the vehicle battery is possible.

Connection to the power supply

- The power cable must not be connected directly to the vehicle battery or lab power supply, but via a fuse of up to 20 A.
- Ensure that the connections of the lab power supply, the power supply at the module and the vehicle battery are easily accessible!

- Route the power cable in such a way that it is protected against abrasion, damages, deformation and kinking. Do not place any objects on the power cable!

> **DANGER!**
>
> *Dangerous electrical voltage!*
> *Connect the power cable only with a suitable vehicle battery or with a suitable lab power supply! The connection to power outlets is not allowed!*
> *To prevent an inadvertent insertion in power outlets, ETAS recommends to equip the power cables with safety banana plugs in areas with power outlets.*

Approved power supply cables

Power supply cables suitable for the ES910.3-A module can be delivered in two designs:

- power supply cable CBP120 with standard banana plugs (current design) and
- power supply cable CBP1205 with safety banana plugs (new design).

> **Note**
>
> *Power supply cables with safety banana plug are suitable only for connection to voltage sources with safety socket.*

> **Note**
>
> *Application, permissible voltages and all the other technical data of the power supply cables are identical for both designs.*

De-energizing the module

The module does not have an operating voltage switch. The module can be de-energized as follows:

- Disconnecting the cables from the measurement inputs

and

- Disconnecting the module from the power supply
    - Disconnecting the module from the lab power supply

      Separating device is the lab plug of the power cable or the plug of the power cable at the connection of the module

  or

    - Disconnecting the module from the vehicle battery

      Separating device is the lab plug of the power cable or the plug of the power cable at the connection of the module

  or

    - Disconnecting the vehicle battery.

Approved cables

- Use exclusively ETAS cables at the connections of the module!

- Adhere to the maximum permissible cable lengths!
- Do not use any damaged cables! Cables may be repaired only by ETAS!
- 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.

Requirements for the location

- Position the module or the module stack on a smooth, level and solid underground.
- The module or the module stack must always be securely fastened.

Fixing the modules on a carrier system

- When selecting the carrier system, observe the static and dynamic forces that could be created by the module or the module stack on the carrier system.

Requirements on the ventilation

- Keep the module away from heat sources and protect it against direct exposure to the sun.

> ⚠ **CAUTION!**
>
> ***Heat concentration in the module possible!***
> *The electronics can be damaged due to overheating.*
> *Do not cover ventilation slits when setting up, assembling or connecting the ES910.3-A module.*
> *Adhere to the minimum distances at the sides and above.*

- Do not stand the module on its long sides.
- Do not stand the module on its top side.
- Never place objects on top of the module.
- The free space above and behind the module must be selected so that sufficient air circulation is ensured. Adhere to the minimum distances of at least 10 centimeters on the sides and above the module.
- Do not operate the module in completely enclosed containers.

> ⚠ **CAUTION!**
>
> ***Heat concentration on the long sides of the module.***
> *The electronics can be damaged due to overheating.*
> *Do not cover ventilation slits when setting up, assembling or connecting with other modules. Adhere to the minimum distance at the sides.*
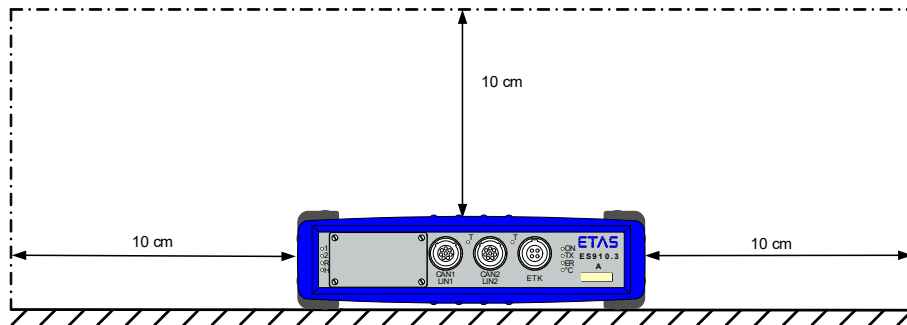
CAUTION!
Heat concentration on the top of the module. *The electronics can be damaged due to overheating.* *Do not stack several ES910.3-As on top of each other.* *When stacking the ES910.3-A with other ETAS modules, it always has to be on top.*

Assembling (interconnecting) the modules

• Prior to assembling (interconnecting) or separating a module stack, the modules must be disconnected from the supply voltage or they have to be in the standby operating mode.

Transport

• Stack and connect the modules only at the location of the startup!
• Do not transport the modules at the cable of the module or any other cables.

Maintenance

The product is maintenance-free.

Repair

If an ETAS hardware product should require a repair, return the product to ETAS.

Cleaning the module housing

• Use a dry or lightly moistened, soft, lint-free cloth for cleaning the module housing.
• Do not user any sprays, solvents or abrasive cleaners which could damage the housing.
• Ensure that no moisture enters the housing. Never spray cleaning agents directly onto the module.

Ambient conditions

The housing and the connectors of the module as well as the plug connectors of the cables meet the degree of protection IP30.

Opening the module

> **CAUTION!**
>
> ***Damage to the module and loss of properties based on IP30!***
> *Do not open or change the module housing!*
> *Work on the module housing may only be performed by ETAS.*

Potential equalization

> **CAUTION!**
>
> ***Potential equalization in the vehicle is possible via the shield of***
> ***the connecting cables of the modules!***
> *Install the modules only at locations with the same electrical potential*
> *or isolate the modules from the installation location.*

Cabling

For detailed information about cabling, see the User's Guide of the module.

3 Hardware Description

This chapter provides you with an overview of the ES910.3-A with information on the housing, serial number, interfaces and indicators.

3.1 Overview

Rapid prototyping can be executed with the compact module ES910.3-A. The ES910.3-A has a simulation controller and the ECU interfaces CAN, LIN, ETK and XETK and also one interface for Daisy Chain modules (ES4xx/ES63x/ES93x modules). If additional interfaces are required, the extension slot of the ES910.3-A can be used with the ES920.1 FlexRay module, the ES921.1 CAN module or with the ES922.1 CAN FD module. The Service Port provides the functions "Wake Up" and "Trigger". The ES910.3-A is supported by INCA as an interface for measure, calibration and diagnostic applications.

3.1.1 Rapid Prototyping of Software Functions

In this context, rapid prototyping refers to processes which enable early control of the specifications in close-to-production vehicles. The fact that new developments are tested and confirmed at an early stage reduces the risks, increases the quality of the development, and reduces the development time and thus the costs.

The modeled software function is to be implemented as a prototype. Rapid prototyping systems can be used as an execution platform for the software portions of the control and diagnostic functions. They are then linked to the generators, sensors, actuators, and ECUs of the vehicle. Due to these interfaces to the vehicle, the software functions must be executed in the rapid prototyping system – as in the ECU – while meeting real-time requirements.

Rapid prototyping systems are usually real-time computer systems with significantly higher computing performance than ECUs. Rapid prototyping systems can be configured, depending on the application, e.g., regarding the required interfaces for input and output signals. The entire system is designed for use in the vehicle and is operated, e.g., using a PC. The software function can be tested and modified directly in the vehicle.

In the bypass application, new or modified software functions are specified by a model and run on the rapid prototyping system.

This approach is suited for enhancing existing functions. The existing functions in the control unit are often still calculated but modified, so that the input values are sent via the bypass interface, and the output values from the new bypass function are used.

3.1.2 ES910.3-A Features

Overview of the major features of the ES910.3-A:

- Highly efficient, compact development and experimental platform with high computing and simulation performance due to the use of a close-to-target, fast floating-point processor.
- Smooth transition from the finished function prototype to ECU software development by using the AUTOSAR-compatible RTA-OSEK operating system.
- 1 Gbit/s Ethernet connection to the PC

- Equipment with universal ECU interfaces:
  - One ETK ECU interface for bypass, measure and calibration applications
  - Two CAN interfaces (High-Speed or Low-Speed) for bypass applications
  - Two LIN interfaces for measure and Rapid prototyping applications
- Equipping with a configurable Ethernet interface:
  - for an XETK for bypass, measurement and calibration applications or
  - for an ECU with Ethernet interface (XCP on UDP) for bypass, measurement and calibration applications or
  - for the XCP-on-Ethernet interface iLinkRT^{TM} for fast measurement and calibration privileges (application with INCA-MCE)
- Equipping with a configurable IO interface:
  - for ES400 Micro I/O & Measurement Modules for Rapid Prototyping applications or
  - for standardized, real time-capable automation bus as EtherCAT-slave device for fast measurement and calibration privileges (application with INCA-MCE)
- Support of the ETAS synchronization mechanism at the interfaces PC (SYNC IN functionality) and ECU (SYNC OUT functionality)
- EtherCAT selectable as source for ETAS synchronization mechanism
- One slot for extension modules (extension slot)
- Module suitable for use in automotive applications; suitable for use in the development environment and in the vehicle on test drives.
  - Channels galvanically isolated from each other, from the device ground and from the supply voltage
  - Not sensitive to extreme environmental conditions (temperature, EMC)
  - Wide range of power supply
  - High mechanical stability and durability
- Member of the ETAS Tool Suite
  - Rapid prototyping of control functions with MATLAB®/Simulink®, ASCET-MD, and C by integration in INTECRIO
  - Supported by INCA, INCA ES9xx Add-On, INCA-EIP, RTA-TRACE, HSP

For the complete technical data of the ES910.3-A, refer to the chapter "Technical Data" on page 74.

3.2 Housing

Standard housing with interfaces on the front and rear of the device is used for the ES910.3-A. The sturdy metal housing of the ES910.3-A has nonskid plastic feet.

It can be easily screwed onto a carrier system for installation in a vehicle or in the lab. The housings of this device family can also quickly and easily be connected to one another (see the chapter "Setup" on page 42).

The ES910.3-A is specifically designed to be installed in the passenger cell.

Fig. 3-1   ES910.3-A View of the Device

3.3 Interfaces

3.3.1 Front Panel

The following interfaces are on the front panel of the ES910.3-A:

- Extension slot (e.g. for ES920.1 FlexRay Module)
- CAN1/LIN1 (1 x CAN, 1 x LIN)
- CAN2/LIN2 (1 x CAN, 1 x LIN)
- ETK (1 x ETK)
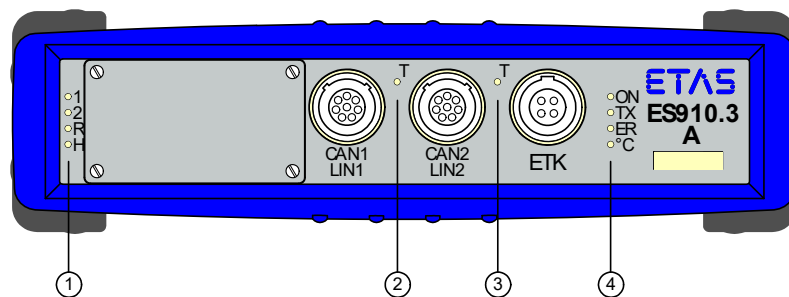
Fig. 3-2   ES910.3-A Front Panel

LEDs are assigned to the module and to the interfaces of the module:

No. in Fig. 3-2 (Name of LED)	Assignment	Display Function
1 (1, 2)	Module	Operational state of the module (see chapter 3.4.2 on page 21)
1 (R, H)	Configurable	Customized configuration (see chapter 3.4.2 on page 21)
2 (T)	CAN1/LIN1, CAN2/LIN2	Communication at the interfaces CAN1, LIN1, CAN2 and LIN2 (see chapter 3.4.4 on page 23)
3 (T)	ETK	Communication at the ETK interface (see chapter 3.4.4 on page 23)
4 (ON, TX, ER, °C)	Module	Functional state of the module (see chapter 3.4.3 on page 22)

3.3.2   Back Panel

The following interfaces are on the back panel of the ES910.3-A:

- 6 … 32V DC (power supply)
- **ON/AUTO** switch
- SP (Service Port)
- IO (interface for ES4xx/ES63x/ES93x modules or EtherCAT automation bus)
- ECU SYNC OUT (ECU or iLinkRT^{TM} interface)
- PC SYNC IN (Ethernet interface to the PC)
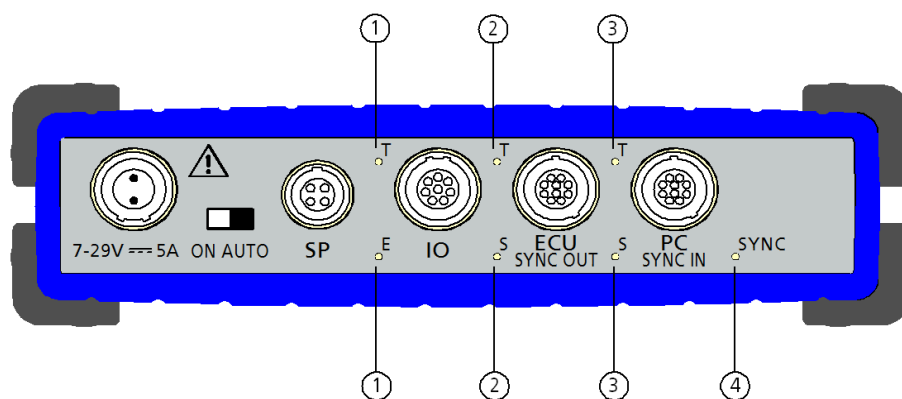
Fig. 3-3   ES910.3-A Back Panel

LEDs are assigned to some interfaces of the module:

No. in Fig. 3-3 (Name of LED)	Assignment	Display Function
1 (T, 2E)	IO	Communication at the IO interface (see chapter 3.4.4 on page 23)
2 (T, S)	ECU	Communication at the ECU interface (see chapter 3.4.4 on page 23)
3 (T, S)	PC	Communication at the PC interface (see chapter 3.4.4 on page 23)
4 (SYNC)	Module	Synchronization state of the module (see chapter 3.4.3 on page 22)

3.4 Indicators

3.4.1 Flash Codes

The ES910.3-A is equipped with LEDs, which indicate the operational and functional state of the module, as well as with LEDs which display the function of individual interfaces. The following flash codes are used for the LEDs:
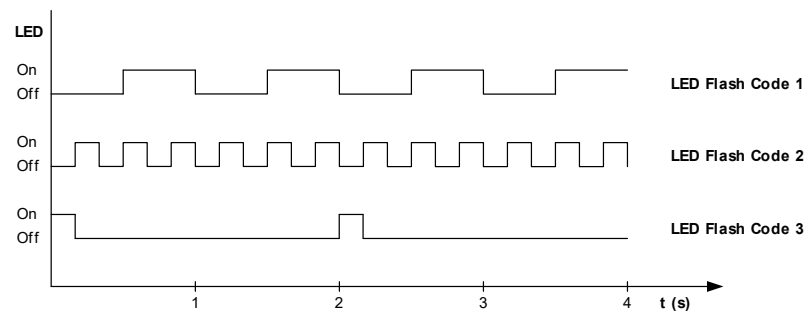
Fig. 3-4 Flash Codes of the Indicators

3.4.2 ES910.3-A Operational State

Four LEDs can be found on the front panel of the ES910.3-A. They indicate the following operational states:

LED	Display	Operational State
ON	Green	The unit is powered on.
	Green, flashing (Flash code 3)	The automatic power on/off of the power supply is enabled and the device is on "Standby".
TX	Yellow	Data is being transferred.
	Off	No data transfer
ER	Red	Device is currently booting or booting was unsuccessful.
	Red, flashing (Flash code 1)	Firmware update is being executed or internal device software error (an error file exists and can be called up in the web interface of ES910.3-A and mailed to the Technical Support)

LED	Display	Operational State
°C	Red (Flash code 3)	Temperature inside the housing has exceeded a critical level, model is stopped, ES910.3-A is in standby
	Red	Temperature inside the housing has exceeded the critical level, model is stopped,
	Red (Flash code 2)	Temperature inside the housing has reached a critical level.
	Off	Temperature inside the housing is in normal operational range.

3.4.3   ES910.3-A Functional State

LEDs on the Front Panel

Four LEDs can be found on the left-hand side of the front panel of the ES910.3-A. They indicate the following functional states:

LED	Display	Functional State
1	Red	User-specific [1]
2	Green	User-specific [1]
R	Yellow (Flash code 1)	Model running on the system from RAM
	Yellow (Flash code 3)	Model running on the system from Flash
	Off	No model running on the system
H	Green, flashing (Flash code 1)	The module is run and an RTIO driver is enabled.
	Green, flashing (Flash code 3)	The module is run and the RTIO drivers are disabled.

[1] User-specific configuration in INTECRIO

LEDs on the Back Panel

One LED **SYNC** can be found on the right-hand side of the back panel of the ES910.3-A. The LED indicates the synchronization function of the module (master or slave) and the synchronization state.

LED	Display	Operational State
SYNC	Blue, flashing, fully bright	The module is a synchronization master; the module is not synchronized externally
	Blue, flashing semi and fully bright alternately	The module is a synchronization slave; module is synchronized externally: either at the interface "PC SYNC IN" or "IO" ("EtherCAT" operating mode)

3.4.4   Functional State of Individual Interfaces

If the ES910.3-A is powered on (operational state "On") they indicate the following functional states at the assigned interfaces:

Interface CAN1/LIN1 and CAN2/LIN2

A common LED **T** is assigned to the interfaces CAN1/LIN1 and CAN2/LIN2 (see Fig. 3-2 on page 19).

LED	Display	Functional State
T	Yellow	Communication as many as one of the interfaces (CAN1 or LIN1 or CAN2 or LIN2)
	Off	Communication interrupted at all interfaces (CAN1 and LIN1 and CAN2 and LIN2)

ETK Interface

An LED **T** is assigned to the interface ETK (see Fig. 3-2 on page 19).

LED	Display	Functional State
T	Yellow	Communication at the interface
	Off	Communication interrupted

IO Interface

An LED **T** and an LED **E** are assigned to the interface IO (see Fig. 3-3 on page 20).

Operational mode "Daisy Chain":

LED	Display	Functional State
T	Yellow	Communication at the interface
	Off	Communication interrupted
E	Red	Error at the interface, communication with the ES4xx module chain not possible
	Flashing red (1 Hz)	PC accessing the ES4xx module chain for configuration purposes
	Off	No error

Operational mode "EtherCAT":

The LED **E** corresponds to the "Run LED" in the "EtherCAT" operating mode (EtherCAT slave device) and indicates the EtherCAT operating mode.

LED	Display	Functional State
T	Yellow	Communication at the interface
	Off	Communication interrupted

LED	Display	Functional State
E	Off	Module in state INIT
	Red, blinking (slow)	Module in state PRE-OPERATIONAL
	Red, single flash	Module in state SAFE-OPERATIONAL
	Red	Module in state OPERATIONAL
	Red, flickering (fast)	Module in state BOOTSTRAP

ECU Interface

An LED **T** and an LED **S** are assigned to the interface PC (see Fig. 3-3 on page 20).

LED	Display	Functional State
T	Yellow	Communication at the interface
	Off	Communication interrupted
S	Green	1 Gbit/s Communication
	Yellow	100 Mbit/s communication
	Off	Communication interrupted

PC Interface

An LED **T** and an LED **S** are assigned to the interface PC (see Fig. 3-3 on page 20).

LED	Display	Functional State
T	Yellow	Communication at the interface
	Off	Communication interrupted
S	Green	1 Gbit/s Communication
	Yellow	100 Mbit/s communication
	Off	Communication interrupted

3.5 Acoustic Signal

The ES910.3-A has an acoustic signal generator.

Emitting an Acoustic Signal

- Short signal when booting the ES910.3-A.
- Linked to the °C indicator, temperature states of the module are indicated:
  - Sequence of short signals when critical temperature is reached
  - Permanent signal when critical temperature is exceeded
- Further customized configurations are possible in INTECRIO.

4   Functional Description

This chapter describes the block diagram, the power supply, the operating states, the "Wake Up" function, the interfaces of the ES910.3-A, NVRAM, Watchdog, Real Time Clock as well as the firmware update.

4.1   Block Diagram
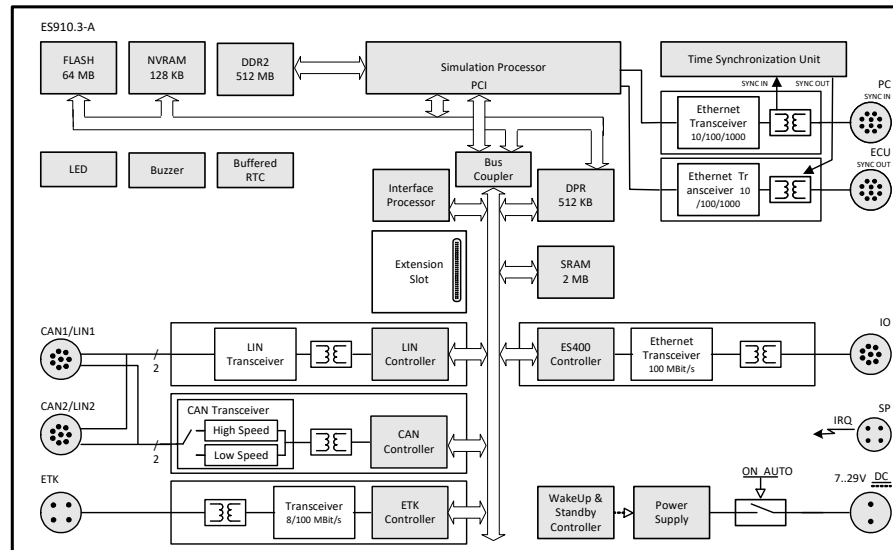
Fig. 4-1   Block Diagram of the ES910.3-A

4.2   Power Supply (7-29V DC)

The power supply interface (7-29V DC) of the ES910.3-A is routed to a 2-pin connector (Lemo socket) on the back panel of the device. Power is supplied to the ES910.3-A via an external power supply or vehicle battery.

The first time the ES910.3-A is connected to the operating voltage, the module switches itself on for some seconds. During this time, the ES910.3-A is initialized and configured. The module emits a short acoustic signal acknowledging the end of this procedure.

4.3   ON/AUTO Switch

The **ON/AUTO** switch can be used to select whether the ES910.3-A is powered on permanently or whether it is powered on and off automatically depending on signals at specific interfaces.

4.3.1   ON/AUTO Switch in Position „ON"

If the **ON/AUTO** switch is "ON", the power supply of the ES910.3-A is activated when the external power supply is switched on. The module is powered on ("on"). Powering the connected external power supply on/off results in the switchover between the operational states "On" and "Off".

4.3.2 ON/AUTO Switch in Position „AUTO"

If the **ON/AUTO** switch is set to "AUTO", the module is powered on and off automatically.

4.4 Operational States

Possible operational states of the supply of the ES910.3-A with operating voltage are "Off", "Standby" and "On".

4.4.1 Operational State: "Off"

The ES910.3-A is not connected to the external power supply and is completely powered off. All interfaces are disabled. The "Wake Up" function (see chapter 4.5 on page 26) is disabled.

4.4.2 Operational State: "Standby"

If the **ON/AUTO** switch is set to "AUTO", the module remains on "Standby" until the module is switched to "On" with the "Wake Up" function or when the **ON/AUTO** switch is switched to ON.

In this operating mode, the modules connected to the interfaces are not stimulated. The LED **ON** flashes green (flash code 3).

4.4.3 Operational State: "On"

With "On", the power supply of the ES910.3-A and all interfaces are activated. The "Wake Up" function is enabled. The LED **ON** does light up green.

4.5 "Wake-Up" Function

The "Wake-Up" function is enabled when the **ON/AUTO** switch is switched to "AUTO". The module can automatically switch between the operational states "Standby" and "On" via the "Wake-Up" function.
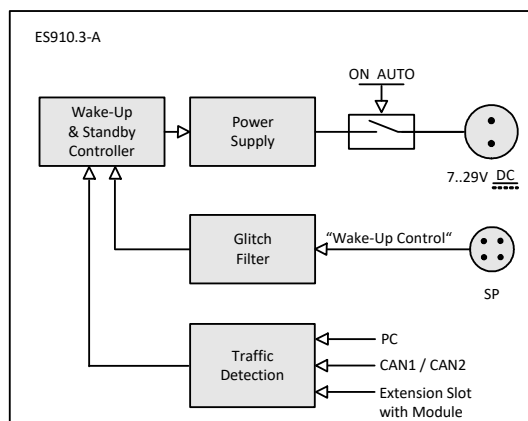
Fig. 4-2   "Wake-Up" Function

If the ES910.3-A is on "Standby", the module switches to "On"

- after data exchange at the PC interface (Ethernet) or
- after data exchange at at least one CAN interface (only High-Speed CAN) or

- after data exchange at at least one FlexRay interface (with ES920.1 module) or
- after detection of the FlexRay "Wake-Up Pattern" (with the ES920.1 module) or
- after data exchange at at least one CAN interface (with ES921.1 module) or
- on connection of the "Wake-Up Control" pin to operating voltage.

If data exchange ends at these interfaces or if the "Wake-Up Control" pin is no longer connected to the operating voltage, the ES910.3-A switches back to "Standby".
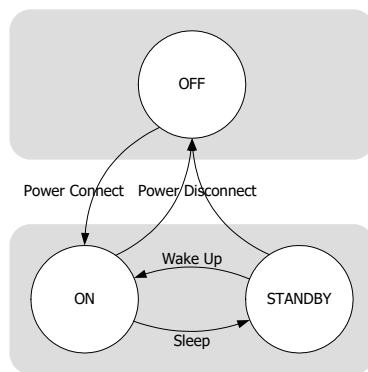
Fig. 4-3   Operational States of the Power Supply (Simplified)

The following table is a list of possible ways of activating the ES910.3-A.

Source of activating	Active	Wake Up Event	Sleep Condition
ON/AUTO switch	Always	„ON"	„AUTO"
PC	Always	Traffic	No traffic
ECU	Selectable	Traffic	No traffic
CAN1/LIN1	Selectable	Traffic	No traffic
CAN2/LIN2	Selectable	Traffic	No traffic
Pin „Wake Up Control"	Selectable	High	Low
Extension Module (Extension Slot)	Selectable	Traffic	No traffic
Extension Module (Extension Slot)	Selectable	ES920: Wakeup Pattern	ES920: no traffic

These interfaces can be configured in the web interface of the ES910.3-A (see chapter 5.6.1 on page 60) and in the calibration software for the "Wake Up" function.

4.6   Service Interface (SP)

The Service interface of the ES910.3-A is routed to a 4-pin SP connector (Lemo socket) on the back panel of the device. Two connector pins are used for the "Manual Trigger" function and one for the "Wake Up Power" function.

Note

The cable for using the ES910.3-A "Manual Trigger" and "Wake Up" functions has to be customized by the customer (see chapter 7.7.7 on page 84). The necessary connector is not part of the delivery scope or accessories of the ES910.3-A.

4.6.1   "Manual Trigger" Function

The "Manual Trigger" function at the two trigger pins of the Service Port (SP) of the ES910.3-A can be used for different applications:

- realization of the emergency shutdown function after the emergency shutdown button has been pressed or
- realization of power-on/initialization sequences after terminal 15 (Kl.15) has been pressed.
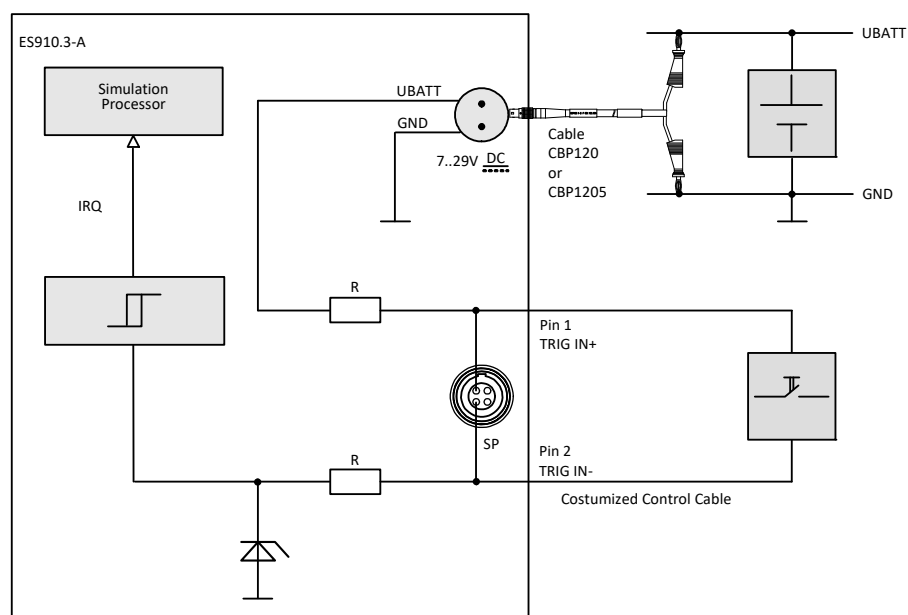
Fig. 4-4   "Manual Trigger" Function with Button between Pin 1 and Pin 2

If, for example, you install a button between the two trigger pins, changes in button status are interpreted as a trigger event. Pressing the button generates an interrupt for starting customized scenarios configured in the Rapid Prototyping calibration software.
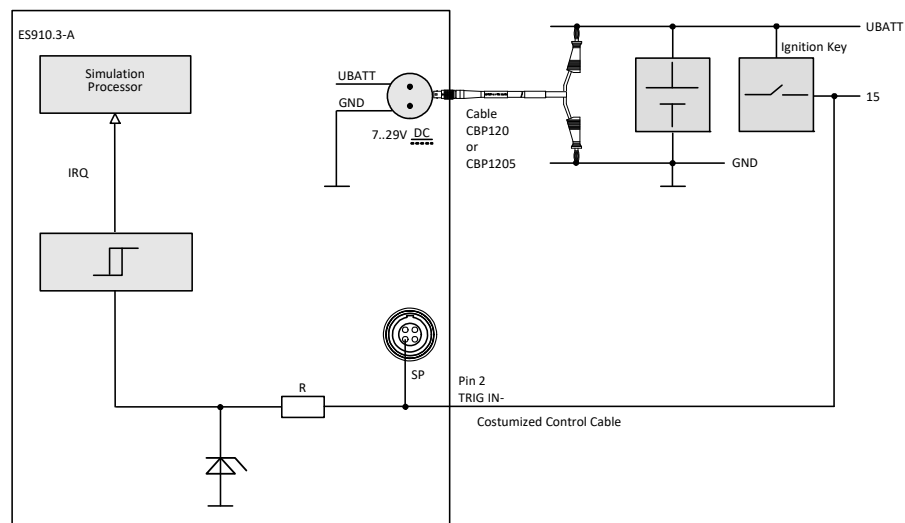
Fig. 4-5   "Manual Trigger" Function with Terminal 15

The state of the button connected to the two pins can also be queried from the Rapid Prototyping model (Polling Mode).

The necessary minimum pulse width of the initiating trigger signal can be configured in the calibration software.

4.6.2   "Wake Up Control" Pin

The ES910.3-A can be activated at the "Wake Up" pin of the Service interface (SP) when connected to the operating voltage. It is possible to switch between "Standby" and "On" if the **ON/AUTO** switch is switched to "AUTO" (see chapter 4.3.2 on page 26).

Usually, the "Wake Up" pin is connected to the signal of terminal 15. The power supply of the ES910.3-A is activated when UBATT is applied at terminal 15.
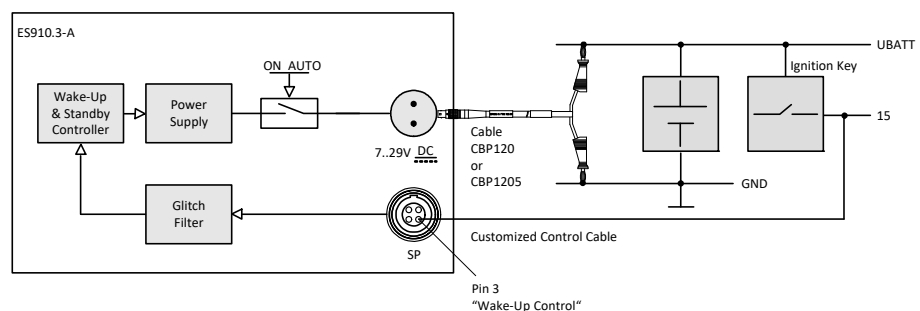
Fig. 4-6   Connecting the Wake Up Pin to Terminal 15

The voltage range at the "Wake Up Control" pin of the Service Port corresponds to the operating voltage range of the ES910.3-A (7 V to 29 V direct voltage). Interfering signals pending at the "Wake Up Control" pin of the Service Port are filtered out. For more technical data, refer to the chapter 7.7.7 on page 84.

4.7   PC Interface (PC)

The PC interface of the ES910.3-A is routed to an 10-pin connector (Lemo socket) on the back panel of the device. The interface is galvanically isolated from the other interfaces of the ES910.3-A.

The PC interface is a 10/100/1000Base-T Ethernet connection of the ES910.3-A module to the user PC. This interface allows the ETAS Software Tools access to the ES910.3-A.

The Ethernet interface has a link signal detector. As soon as an Ethernet signal is detected, the "Wake Up" function switches from standby to normal operation (see chapter 4.5 on page 26). When no more link signals are received, the ES910.3-A automatically switches to standby mode after a certain time has elapsed.

Note

The Ethernet adapter of the connected PC has to be configured accordingly for it to be able to send link pulses.

4.7.1   Mixed Network

If the ES910.3-A is to be used in a network with other ETAS modules (ES59x, ES6xx) on an ES600 module, the ES910.3-A can communicate with the PC with 10/100 Mbit/s, the same as the other modules.

4.7.2   ES910.3-A Standalone Operation

It is also possible for the ES910.3-A to run a rapid prototyping model without a connected PC (standalone). The ES910.3-A is connected to a PC and flashed with a rapid prototyping model for this purpose.

4.8   CAN Interface (CAN1/LIN1, CAN2/LIN2)

The ES910.3-A has two CAN interfaces. One each of the CAN interfaces is routed to the two 8-pin CAN1/LIN1 and CAN2/LIN2 connectors (Lemo socket) on the front panel.

CAN1 and CAN2 are complete independent CAN channels with separated connections and CAN controllers. The CAN interfaces produce a simple and direct connection between the ES910.3-A and the CAN network.

The interfaces are galvanically isolated from each other and from the other interfaces of the ES910.3-A.

Note

The four interfaces CAN1 and LIN1 (CAN1/LIN1 connector) or CAN2 and LIN2 (CAN2/LIN2 connector) can be configured and used simultaneously and independently of one another.

4.8.1   Operating Modes

The CAN interfaces of the ES910.3-A can be operated in High-Speed CAN link (ISO 11898-2) or Low-Speed CAN link (ISO 11898-3). Switching between the two operating modes is controlled by software. The operating mode can be selected individually for each interface.

4.8.2   Feature

You can find a list of CAN applications supported by the ES910.3-A in chapter 7.6.2 on page 78.

4.8.3   Bus Terminating Resistor

Low-Speed CAN

In the ES910.3-A, two relatively high-impedance termination resistors of 2.26 kOhm each (RTH, RTL) are integrated for the Low-Speed CAN link.

This guarantees that, in a terminated CAN network, the ES910.3-A does not have a great influence on the sum of the terminations of the overall system. This should, however, be checked regardless particularly with lab networks or with tests in existing networks.

In a Low-Speed CAN network, the individual nodes are typically terminated with 500 Ohm to 6 kOhm. To ensure optimum system conditions, the CAN network should be terminated with around 100 Ohm (parallel connection of all terminations).

For more details on the Low-Speed CAN network, consult the ISO/DIS 11898 "Road vehicles — Controller area network (CAN) — Part 3: Low-Speed, fault-tolerant, medium dependent interface".

Note

*The bus termination resistors intended for High-Speed CAN can **not** be used in this operating mode!*

High-Speed CAN

The High-Speed operating mode of the CAN interface requires the use of bus termination resistors.

In accordance with the CAN specification, a bus termination resistor of 120 Ohm is required at each of the two open ends of the bus. This has to be connected to the cable or to the connector. ETAS supplies cables and termination resistors of 120 Ohm for setting up CAN networks.

4.9   LIN Interface (CAN1/LIN1, CAN2/LIN2)

The ES910.3-A has two LIN interfaces. One each of the LIN interfaces is routed to the two 8-pin CAN1/LIN1 and CAN2/LIN2 connectors (Lemo socket) on the front panel.

LIN1 and LIN2 are completely independent LIN interfaces with separate connections and LIN controllers. The LIN interfaces establish a simple and direct connection between the ES910.3-A and the LIN network. The interfaces are galvanically isolated from each other and from the other interfaces of the ES910.3-A and are also protected against overload and incorrect stress.

Note

The four interfaces CAN1 and LIN1 (CAN1/LIN1 connector) or CAN2 and LIN2 (CAN2/LIN2 connector) can be configured and used simultaneously and independently of one another.

4.9.1   Operating Modes

Each of the two LIN interfaces can be configured in the calibration software either as a LIN master or as a LIN slave. Switching between the two operating modes is controlled by the software and can be selected separately for every interface.

4.9.2   Feature

You can find a list of LIN applications supported by the ES910.3-A in chapter 7.6.2 on page 78.

The LIN nodes of the ES910.3-A can send and receive LIN messages for Rapid Prototyping applications. Functionalities for diagnostics as well as for measuring and calibration are not supported by the LIN interfaces of the ES910.3-A.

4.9.3   Power Supply on the Bus

The LIN nodes of the ES910.3-A can either be powered externally by the LIN bus or internally by the module. The type of power supply must be configured in the web interface of the ES910.3-A (see chapter 5.6 on page 60).
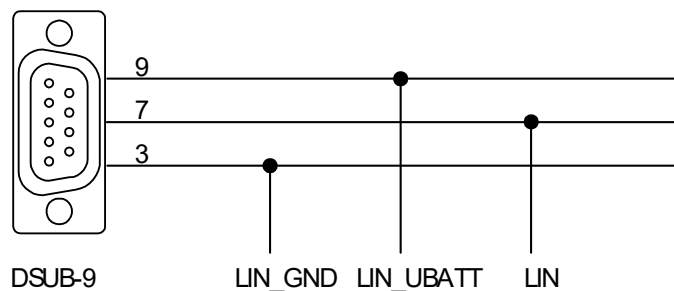
Fig. 4-7   Power Supply at the LIN Bus

To adhere to the reference level (and thus identical thresholds) at the individual nodes of the LIN bus, the LIN transceivers (physical layer) of all bus nodes should be powered with the same voltage. It is recommended that you power off the internal power supplies and operate all nodes of the LIN bus with the external voltage which also powers the other bus users (LIN_UBATT, see Fig. 4-7 on page 32).

If there is no access or no possibility to use the LIN_UBATT voltage as reference and supply voltage, the LIN transceivers of the LIN node of the ES910.3-A must be powered by a connectable internal power source of the module. This internal supply voltage is not routed out via the CAN1/LIN1 or CAN2/LIN2 connectors. The ES910.3-A is not designed to power external nodes at the LIN bus.

Internal pull-up resistances can be connected to the LIN interfaces of the ES910.3-A as master resistances. The connection of the master resistance of the LIN interface can be configured in the web interface of the ES910.3-A.

4.10   ETK Interface (ETK)

The ES910.3-A has one ETK interface which is routed to a 4-pin ETK connector (Lemo socket) on the front panel. The interface is galvanically isolated from the other interfaces of the ES910.3-A.

The ETK interface of the ES910.3-A supports the ECU application via the emulator test probe (ETK).

> **Note**
>
> *Please note that the ES910.3-A does not support all connected ETK types (see chapter 7.7.6 on page 83). Take a look at the ETAS website for detailed information on the ETKs supported by the ES910.3-A.*

4.10.1 Initialization

If an ETK type supported by the ES910.3-A is connected to the ETK interface it is recognized automatically. The ETK interface is automatically initialized.

If an ETK type which is not supported by the ES910.3-A is connected to the ETK interface the overall system behaves, as if no ETK is connected. No specific error message is generated.

4.10.2 Operating Modes

In addition to single transfer for application with the ETK, the ES910.3-A supports data transfer in block mode. The ES910.3-A module usually works in block mode; single mode is supported for compatibility reasons.

The following table lists the features of the individual operating modes for the ETK interface.

| | **Operating Mode of the ETK Interface** | | |
	Basic	**Compatibility**	**Advanced**
No. of variables	29/45/45	Extended	Configurable
Rate	3 + 2	3 + 2	16 + 16
ETK Speed	8 Mbit/s	8/100 Mbit/s	100 Mbit/s
ETK Transfer	Single	Block	Block
AML Version	V1.0 or higher	V1.0 or higher	V1.2 or higher
ES590, ES591, ES592, ES593-D, ES595, ES690, ES1232, ES910	Yes	Yes	Yes

"Basic" Operating Mode

When using the "Basic" operating mode, older projects are supported without any change. All ETK interface hardware can be used.

"Compatibility" Operating Mode

An important feature of the "Compatibility" operating mode is block transfer. The block transfer between the ETK and the ES910.3-A is activated automatically. This means the following advantages:

- Extended number of variables per measure rate,
- Considerably faster download times for code and data to the ECU and
- Considerably improved transfer times for rapid prototyping rates.

"Advanced" Mode

The "Advanced" operating mode provides a number of other possibilities.
The 100 Mbit/s Block ETK protocol results in increased ETK interface perfor-
mance. The most important advantages in comparison to the "Compatibility"
operating mode are:

- 16 rates for measuring,
- 16 rates for rapid prototyping and the
- possibility to configure the number of variables per measure rate.

4.11   IO Interface (IO)

The ES910.3-A has one IO interface for modules of the ES4xx line. This IO inter-
face is routed to an 8-pin IO connector (Lemo socket) on the back panel of the
device and is galvanically isolated from the other interfaces of the ES910.3-A.

4.11.1   Operating Modes

The IO interface can be used either for the connection of ES4xx/ES63x/ES93x
modules in a decentral ETAS Ethernet topology (daisy chain) or when connecting
to an EtherCAT bus as EtherCAT slave device.

> **Note**
>
> *The simultaneous use of these operating modes at the IO interface of an
> ES910.3-A module is not possible.*

Selecting the operating mode of the IO interface and its configuration is done on
the web interface of ES910.3-A (see chapter 5.6.5 on page 62).

> **Note**
>
> *In the delivery state, the IO interface is configured for operation with ETAS
> daisy chain modules.*

4.11.2   "Daisy Chain" Operating Mode

In the "Daisy Chain" operating mode, an ES4xx/ES63x/ES93x module chain can
be connected to the IO interface. The signals acquired by the modules are avail-
able directly in the ES910.3-A. The function model running in the ES910.3-A can
use this data.

For data transfer, the ES400 modules use a 100 Mbit/s Ethernet network connec-
tion in duplex operation. The universal ASAM measure and calibration protocol
XCP is used for serial communication. On the Ethernet transport and network
layer, the UDP/IP protocol is used. Within the XCP protocol, the modules transfer,
among other things, module ID, time stamp and measure and/or stimulation
data in an extremely precise and predictable time pattern. The communication
protocol used for the ES400 family avoids repeated transfer of protocol data,
which takes place, for example, in handshake-based systems. This makes a high
bandwidth available for reference data.

The IO interface of ES910.3-A does **not** supply the modules of the ES4xx/ES63x/
ES93x module chain with operating voltage. The modules are thus powered on
at the ES910.3-A with the Y cable CBEP430 or CBEP4305 (see chapter 5.5.3
on page 58).

4.11.3   "EtherCAT" Operating Mode

EtherCAT (Ethernet for Control Automation Technology) is a fieldbus system based on Ethernet developed by Beckhoff and the EtherCAT Technology Group (ETG). EtherCAT is open technology that is standardized in international standards.

Note

For additional information about EtherCAT, see the homepage of the EtherCAT Technology Group (ETG) that continues the development of the protocol.

Note

For additional information about EtherCAT, see the specifications for the ECU data presentation and implementation details in conjunction with the Ether-CAT protocol which are available from ETAS GmbH upon request.

Application of the EtherCAT Bus in the Automotive Sector

The very fast EtherCAT bus is suitable for use in critical applications: for example, in the automotive sector, an engine test bench can be connected directly with the INCA-MCE hardware via the real time-capable protocol. The EtherCAT protocol is supported by INCA-MCE for this fast measurement and calibration privilege to the ECU.

Besides the fast ECU access, the use of EtherCAT enables the automation of test bench components, such as the indexing system, exhaust gas analysis and special measuring technology. A global clock that is synchronizing the devices allows compiling decentrally acquired measuring data and analyzing them together.

Note

For additional information about the application access via EtherCAT as Ether-CAT slave device see chapter 5.4.4 on page 55 and the INCA-MCE User's Guide.

Synchronization of ETAS Modules in EtherCAT Operating Mode

In the EtherCAT operating mode of the IO interface, ES910.3-A takes over the function of an EtherCAT slave device within an EtherCAT segment. The ES910.3-A and connected ETAS modules of this system are synchronized with the Ether-CAT system clock. The ETAS hardware synchronization function at the PC interface (SYNC IN) of ES910.3-A is deactivated in the EtherCAT operating mode.

Connecting the EtherCAT Bus

A cable for connecting the EtherCAT bus to the IO interface of ES910.3-A will be provided by ETAS Engineering upon request. Cable lengths of up to 30 m can be supplied.

4.11.4   Feature

The applications at the IO interface supported by ES910.3-A are located in an overview in chapter 7.6.2 on page 78.

4.11.5   Overload for Rapid Prototyping Applications

If the ES930.1 is operated in event mode for the Rapid Prototyping applications, it is possible in the case of events with very quick succession and frequent occurrence that the ES910.3-A can no longer process the data of the ES930.1. The ES910.3-A discards data of the ES930.1 or data of other ETAS daisy chain modules that are present at its IO interface. The IO interface of the ES910.3-A to which the ES930.1 is connected is overloaded.

If the ES910.3-A detects the described overload case, an error bit is set.

Note

An overload event is possible only if the ES930.1 is operated in event mode for Rapid Prototyping applications.

To avoid additional overload cases, a new configuration of the ES930.1 is required which either generates fewer data or increases the time intervals between the transfer of data. This can also be done, for example, with events that follow in succession that are not too short or through fewer events.

Short-term Overload

For short-term overload cases, the configuration can be transferred to the ES930.1 and, with according configuration, the overload situation can be ended.

Permanent overload

If the RP model has ended on the ES910.3-A, the ES930.1 continues to generate high data volumes due to the configuration that leads to a permanent overload. For this reason, the XCP connection between the IO interface of the ES910.3-A and the daisy chain connection of the ES930.1 remains at a constant overload.

Ending the permanent Overload

To end the overload, a change of the configuration of ES930.1 is required. This cannot be easily accomplished during a permanently lasting overload situation:

- An adjusted RP model containing a new configuration of the ES930.1, cannot transfer this configuration over the overloaded XCP connection to the ES930.1.

- The ES930.1 connected to the overloaded IO interface of the ES910.3-A can neither be accessed from the PC with the configuration program nor is it possible to perform a "Search for Hardware" with HSP.

The described permanent overload event can only be terminated,

- if the ES930.1 is disconnected from the IO interface of the ES910.3-A, connected directly with the PC and reconfigured, or

- if the source of the overload at the ES930.1, which generates the events at the digital input, is switched off or removed from the digital inputs and the module is reconfigured.

Note

The overload case described at the IO interface does not impact either the function or the performance at the other interfaces of ES910.3-A.

4.12 ECU Interface (ECU)

The ES910.3-A has one ECU interface which is routed to a 4-pin ECU connector (Lemo socket) on the back panel. The ECU interface is galvanically isolated from the other interfaces of the ES910.3-A.

4.12.1 Connecting the Hardware and Configuration

Hardware can either be connected directly to the ECU interface or be operated at an externally connected switch.

Operation without external Switch at the ECU Interface

The ES910.3-A can optionally access the following hardware directly if no external switch is connected to the ECU interface:

- an XETK or an ECU with Ethernet interface, or
- a text bench computer with iLinkRT^{TM} interface.

To access the directly connected hardware, the Ethernet Interfaces "PC" and "ECU" of the module must be connected with each other via the internal (software) switch of ES910.3-A (Ethernet layer 2 software bridge).

> **Note**
>
> *If hardware is connected **directly** at the ECU interface, the internal switch on the web interface of the module must be configured with the setting "L2 Bridge on" (see chapter 5.6.6 on page 63).*

Operation with external Switch at the ECU Interface

If the ECU interface is connected with an external switch, the following hardware can be connected to the external switch and, at the same time, be operated at the ES910.3-A:

- several XETKs or several ECUs with Ethernet interface, or
- additional ETAS modules, or
- one or several interfaces with the iLinkRT^{TM} protocol, or
- a combination of these Interfaces.

> **Note**
>
> *If an external switch **with** iLinkRT interface is used at the ECU interface, the PC or Drive Recorder may **not** be **directly** connected with the PC interface of ES910.3-A. PC or Drive Recorder must be connected to the external switch (see Fig. 4-8 on page 38).*
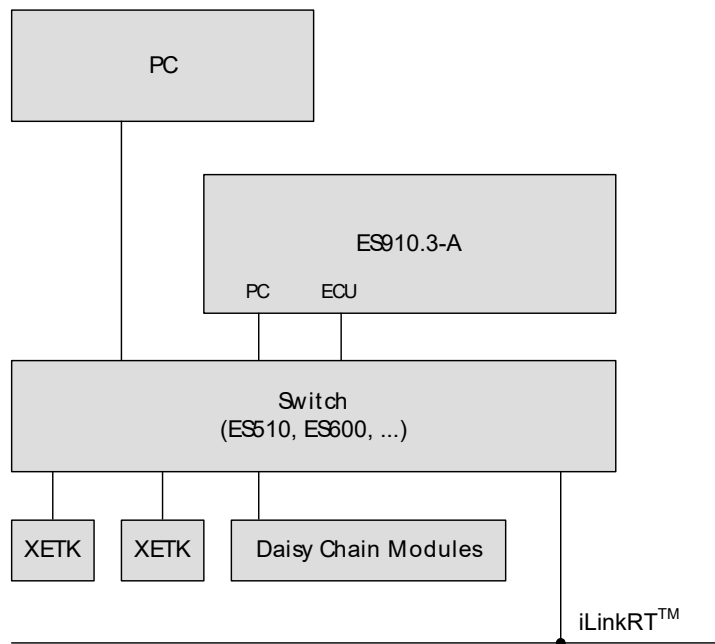
Fig. 4-8   Operation with external switch and iLinkRT^TM at the ECU interface

To access hardware that is connected to an external switch, the connection between the Ethernet interfaces "PC" and "ECU" via the internal (software) switch of ES910.3-A must be disconnected (Ethernet layer 2 software bridge).

> **Note**
>
> *If an external switch is connected to the ECU interface and the iLinkRT function is used at the external switch, the internal switch on the web interface of the module must be configured with the setting "L2 Bridge off" (see chapter 5.6.6 on page 63).*
> *Without this setting, data losses or other errors of ES910.3-A may occur even after minutes of a functional operation.*

> **Note**
>
> *In the delivery state, the ECU interface of ES910.3-A is configured for operation with an external switch ("L2 Bridge off" setting on the web interface of the module).*

4.12.2   Hardware Detection and Protocols

The ES910.3-A detects the directly or via external switch connected hardware (XETK/ECU or iLinkRT^TM bus) and automatically uses the required protocol.

4.12.3   "XETK / ECU with Ethernet Interface" Operating Mode

The ECU interface of the ES910.3-A uses an Ethernet connection in duplex operation for data transfer. The universal ASAM measure and calibration protocol XCP is used for serial communication. The link to the ECU or the XETK corresponds to the XCP specification V1.0.0.

XCP on UDP Rapid Prototyping

The ECU interface supports the XCP on UDP bypass functionality for Rapid Prototyping. The ES910.3-A acts as an XCP master; the connected XCP on UDP bypass device acts as an XCP slave.

XCP on TCP/IP Measuring and Calibrating

The ECU interface supports the XCP on TCP/IP functionality for measuring and calibrating. The ES910.3-A acts as an XCP master; the connected XCP on TCP/IP device acts as an XCP slave.

The universal ASAM measure and calibration protocol XCP is used for serial communication. The UDP/IP protocol is used on the Ethernet transport and network layer.

XETK Rapid Prototyping and Simultaneous Measuring / Calibrating

The ES910.3-A simultaneously supports the functionalities XCP on UDP bypass for Rapid Prototyping and XCP on TCP/IP for measuring and calibrating at the ECU interface for an ECU with XETK.

Note

The operation of an external switch at the ECU interface with daisy chain modules is supported starting with HSP V9.6.0.

4.12.4   "Ethernet Interface with iLinkRT^TM Protocol" Operating Mode

iLinkRT

iLinkRT^TM was developed jointly by AVL List GmbH and ETAS GmbH specifically for the application case of a fast ECU access with INCA-MCE. iLinkRT^TM is a proprietary, open and performance-optimized protocol. It is based on the automotive standard XCP-on-Ethernet, whereby only commands for the measurement and calibration privilege are used.

iLinkRT^TM allows fast measurement and calibration privileges as well as simple implementation for migrating existing test benches up to INCA-MCE.

Note

For additional information about iLinkRT, see the protocol specification "iLinkRT XCP Implementation Description", which is available from ETAS GmbH upon request.

Note

For additional information about the application access via iLinkRT, see chapter 5.4.4 on page 55 and the INCA-MCE User's Guide.

Synchronization of ETAS Modules in iLinkRT Operating Mode

The ETAS hardware synchronization function at the PC interface (SYNC IN) of ES910.3-A is activated in the iLinkRT^TM operating mode.

Connecting the Test Bench Computer

The ECU interface and the test bench computer with iLinkRT^{TM} interface are connected with the CBE200 cable.

4.12.5 "External Switch with ETAS Modules" Operating Mode

At an external switch connected to the ECU interface, it is possible to operate not only several ECUs or several XETKs in rapid prototyping or MC applications, but also additional ETAS modules in MC applications.

> **Note**
>
> *The operation of an external switch at the ECU interface with daisy chain modules is supported starting with HSP V9.6.0.*

For additional information about the use of INCA-MCE, see chapter 5.4.4 on page 55.

4.12.6 Feature

You can find a list of applications supported by the ES910.3-A at the ECU interface in chapter 7.6.2 on page 78.

4.13 Extension Slot

The ES910.3-A has a slot for add-ons (Extension slot). Currently, an ES920.1 FlexRay module or an ES921.1 CAN module can be used.

4.14 NVRAM

Typically, diagnostic data (error states or the last operational states) are stored in non-volatile RAM (NVRAM). Data to be retained during a loss of power or a power-on cycle can be stored in this memory. This data can be read out and analyzed the next time the module is launched.

NVRAM supports cold-start measurements and self-learning algorithms. There are 32 kBytes of NVRAM in the address space of the main processor of the ES910.3-A.

For more information on the NVRAM, refer to the INTECRIO documentation.

4.15 Watchdog

The OSEK operating system of the ES910.3-A enables the realization of a User Watchdog function by software. This enables advanced security concepts to be implemented easily in the rapid prototyping system.

The watchdog function is run in a proprietary independent process and periodically monitors the RTA-OSEK application in which the simulation model runs.

The user can adapt the watchdog function to suit the requirements of the simulation model.

For more details, consult the INTECRIO documentation.

4.16   Real Time Clock

The ES910.3-A has a Real Time Clock (RTC). The clock has to be set in the web interface of the ES910.3-A. This involves the PC time being transferred to the module. The module can also temporarily store the time for a specific duration without a supply voltage.

Error logs are assigned this time information. This makes it possible to ascertain the correct time relationships of the error logs either with the fault behavior of the system or with other events.

The Real Time Clock of the ES910.3-A must be synchronized with the PC in the following cases:

- the first time the ES910.3-A is used,

- at regular intervals or

- after the maximum buffer time has expired (is not used if the ES910 is on standby).

For the technical details of the Real Time clock, refer to chapter 7.7.10 on page 86.

4.17   Firmware

4.17.1   Firmware of the ES910.3-A

The firmware of the ES910.3-A can be updated by the user him/herself so that future versions, perhaps modules with a more extensive range of functions, can also be used. The firmware update is executed on the connected PC using service software.

4.17.2   Firmware of the Modules mountable in the Extension Slot

Note

*As delivered, the ES910.3-A module contains **no** firmware to support the modules mountable in the extension slot.*

The required firmware will be loaded additionally when the extension module is plugged in and the ES910.3-A firmware is updated by the HSP service software. This firmware update is esssential in following cases:

- after the first-time installation of an extension module and

- after every module type replacement in the extension slot (e.g. ES920 replaces the ES921).

If immediate successively different examplares of the same module type (e.g. ES920) are used in the same ES910.3-A module no additional firmware update is necessary.

5   Getting Started

This chapter describes the assembly, cabling and configuration for the ES910.3-A.

5.1   Transferring Dissipated Heat

5.1.1   Ventilation of the Module

The housing of the ES910.3-A absorbs the heat generated inside the module due to dissipation power and disperses it via its surface.

The module requires additional ventilation with an internal fan and ventilation slits on the side to prevent the ES910.3-A from overheating during operation, increase the safety and reliability of the module and extend its useful life.

5.1.2   Monitoring the Temperature

The temperature in the housing of the ES910.3-A is constantly measured and monitored; operational ranges are indicated on the front of the module via the **°C** indicator.

Indicator	Display	Operational State
°C	Red (Flash code 3)	Temperature inside the housing has exceeded a critical level, model is stopped, ES910.3-A is in standby
	Red	Temperature inside the housing has exceeded the critical level, model is stopped,
	Red (Flash code 2)	Temperature inside the housing has reached a critical level.
	Off	Temperature inside the housing is in normal operational range.

If the **°C** indicator flashes, the air circulation and thus the heat transfer of the module must be improved without delay. To ensure safe operation of the ES910.3-A, you can, for example, reduce the ambient temperature.

If the temperature inside the ES910.3-A continues to rise, the module powers off automatically and the **°C** indicator is lit until the normal operating temperature is reached inside the housing. This protects the electronics of the module from being irreversibly damaged due to overheating.

5.2   Setup

5.2.1   Requirements for Setting Up an ES910.3-A Module

You must adhere to important requirements when setting up and operating the ES910.3-A to ensure efficient exchange of heat with the environment and avoid heat concentration:

- Place the ES910.3-A module on a smooth, flat surface.
- Do not stand the ES910.3-A module on its long sides.

- Do not stand the ES910.3-A module on its top side.
- Never place objects on top of the module.
- Keep the ES910.3-A module away from sources of heat and make sure the module is not standing in direct sunlight.
- Adhere to the minimum distances of at least 10 centimeters on the sides and above the module (see Fig. 5-1 on page 43).
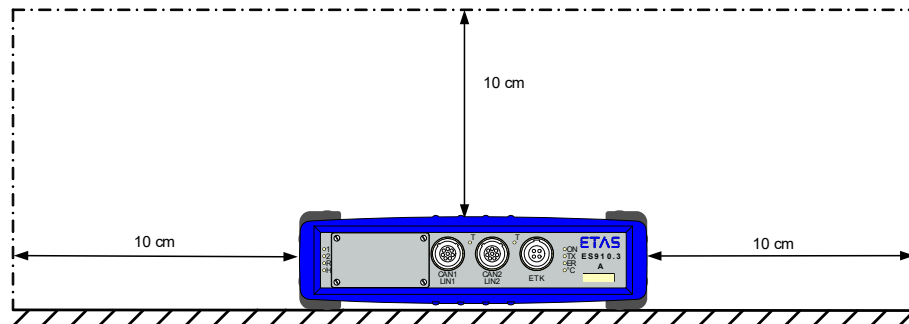- Do not operate the ES910.3-A module in completely enclosed containers.

Fig. 5-1   Free Space around the ES910.3-A

> ⚠ **CAUTION!**
>
> ***Heat concentration in the module possible!***
> *The electronics can be damaged due to overheating.*
> *Do not cover ventilation slits when setting up, assembling or connecting the ES910.3-A module.*
> *Adhere to the minimum distances at the sides and above.*

5.2.2   Requirements when Setting up with Other Modules

You must adhere to important requirements when setting up and operating the ES910.3-A with other modules to ensure sufficient ventilation and avoid heat concentration:

- ETAS recommends not to stack or assemble ES910.3-A modules on top ofeach other particularly if these modules are to be operated simultaneously.
- Please adhere to the general notes on setting up and operating the ES910.3-A in chapter 5.2.1 on page 42!

> ⚠ **CAUTION!**
>
> ***Heat concentration on the top of the module.***
> *The electronics can be damaged due to overheating.*
> *Do not stack several ES910.3-As on top of each other.*
> *When stacking the ES910.3-A with other ETAS modules, it always has to be on top.*

5.3   Assembly and Locking

5.3.1   Fixing a Module onto a Carrier System

The ES910.3-A has a rugged metal housing with nonskid plastic feet. The unit can easily be screwed onto a carrier system for installation in a vehicle or in the lab.

The screw thread for attaching your device is already contained in the housing and is easily accessible.

⚠️ **CAUTION!**

Heat concentration on the long sides of the module.
The electronics can be damaged due to overheating.
Do not cover ventilation slits when setting up, assembling or connecting with other modules. Adhere to the minimum distance at the sides.

To fasten the ES910.3-A housing:

- Remove the plastic feet from the bottom of the module by pushing a minus screwdriver between the housing bottom and the plastic foot. Lifting off the plastic foot using the screwdriver as a lever.
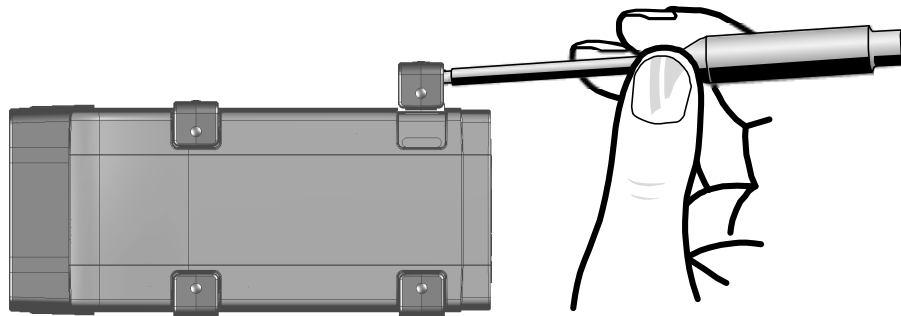

Fig. 5-2   Levering Off the Plastic Foot

- A threaded hole will become visible under the plastic foot.

  The threads for fastening the module are located both on the bottom of the ES910.3-A housing.
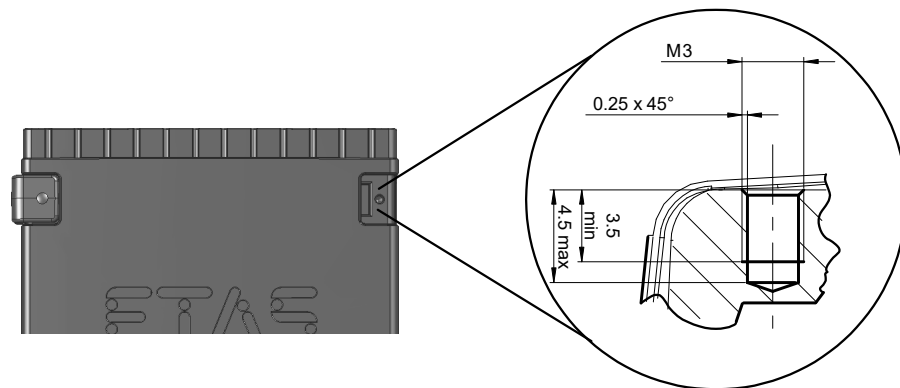
Fig. 5-3   Tapped blind hole

> ⚠ **CAUTION!**
>
> ***The electronic can be damaged or destroyed!***
> *Do not rework the threaded hole.*

Note

*Use **excluding** M3 cylinder screws and fastening the module onto your carrier system with a max. torque of 0.8 Nm.*
The max. length of engagement into the tapped blind hole of housing is 3 mm (see Fig. 5-3 on page 45).

5.3.2   Connecting Several Modules Mechanically

As ETAS system housing was used, the ES910.3-A can also be connected to modules of the ETAS compact line (ES59x, ES6xx, ES930) providing certain conditions are adhered to (see chapter 5.2.2 on page 43). These can be combined easily using the T-Brackets provided to form larger blocks.

ES910.3-A modules can only be connected vertically to other modules.

If the ES910.3-A is to be connected with modules of the ETAS compact line, the latter must not be positioned to the side of the ES910.3-A as this would mean insufficient exchange of heat.

> ⚠ **CAUTION!**
>
> ***Heat concentration on the long sides of the module.***
> *The electronics can be damaged due to overheating.*
> *Do not cover ventilation slits when setting up, assembling or connecting with other modules. Adhere to the minimum distance at the sides.*

You can attach a further module of the ETAS compact line under the ES910.3-A. Just remove the four plastic feet on each of the relevant device sides and attach the T-Brackets provided in their place.

To connect modules mechanically:

- Remove the four plastic feet from the bottom of the ES910.3-A so a further module can be attached.

  This makes the assembly slits for the T Brackets accessible.

  You can attach a further module **under** the ES910.3-A.

- Remove the four plastic feet on the relevant side of the second module.

- Turn the seals of the T-Brackets so they are at a right angle to the longitudinal axis of the brackets and click two brackets into the assembly slits on one long side of the first module.

- Click the second module into the two T-Brackets.
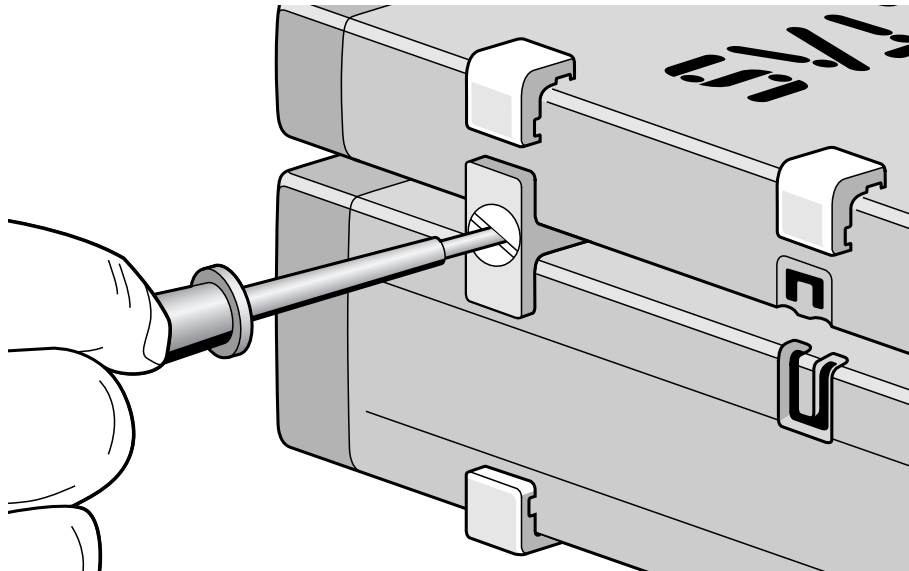
Fig. 5-4   Connecting the ES910.3-A to Another Module

- Quarter-turn the seals of the T-Brackets. This locks the connection of the two modules.

- Click the other two T-Brackets into the assembly slits on the opposite long side of the device and lock these brackets too.

- If you would like to stack further modules, repeat this procedure with the next module.

Note

Please adhere to the requirements listed in chapters 5.2.1 on page 42 and 5.2.2 on page 43.

5.4 Applications

> **Note**
>
> *You can find a list of applications supported by the ES910.3-A in chapter 7.6.2 on page 78.*

5.4.1 ETK Bypass Systems

ETK Bypass System via ETK Interface and CAN Interface

In this application, the rapid prototyping tasks and the calculating of the functions are realized by the ES910.3-A. The ES910.3-A is equipped with an access via the CAN interfaces (High-Speed or Low-Speed) and the ETK interface for bypass applications. Additionally measure and calibration applications can be executed using the CAN interfaces and the ETK interface.
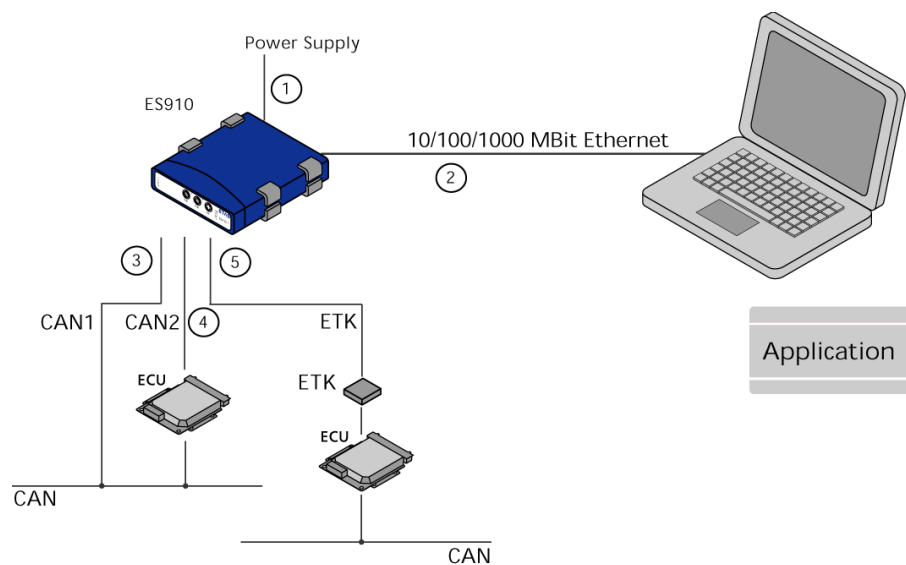
Fig. 5-5   ETK Bypass System with ES910.3-A

Cable in Fig. 5-5	Function	Short Name
1	Power supply cable	CBP120, CBP1205
2	PC connecting cable	CBE200
3, 4	CAN connecting cable	K106, K107, CBAC130, CBAC140, CBAC150, CBCX130
5	ETK connecting cable	CBM150

ETK Bypass System via ETK Interface and CAN/LIN Interfaces

Here, the ES910.3-A runs rapid prototyping tasks and calculates the functions.

The ES910.3-A has access for bypass applications via the CAN interfaces (High-Speed or Low-Speed), the LIN interfaces and the ETK interface.

Measuring and calibration applications are also possible via the CAN interfaces and the ETK interface.

Fig. 5-6   ETK Bypass System with ES910.3-A

Cable in Fig. 5-6	Function	Short Name
1	Power supply cable	CBP120, CBP1205
2	PC connecting cable	CBE200
3, 4	CAN/LIN connecting cable (CAN/LIN combined)	CBCFI100
	CAN connecting cable (CAN only)	CBAC130, CBAC140, CBAC150, CBCX130
5	ETK connecting cable	CBM150

XETK Bypass System via ECU Interface and CAN/LIN Interfaces

Here, the ES910.3-A runs rapid prototyping tasks and calculates the functions.

The ES910.3-A has access for bypass applications via the CAN interfaces (High-Speed or Low-Speed), the LIN interfaces and the ECU interface. Measuring and calibration applications are also possible via the ECU interface. The ECU interface of the ES910.3-A must be connected directly to the XETK.
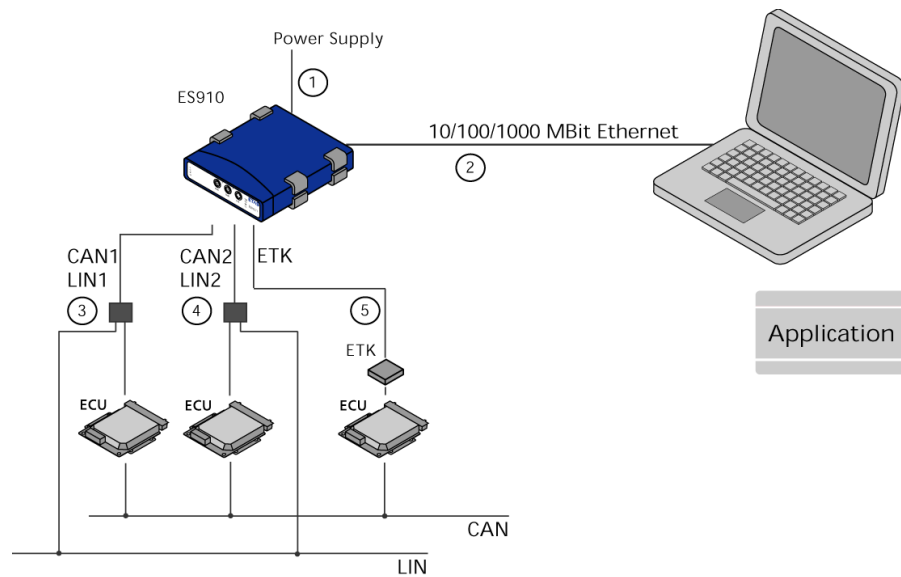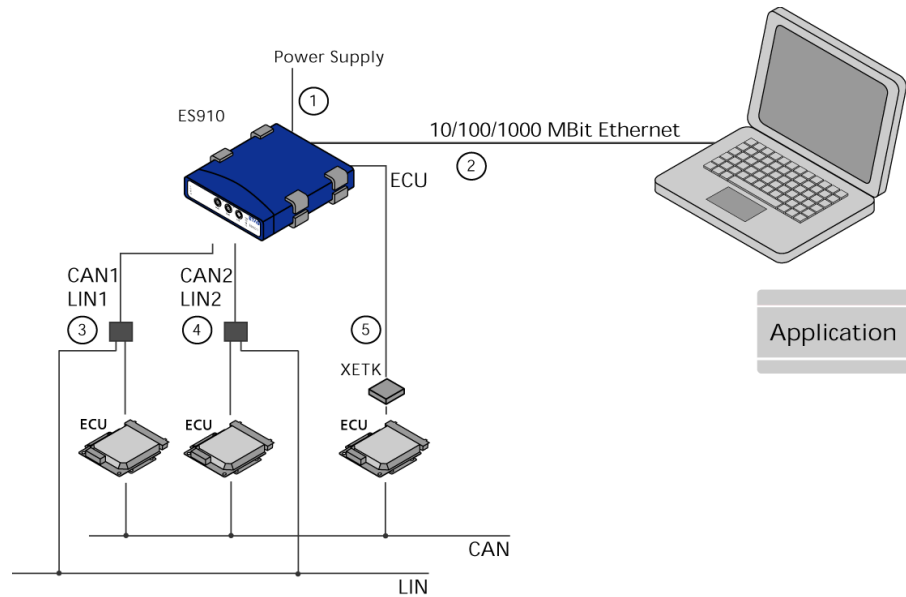

Fig. 5-7   ETK Bypass System with ES910.3-A

Cable in Fig. 5-7	Function	Short Name
1	Power supply cable	CBP120, CBP1205
2	PC connecting cable	CBE200
3, 4	CAN/LIN connecting cable (CAN/LIN combined)	CBCFI100
	CAN connecting cable (CAN only)	CBAC130, CBAC140, CBAC150, CBCX130
5	XETK connecting cable	CBE230

5.4.2 ETK Bypass System with Simultaneous Measuring and Calibration

ES910.3-A with ES600 Network Module

Using an ES600 network module makes it possible to measure and calibrate simultaneously in the ETK Bypass System.
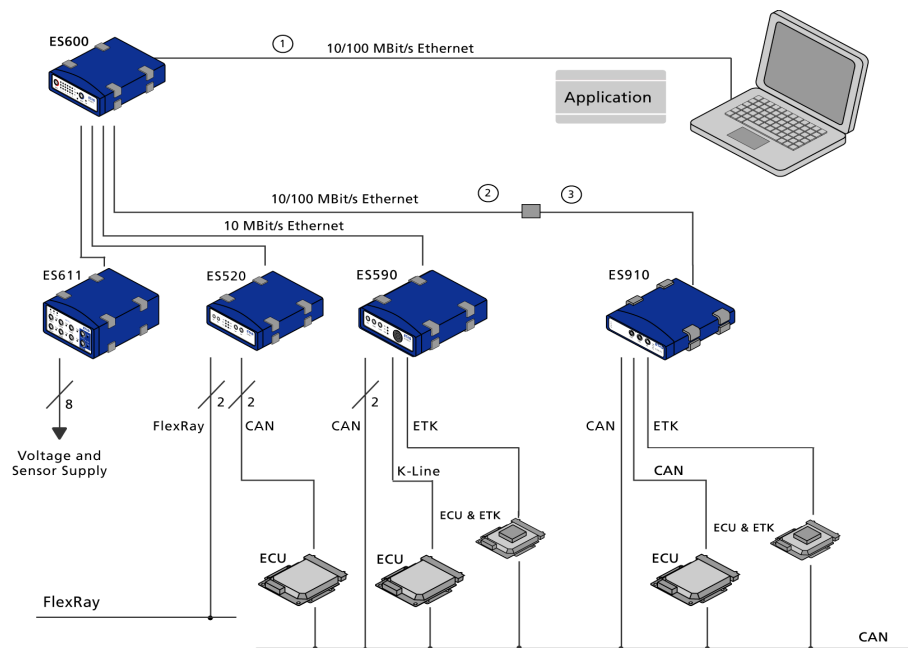

Fig. 5-8   ETK Bypass System with Simultaneous Measuring and Calibration

Cable in Fig. 5-8	Function	Short Name
1	PC connecting cable	CBE100
2	Ethernet adapter cable (100 Mbit/s)	CBAE330 (connected to cable 3)
3	Ethernet connecting cable (1 Gbit/s)	CBE230 (connected to cable 2)

In INCA/INCA-EIP, the ES910.3-A Rapid Prototyping Module acts as an ECU with a calibration port. INCA synchronizes the measure signals from the Rapid Prototyping Target with those of the vehicle ECU and sensors (see Fig. 5-8 on page 50).

In bypass experiments, INCA has access to all control and diagnostic parameters as well as to all measure signals of the connected ECU via the ETK interface of the ES910.3-A. In addition, INCA/INCA-EIP provides access to all bypass variables stored in the ES910.3-A Rapid Prototyping Module.

Further bus analysis functions on the CAN bus (CAN Monitoring, CAN CCP or XCP on CAN) can be made accessible with the modules ES59x/ES520, for example.
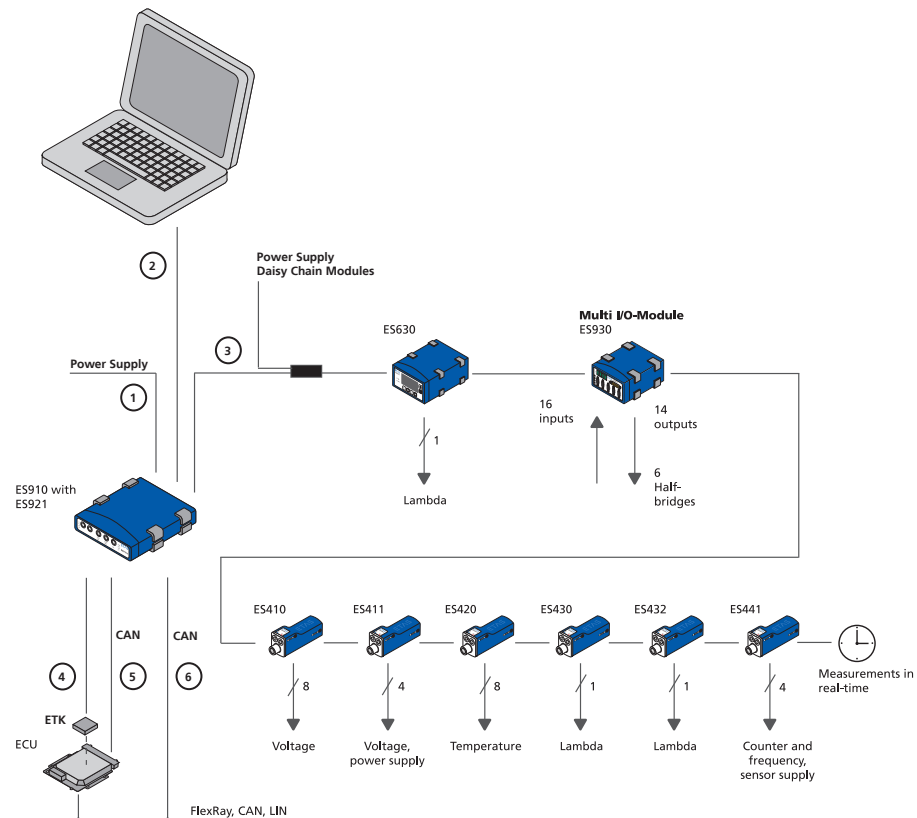
ES910.3-A with Daisy Chain Modules

Fig. 5-9   ETK Bypass System with Daisy Chain Modules

Cable in Fig. 5-9	Function	Short name
1	Power supply cable	CBP120, CBP1205
2	PC connecting cable	CBE200
3	Power supply and Ethernet cable Daisy Chain modules	CBEP430, CBEP4305
4	ETK connecting cable	CBM150
5, 6	CAN connecting cable (CAN only)	CBAC130, CBAC140, CBAC150, CBCX130

ES4xx/ES63x/ES93x modules in a decentral ETAS Ethernet topology (daisy chain) can be used either for measurement and calibration with INCA or for Rapid Prototyping with INTECRIO and the ES910.3-A module.

The IO interface of the ES910.3-A enables an module chain to be connected directly. All you need to do is connect the data transfer cable CBEP430 or the data transfer cable CBEP4305 to the ES910.3-A module.

The ES400 product family concept of positioning the small and sturdy ES400 modules as close as possible to the sensors, concatenating the modules with each other and connecting just the first module of this chain to the ES910.3-A results in a simple network architecture.

Connecting an ES400 module chain integrates their new powerful, scalable interfaces of varying types to a single interface of the ES910.3-A Rapid Prototyping Module. For example, the ES411.1 Module enables A/D conversion with power supply of the sensors (4 channels) and the ES420 Module enables thermal measuring. The ES930.1 Multi I/O Module provides different analog and digital inputs and outputs as well as half-bridge switches.

The Daisy Chain modules can be accessed directly from the Rapid Prototyping experiment when using the ES910.3-A. Every signal can be processed directly in the Rapid Prototyping model.
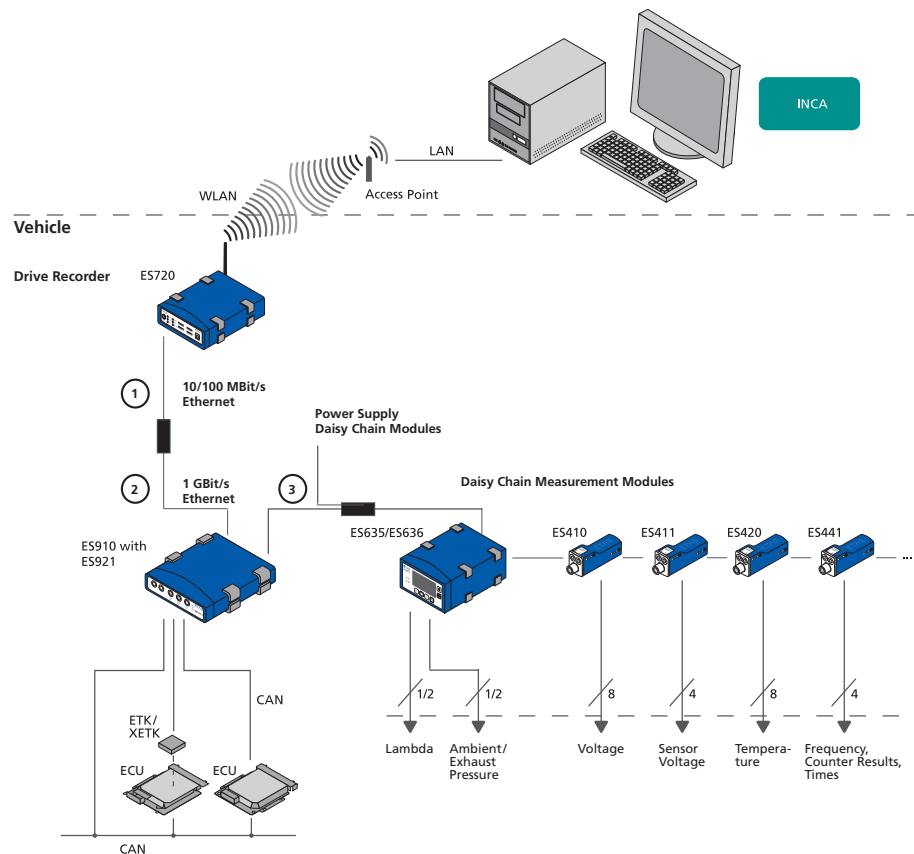
5.4.3   ES910.3-A with ES720.1 Drive Recorder

Fig. 5-10   ETK Bypass System with ES720 Drive Recorder and Daisy Chain Modules

Cable in Fig. 5-10	Function	Short Name
1	Ethernet adapter cable (100 Mbit/s)	CBAE330 (connected to cable 2)
2	Ethernet connecting cable (1 Gbit/s)	CBE230 (connected to cable 1)
3	Power supply and Ethernet cable Daisy Chain modules	CBEP430, CBEP4305

For measurement tasks in the development, application and validation of electronic vehicle systems, the ES910.3-A module can be connected directly to the ES720.1 Drive Recorder.

Additional ECU and bus interface modules as well as measurement modules are networked with each other via Ethernet and connected with the drive recorder or ES910.3-A.

The drive recorder records all the data acquired by the connected modules. ES720.1 supports the simultaneous recording of different measurements (multi-recording). The data are stored in the ASAM standard format MDF (Measure Data Format). They can be conveniently analyzed Measure Data Analyzer MDA from ETAS and easily compared with INCA reference measurements.

The ES720.1 module can automatically transfer the recorded measurement files encrypted and compressed via LAN, WLAN or wireless radio to customer-specific data servers.

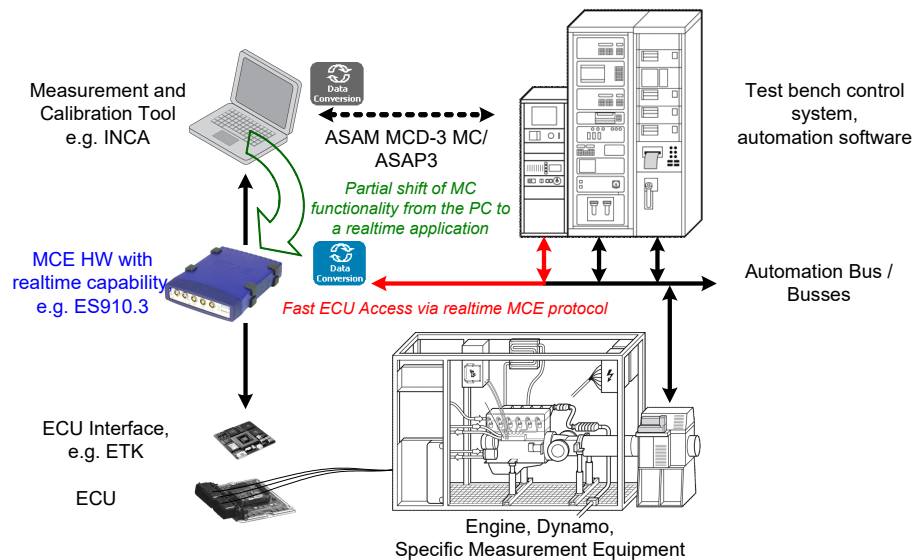### 5.4.4 ES910.3-A for fast application access with INCA-MCE

Fig. 5-11 Test Bench System with ECU access in real-time

With the fast test bench connection for automated measurement and calibration tasks INCA-MCE (Measurement and Calibration Embedded) developed by ETAS, an automation system can access the ECU in real-time via the ES910.3-A proto-typing and interface module.

Partial functions of the INCA application tool were relocated to the real time-capable ES910.3-A hardware.

The measurement and calibration privileges from the automation tool are then no longer carried out via ASAP3/ASAM MCD-3 MC, but via EtherCAT, a real time-capable, Ethernet-based fieldbus, or iLinkRT™, a heavily simplified variant of XCP-on-Ethernet.

The application mechanisms, such as converting the data exchanged between test bench (physical) and ECU (hexadecimal), are carried out on the real-time operating system of ES910.3-A.

Due to the fast access via INCA-MCE, functions such as those for component protection (e.g. knock controller and exhaust gas temperature monitoring) or virtual sensors (e.g. air-mass sensor, torque model and exhaust gas temperature sensor), which are often not yet available in the ECU during the early develop-ment phases, can be moved to the automation software of the test bench com-puter.

> **Note**
>
> *For additional information about the application access via EtherCAT as Ether-CAT slave device see chapter 4.11.3 on page 35 and the INCA-MCE User's Guide.*

> **Note**
>
> *For additional information about the application access via iLinkRT, see chapter 4.12.4 on page 39 and the INCA-MCE User's Guide.*

Cable for EtherCAT operating mode

A cable for connecting the EtherCAT bus to the IO interface of ES910.3-A module will be provided by ETAS Engineering upon request. Cable lengths of up to 30 m can be supplied.

Cable for iLinkRT operating mode

Connecting the iLinkRT^{TM} bus to the ECU interface of ES910.3-A is done with the CBE200 cable. Cable lengths of up to 8 m can be supplied.

5.5 Cabling

The interfaces of the ES910.3-A may be cabled in any order. Special connecting cables are available and can be ordered separately. An overview is contained in the chapter "Cables and Accessories" on page 106.

> **Note**
>
> *Make sure you carefully check the names of the cables used. Using the wrong cables can keep your ES910.3-A from functioning properly or damage the ES910.3-A and any devices connected to it.*

5.5.1 Power Supply Interface (7-29V DC)

To connect the ES910.3-A with the power supply:

- Connect the power supply cable supplied to the **7-29V DC** interface of the ES910.3-A.
- Connect the supply voltage pins of the cable with the required power supply.

    Note the color coding of the connectors.

    Note the current consumption of the ES910.3-A and its supply voltage range. The admissible values are listed in chapter 7.7.1 on page 81.

5.5.2 PC Interface (PC)

The CBE200-3 PC connecting cable supplied with the ES910.3-A module is only suitable for the direct connection to a user PC. For information on other connecting cables which can be supplied separately, refer to the chapter "Cables and Accessories" on page 106.

Operating the ES910.3-A Separately on a PC

To use the ES910.3-A separately on a PC:

- Connect the CBE200 PC connection cable supplied to the **PC** interface of the ES910.3-A.
- Connect the RJ-45 connector with the available Ethernet interface port of your PC.
- Launch your application.

Operating the ES910.3-A at an ES720.1 Drive Recorder

If you want to operate the ES910.3-A with an ES720.1 drive recorder, you find detailed relevant information in the user documentation of ES720.1.

The cables CBE230 and CBAE330 are required for connecting the modules. For information about additional available connecting cables, see chapter "Cables and Accessories" on page 106.

Commissioning the ES910.3-A with an ES720.1 drive recorder:

- Connect the CBE230 cable with the CBAE330 adapter cable.

- Connect the **PC** port of ES910.3-A with the CBE230 cable connection and the CBAE330 adapter cable with the **ETH** port of ES720.1 .

  Observe the color coding of the plug connectors which must match the corresponding marking at the housing.

- Start your application.

Operating an ES910.3-A with Other Devices on a PC

If you want to operate the ES910.3-A with other devices from the ES5xx/ES6xx line on one PC, consult the ES600 user documentation for details.

To operate an ES910.3-A with other devices of the ES5xx/ES6xx line:

- If you would like to operate the ES910.3-A with several devices from the ES5xx-/ES6xx line, connect the CBE230 Ethernet connection cable (which has to be purchased separately) to the Ethernet connection adapter CBAE330.

- Connect the **PC** port of the ES910.3-A to an ES600 using the cable connection CBE230 and CBAE330 adapter cable.

  Note the color coding of the connectors which has to match up with the corresponding marking on the housing. For more details, refer to the ES600 user documentation.

- Launch your application.

  The relevant user documentation contains information on configuration and data acquisition.

5.5.3   IO Interface (IO)

"Daisy Chain" Operating Mode

The IO interface of ES910.3-A does not supply the daisy chain modules of the ES4xx/ES63x/ES93x with operating voltage. Connecting these modules to ES910.3-A is, therefore, done with the CBEP430 or the CBEP4305 Y-cable for providing the supply voltage of the daisy chain modules (see Fig. 5-9 on page 51).

To wire the first Daisy Chain module with the ES910.3-A and the power supply

- Connect the combined Ethernet and power supply cable with the **IN** socket of the first module of the module chain.

- Connect the free connector with the IO interface **IO** of your ES910.3-A.

- Connect the supply voltage connector of the combined Ethernet and power supply cable with the desired power supply.

  Note the color coding of the connectors.

- Find out more about how to proceed when wiring the Daisy Chain modules in the relevant User's Guide.

"EtherCAT" Operating Mode

The cable for connecting the EtherCAT bus to the IO interface of the ES910.3-A module will be provided by ETAS Engineering upon request. Cable lengths of up to 30 m can be supplied.

5.5.4   ECU Interface (ECU)

The ECU interface and the test bench computer with iLinkRT^{TM} interface are connected with the CBE200 cable.

5.6   Configuring the ES910.3-A

The ES910.3-A is configured by the **ON/AUTO** switch and at the PC via a graphic user interface. A web browser application is used as an interface.

5.6.1   Web Interface

The web interface of the ES910.3-A consists of a home page, a page for customized configuration of the interfaces for the "Wake Up" function and other pages with information on the status of the ES910.3-A.

Note

After changing a configuration on the web interface of ES910.3-A, the module has to be restarted!

5.6.2   Launching the ES910.3-A Web Interface

To launch the ES910.3-A web interface:

- Connect the ES910.3-A to the PC.
- Start the HSP program on the PC.
- Click **Hardware Search**.
- Highlight the ES910.3-A to be configured in the "Hardware" window.
- Right-click **System Configuration**.

  The default web browser launches the web interface for configuring the ES910.3-A with the current IP address of the module in the address field.

  The home page of the ES910.3-A web interface is displayed.

5.6.3   Configuring the "Wake Up" Function

To configure the "Wake Up" function:

- Start the ES910.3-A web interface (see chapter 5.6.2 on page 60).
- Click **Device Configuration**.
- Click **Wake Up**.

  The page for configuring the "Wake Up" function is displayed.
- Configure the interfaces of the ES910.3-A for the "Wake Up" function.

Note

After changing a configuration on the web interface of ES910.3-A, the module has to be restarted!

5.6.4   Configuring the CAN/LIN Interfaces

Calling up the Configuration Page on the Web Interface

Calling up the configuration page:

- Start the ES910.3-A web interface (see chapter 5.6.2 on page 60).
- Click **Device configuration**.
- Click **Port Settings**.

  The page for configuring the CAN/LIN interfaces is displayed.

Configuring the CAN Interfaces

For more details on the configurable parameters of the CAN interfaces, refer to chapter 4.8 on page 30. The CAN interfaces can be configured independently of one another.

To configure the CAN1 interface:

- Select "High Speed".

  The CAN1 interface is operated in the operating mode "High-Speed".

or

- Select "Low Speed / Fault Tolerant".

  The CAN1 interface is operated in the operating mode "Low-Speed".

- Click **Save Config**.

  The configuration of the CAN1 interface is saved.

To configure the CAN2 interface:

- Select "High Speed".

  The CAN2 interface is operated in the operating mode "High-Speed".

or

- Select "Low Speed / Fault Tolerant".

  The CAN2 interface is operated in the operating mode "Low-Speed".

- Click **Save Config**.

  The configuration of the CAN2 interface is saved.

Note

After changing a configuration on the web interface of ES910.3-A, the module has to be restarted!

Configuring the LIN Interfaces

For more details on the configurable parameters of the LIN interfaces, refer to chapter 4.9 on page 31. The LIN interfaces can be configured independently of one another.

To configure the LIN1 interface:

- Select "Master resistor disconnected".

  The LIN1 interface is operated without the internal termination resistor.

  or

- Select "Master resistor connected".

  The LIN1 interface is operated with the internal termination resistor.

- Click **Save Config**.

  The configuration of the LIN1 interface is saved.

To configure the LIN2 interface:

- Select "Master resistor disconnected".

  The LIN2 interface is operated without the internal termination resistor.

  or

- Select "Master resistor connected".

  The LIN2 interface is operated with the internal termination resistor.

- Click **Save Config**.

  The configuration of the LIN2 interface is saved.

Note

After changing a configuration on the web interface of ES910.3-A, the module has to be restarted!

5.6.5   Configuring the IO Interface

For notes about the configurable parameters of the IO interface, see chapter 4.11 on page 34.

Note

At the "IO" interface, it is possible to use either ETAS daisy chain modules or the EtherCAT automation bus. The simultaneous use at an ES910.3-A module is not possible.

Calling up the Configuration Page on the Web Interface

Calling up the configuration page:

- Start the ES910.3-A web interface (see chapter 5.6.2 on page 60).

- Click on **Device Configuration**.

- Click on **Port Settings**.

  The page for configuring the IO interface is displayed.

Configuring the IO Interface

To configure the IO interface

- Under the Port Micro I/O Interface, select the "ES400 daisy chain" setting.

  The IO interface is configured for operating with daisy chain modules.

or

- Under the Port Micro I/O Interface, select the "EtherCAT slave" setting.

- For EtherCAT mode, select the "EtherCAT enhanced mode" setting.

  The IO interface is configured for operating in the EtherCAT mode.

- Click on **Save Config**.

  The configuration of the IO interface is being saved.

Note

After changing a configuration on the web interface of ES910.3-A, the module has to be restarted!

5.6.6   Configuring the ECU Interface

Calling up the Configuration Page on the Web Interface

Calling up the configuration page:

- Start the ES910.3-A web interface (see chapter 5.6.2 on page 60).

- Click on **Device Configuration**.

- Click on **Ethernet Configuration**.

  The page for configuring the internal switch (Ethernet layer 2 software bridge) of ES910.3-A is displayed.

Configuring the ECU Interface

If hardware is connected **directly** to the ECU interface, the **internal** switch of ES910.3-A must be configured with the "L2 Bridge on" setting. If an **external** switch is connected to the ECU interface, the **internal** switch of ES910.3-A must be configured with the "L2 Bridge off" setting. For additional notes about operating the ECU interface, see chapter 4.12.1 on page 37

Note

In the delivery state, the ECU interface of ES910.3-A is configured for operation with an external switch ("L2 Bridge off" setting on the web interface of the module).

To configure the internal switch:

- On the **Ethernet Configuration** page, select the **L2 Bridge on** setting.

  The Ethernet interfaces "PC" and "ECU" of the module are connected with each other via the internal (software) switch of ES910.3-A.

  The ECU interface is configured for operation with directly connected hardware (without external switch).

  or

- On the **Ethernet Configuration** page, select the **L2 Bridge off** setting.

  The connection between the Ethernet interfaces "PC" and "ECU" of the module is disconnected via the internal (software) switch of ES910.3-A.

  The ECU interface is configured for operation with an external switch.

- Click on **Save Config**.

  The configuration of the ECU interface is being saved.

Note

After changing a configuration on the web interface of ES910.3-A, the module has to be restarted!

6   Troubleshooting Problems

This chapter gives some information of what you can do when problems arise with the ES910.3-A and problems that are not specific to an individual software or hardware product.

6.1   Troubleshooting ES910.3-A Problems

Please observe the LEDs which provide information on the functions of the interface and the ES910.3-A (see the chapter "Indicators" on page 21) to be able to judge the operational state of the ES910.3-A as well as troubleshooting measures.

The following table lists some of the possible problems with a remedy.

If you have any further questions, please contact our Customer Support (see chapter 10 on page 110).

Problem	Diagnostic Questions	Possible Solutions
The ETK interface is not initialized.	Which ETK is connected?	Check whether the connected ETK is supported (see chapter 7.7.6).
The ES910.3-A is not found with "Search for Hardware" in INCA.	Have you installed the INCA Add-On ES9xx?	Check that at least INCA V6.2.1 with hotfix 7 and, in addition, INCA Add-On ES9xx V6.2.1 or higher have been installed.
	Is the hardware on the PC connected with the CBE200 cable?	Check that the connection is undamaged.
	Is the CBE200 cable connected on the correct interface of the ES910.3-A?	Check that the CBE200 cable is connected with the PC interface (PC) and not by mistake with the neighboring ECU interface (ECU).
	Is the CBE230 cable connected on the correct interface of the ES910.3-A?	Check that the CBE230 cable is connected with the ECU interface (ECU) and not by mistake with the neighboring PC interface (PC).

Problem	Diagnostic Questions	Possible Solutions
A XETK connected directly to the ECU interface or a directly connected ECU is not found in INCA using "Search for Hardware".	Is the internal switch of ES910.3-A connected?	On the web interface of ES910.3-A, check the setting of the internal switch (see chapter 5.6.6 on page 63). In this application, the internal switch of ES910.3-A must be configured with "L2 Bridge on" (see chapter 4.12.1 on page 37).
Data is lost during data transfer.	Are you using WLAN in your test setup?	WLAN is not permissible within this ETAS network. Wire your test setup (ETAS modules and their connection to the PC) with ETAS cables only.
	Are you using the correct type of network card in your laptop?	Check whether you are using a PCMCIA network card in your laptop. PCMCIA cards with an 8- or 16-bit data bus are not suitable. Only use PCMCIA cards with a 32-bit data bus, mini-PCI or ExpressCards.
	Are you using an external switch at the ECU interface in your measuring setup?	On the web interface of ES910.3-A, check the setting of the internal switch (see chapter 5.6.6 on page 63). In this application, the internal switch of ES910.3-A must be configured with "L2 Bridge off" (see chapter 4.12.1 on page 37).
	Are you using an ES930.1 in event mode in your measuring setup?	Check whether the error bit for the overload case of ES910.3-A is set at the IO interface. For notes about exiting the overload case, see chapter 4.11.5 on page 36.

6.2   Problems and Solutions

6.2.1   Network Adapter cannot be selected via Network Manager

Cause: APIPA is disabled

The alternative mechanism for IP addressing (APIPA) is usually enabled on all Windows XP and Vista systems. Network security policies, however, may request the APIPA mechanism to be disabled. In this case, you cannot use a network adapter which is configured for DHCP to access ETAS hardware. The ETAS Network Manager displays a warning message.

The APIPA mechanism can be enabled by editing the Windows registry. This is permitted only to users who have administrator privileges. It should be done only in coordination with your network administrator.

To enable the APIPA mechanism:

- Open the Registry Editor:
    - Windows XP:
      Click **Start** and then click **Run**. Enter `regedit` and click **OK**.
    - Windows Vista:
      Click **Start**, enter `regedit` in the entry field, and push <ENTER>.

  The registry editor is displayed.

- Open the folder `HKEY_LOCAL_MACHINE\SYS-TEM\` `CurrentControlSet\Services\` `Tcpic\Parameters\`
- Click **Edit** →**Find** to search for the key `IPAuto-configurationEnabled`.

If you cannot find any instances of the registry key mentioned, the APIPA mechanism has not been disabled on your system, i.e. there is no need to enable it. Otherwise proceed with the following steps.

- Set the value of the key `IPAutoconfigurationEnabled` to `1` to enable the APIPA mechanism.

  You may find several instances of this key in the Windows registry which either apply to the TCP/IP service in general or to a specific network adapter. You only need to change the value for the corresponding network adapter.

- Close the registry editor.
- Restart your workstation in order to make your changes take effect.

6.2.2   Search for Ethernet Hardware fails

Cause: Personal Firewall blocks Communication

For a detailed description on problems caused by personal firewalls and possible solutions see "Personal Firewall blocks Communication" on page 69.

Cause: Client Software for Remote Access blocks Communication

PCs or notebooks which are used outside the ETAS hardware network sometimes use a client software for remote access which might block communication to the ETAS hardware. This can have the following causes:

- A firewall which is blocking Ethernet messages is being used (see „Cause: Personal Firewall blocks Communication" on page68)

- By mistake, the VPN client software used for tunneling filters messages. As an example, Cisco VPN clients with versions before V4.0.x in some cases erroneously filtered certain UDP broadcasts.

  If this might be the case, please update the software of your VPN client.

Cause: ETAS Hardware hangs

Occasionally the ETAS hardware might hang. In this case switch the hardware off, then switch it on again to re-initialize it.

Cause: Network Adapter temporarily has no IP Address

Whenever you switch from a DHCP company LAN to the ETAS hardware network, it takes at least 60 seconds until ETAS hardware can be found. This is caused by the operating system's switching from the DHCP protocol to APIPA, which is being used by the ETAS hardware.

Cause: ETAS Hardware had been connected to another Logical Network

If you use more than one PC or notebook for accessing the same ETAS hardware, the network adapters used must be configured to use the same logical network. If this is not possible, it is necessary to switch the ETAS hardware off and on again between different sessions (repowering).

Cause: Device driver for network card not in operation

It is possible that the device driver of a network card is not running. In this case you will have to deactivate and then reactivate the network card.

To deactivate and reactivate the network card:

- To deactivate the network card first select in the Windows start menu the following item:
  - Windows XP:
    Control Panel →**Network Connections**
  - Windows Vista:
    Control Panel →**Network and Internet** →**Network and Sharing Center** →**Manage Network Connections**
- Right click on the used network adapter and select **Disable** in the context menu.

- In order to reactivate the network adapter right click on it again and select **Enable**.

Cause: Laptop power *management deactivates the network card*

The power management of a laptop computer can deactivate the network card. Therefore you should turn off power monitoring on the laptop.

To switch off power monitoring on the laptop:

- From the Windows Start Menu, select

    - Windows XP:
      Control Panel →**System**.

      Then select the **Hardware** tab and click on **Device Manager**.

    - Windows Vista:
      Control Panel →**System and Maintenance** →**Device Manager.**

- In the Device Manager open the tree structure of the entry **Network Adapters**.

- Right click on the used network adapter and select **Properties** in the context menu.

- Select the **Power Management** tab and deactivate the **Allow the computer to turn off this device to save power** option.

- Select the **Advanced** tab. If the property **Auto-sense** is included, deactivate it also.

- Click **OK** to apply the settings.

Cause: Automatic disruption of network connection

It is possible after a certain period of time without data traffic that the network card automatically interrupts the Ethernet connection. This can be prevented by setting the registry key `autodisconnect`.

To set the registry key `autodisconnect`:

- Open the Registry Editor.

- Select under `HKEY_LOCAL_MACHINE\SYSTEM\ ControlSet001\Services\lanmanserver\ parameters` the Registry Key `autodisconnect` and change its value to `0xffffffff`.

6.2.3   Personal Firewall blocks Communication

Cause: Permissions given through the firewall block ETAS hardware

Personal firewalls may interfere with access to ETAS Ethernet hardware. The automatic search for hardware typically cannot find any Ethernet hardware at all, although the configuration parameters are correct.

Certain actions in ETAS products may lead to some trouble if the firewall is not properly parameterized, e.g. upon opening an experiment in ASCET or searching for hardware from within INCA or HSP.

If a firewall is blocking communication to ETAS hardware, you must either dis-able the firewall software while working with ETAS software, or the firewall must be configured to give the following permissions:

- Outgoing limited IP broadcasts via UDP (destination address 255.255.255.255) for destination ports 17099 or 18001

- Incoming limited IP broadcasts via UDP (destination IP 255.255.255.255, originating from source IP 0.0.0.0) for destination port 18001

- Directed IP broadcasts via UDP to the network configured for the ETAS application, destination ports 17099 or 18001

- Outgoing IP unicasts via UDP to any IP in network configured for the ETAS application, destination ports 17099 through 18020

- Incoming IP unicasts via UDP originating from any IP in the network con-figured for the ETAS application, source ports 17099 through 18020, destination ports 17099 through 18020

- Outgoing TCP/IP connections to the network configured for the ETAS application, destination ports 18001 through 18020

Note

The ports that have to be used in concrete use cases depend on the hard-ware used. For more precise information on the port numbers that can be used please refer to your hardware documentation.

Windows XP and Vista come with a built-in personal firewall. On many other systems it is very common to have personal firewall software from third party vendors, such as Symantec, McAffee or BlackIce installed. The proceedings in configuring the ports might differ for each personal firewall software used. Therefore please refer to the user documentation of your personal firewall soft-ware for further details.

As an example for a firewall configuration, you will find below a description on how to configure the widely used Windows XP firewall if the hardware access is prohibited under Windows XP with Service Pack 2.

Solution for Windows XP Firewall, Users with Administrator Privileges

If you have administrator privileges on your PC, the following dialog window opens if the firewall blocks an ETAS product.

To unblock a product:

- In the "Windows Security Alert" dialog window, click on **Unblock**.

  The firewall no longer blocks the ETAS product in question (in the example: ASCET). This decision survives a restart of the program, or even the PC.

Instead of waiting for the "Windows Security Alert" dialog window, you can unblock ETAS products in advance.

To unblock ETAS products in the firewall control:

- From the Windows Start Menu, select **Settings** →**Control Panel**.
- In the control panel, double-click the **Windows Firewall** icon to open the "Windows Firewall" dialog window.
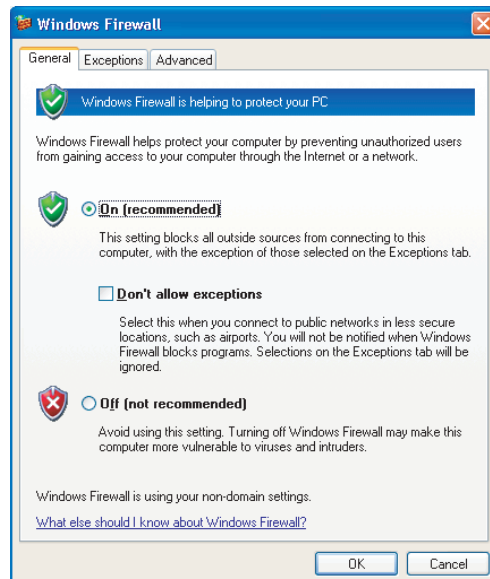
- In the "Windows Firewall" dialog window, open the "Exceptions" tab.
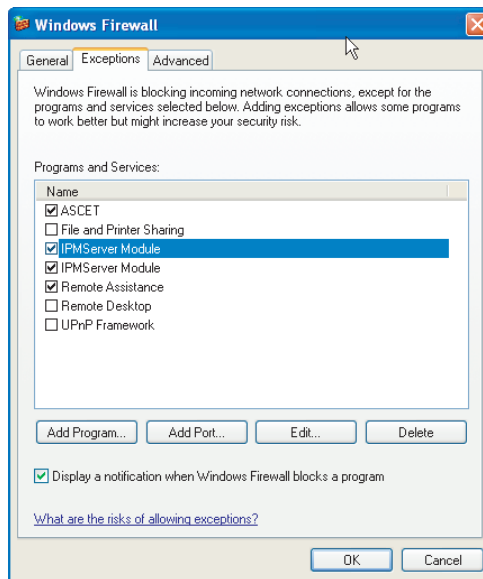
  This tab lists the exceptions not blocked by the firewall. Use **Add Program** or **Edit** to add new programs, or edit existing ones.

- Make sure that the ETAS products and services you want to use are properly configured exceptions.

  – Open the "Change Setup" window.
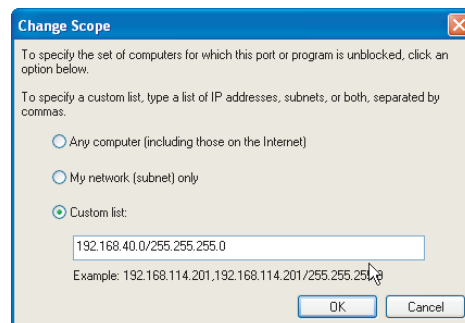
  – To ensure proper ETAS hardware access, make sure that at least the IP addresses `192.168.40.xxx` are unblocked.

  – Close the "Change Setup" window with **OK**.

- Close the "Windows Firewall" dialog window with **OK**.

  The firewall no longer blocks the ETAS product in question. This decision survives a restart of the PC.

Solution for Windows XP Firewall, Users without Administrator Privileges

This section addresses users with restricted privileges, e.g., no system changes, write restrictions, local login.

Working with an ETAS software product requires "Write" and "Modify" privileges within the `ETAS`, `ETASData`, and ETAS temporary directories. Otherwise, an error message opens if the product is started, and a database is opened. In that case, no correct operation of the ETAS product is possible because the database file and some `*.ini` files are modified during operation.

The ETAS software has to be installed by an administrator anyway. It is recommended that the administrator assures that the ETAS program/processes are added to the list of the Windows XP firewall exceptions, and selected in that list, after the installation. If this is omitted, the following will happen:

- The "Window Security Alert" window opens when one of the actions conflicting with a restrictive firewall configuration is executed.
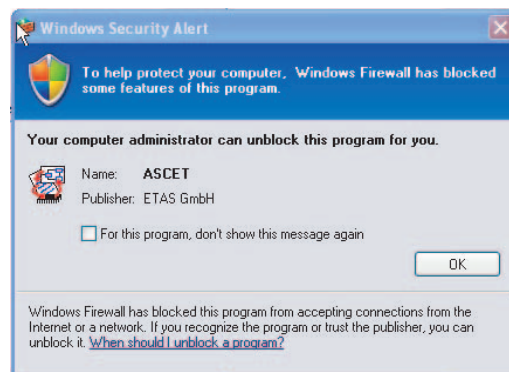
To unblock a program (no Admin privileges):

- In the "Windows Security Alert" dialog window, activate the option **For this program, don't show this message again**.

- Click **OK** to close the window.

  An administrator has to select the respective ETAS software in the "Exceptions" tab of the "Windows Firewall" dialog window to avoid further problems regarding hardware access with that ETAS product.

7   Technical Data

This chapter contains information about the following topics:

- "General Data" on page 74
- "RoHS Conformity" on page 76
- "CE Marking" on page 76
- "Product Return and rRcycling" on page 76
- "Use of Open Source Software" on page 77
- "System Requirements" on page 77
- "Electrical Data" on page 81 and
- "Pin Assignment" on page 87.

7.1   General Data

7.1.1   Identifications on the Product

The following symbols are used for identifying the product:

Symbol	Description
⚠	The User's Guide must be read prior to the startup of the product!
SN: 1234567	Serial number (7-digit)
Vx.yz	Hardware version of the product
F 00K 123 456	Order number of the product (see chapter 9.1 on page 105)
7–29V ⎓	Operating voltage range (DC voltage)
5 A	Current consumption, max.
CE	Marking for CE conformity, see chapter 7.3 on page 76
🚮	Marking for WEEE, see chapter 7.4 on page 76
♻e	Marking for China RoHS, see chapter 7.2.2 on page 76

7.1.2   Fulfilled Standards and Norms

The module adheres to the following standards and norms:

Norm	Test
EN 61326	Electrical equipment for measurement, control and laboratory use - EMC requirements
EN 61000-6-2	Immunity (industrial environments)
EN 61000-6-4	Emission standard (industrial environments)

The module is designed only for use in industrial environments in accordance with EN 61000-6-4. When using the module outside of industrial environments avoid possible radio disturbances by additional shielding measures!

WARNING!

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

7.1.3   Environmental Conditions

Operating temperature range	-40 °C to +50 °C
	-40 °F to +122 °F
Storage temperature range (module without packaging)	-40 °C to +85 °C
	-40 °F to +185 °F
Relative humidity (non-condensing)	0 to 95%
Operating altitude	max. 5,000 m / 16,400 ft
Degree of protection	IP30
Contamination level	2 (acc. to IEC 60664-1 and IEC 61010-1)

Note

*The module is suitable for use in interiors, in the passenger cell or in the trunk of vehicles. The module is **not** suitable for installation in the engine compartment and similar environments.*

7.1.4   Maintenance of the Product

Do not open or change the module housing! Work on the module housing may be performed only by qualified technical personnel. Return defective modules to ETAS for repair.

7.1.5   Cleaning the Product

We recommend cleaning the product with a dry cloth.

7.1.6   Mechanical Data

Dimensions (H x W x D)	36 mm x 126 mm x 160 mm
	1.42 in x 4.9 in x 6.3 in
Weight	approx. 850g / 1.87 lb

7.2   RoHS Conformity

7.2.1   European Union

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

ETAS confirms that the product meets this directive applicable in the European Union.

7.2.2   China

ETAS confirms that the product meets the "China RoHS" (Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation) guidelines applicable to the People's Republic of China with a China RoHS label attached to the product or its packaging.

7.3   CE Marking

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

7.4   Product Return and rRcycling

The European Union (EU) has issued the guideline on waste electric and electronic equipment (Waste Electrical and Electronic Equipment - WEEE) in order to ensure the institution of systems for collection, handling, and disposal of all electronic scrap.

This ensures that the devices are recycled in a resource-friendly way that does not represent any risk to personal health and the environment.

Fig. 7-1   WEEE symbol

The WEEE symbol (see Fig. 7-1 on page 76) on the product or its packaging identifies that the product may not be disposed of together with the remaining trash.

The user is obligated to separate the waste equipment and to provide it to the WEEE return system for reuse.

The WEEE Directive applies to all ETAS devices, but not to external cables or batteries.

Additional information about the recycling program of ETAS GmbH is available from the ETAS sales and service locations (see chapter 10 on page 110).

7.5   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.

7.6   System Requirements

7.6.1   Hardware

Operation of the ES910.3-A requires a power supply voltage of 7 V to 29 V DC.

Ethernet Interface of the PC

A PC with a free Ethernet interface (1 Gbit/s or 100 Mbit/s, Full Duplex) with an RJ-45 connection is required.

Prerequisite for successful initialization of the module

> **Note**
>
> *It is absolutely necessary to deactivate the function for automatic switching to power-save mode of your PC network adapter if there is no data traffic at the Ethernet interface!*

Deactivating the power-save mode:

In Control Panel / Device Manager / Network Adapter, select the network adapter used with a double-click. On the "Power Management" tab, deactivate the option "Allow the computer to turn off this device to save power". Confirm your configuration.

The manufacturers of the network adapters provide different names for this function.

Example:

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

Firmware of the Modules mountable in the Extension Slot

> **Note**
>
> *As delivered, the ES910.3-A module contains **no** firmware to support the modules mountable in the extension slot.*
> *The required firmware has to be loaded additionally (see chapter 4.17 on page 41).*

7.6.2 Supported Applications and Software Requirements

The ES910.3-A is supported by HSP V8.0.0 and higher. RTA-Trace V2.1 controls the interaction of the tasks of the ES910.3-A realtime operating system at runtime. Software in the following versions is required to configure and control the ES910.3-A and for data acquisition purposes.

Note

The supported applications and software versions displayed in the table apply exclusively to the ES910.3-A module described in this user's guide.

Interface ES910.3-A	Application	Classification [1]	HSP	Support in Application Software			
				INCA [2]	INCA-MCE	INTECRIO	ASCET-RP
CAN	CAN IO	RP	V8.0	no	no	V3.1.1	V6.1
	XCP on CAN Bypass	RP	V8.0	no	no	V3.1.1	V6.1
	CAN Monitoring	MC	V8.0	V6.2.1 [3]	no	no	no
	CCP	MC	V8.0	V6.2.1 [3]	no	no	no
	CCP	MCE	V9.4	V7.0.0	V1.0	no	no
	CAN Output	MC	V8.0	V6.2.1 [3]	no	no	no
	XCP on CAN MC	MC	V8.0	V6.2.1 [3]	no	no	no
	XCP on CAN MCE	MCE	V9.4	V7.0.0	V1.0	no	no
	KWP2000	MC	V8.0	V6.2.1 [3]	no	no	no
	UDS	MC	V8.0	V6.2.1 [3]	no	no	no
LIN	LIN IO	RP	V8.0	no	no	V3.1.1	V6.1
	LIN Monitoring	MC	V8.1	V6.2.1 [4]	no	V3.1.1	V6.1

Interface ES910.3-A	Application	Classification [1]	HSP	Support in Application Software			
				INCA [2]	INCA-MCE	INTECRIO	ASCET-RP
ETK	ETK Measurement and Calibration	MC	V8.0	V6.2.1 [3]	no	no	no
	ETK MCE	MCE	V9.4	V7.0.0	V1.0	no	no
	ETK Bypass	RP	V8.0	no	no	V3.1.1	V6.1
ECU	XCP on UDP	RP	V8.0	no	no	V3.1.1	V6.1
	XETK Measurement and Calibration	MC	V8.0	V6.2.1 [3]	no	no	no
	XETK MCE	MCE	V10.0 [5]	V7.1.0 [5]	V2.0 [5]	no	no
	XETK Bypass	RP	V8.0	no	no	V3.1.1	V6.1
	iLinkRT	RP	V9.4	V7.0.0	no	V3.1.1	V6.1
SP	Service Port	RP	V8.0	no	no	V3.1.1	V6.1
IO	ES4xx/ES63x modules	RP	V9.4	no	no	V3.1.1	V6.1
	ES930 modules	RP	V9.4	no	V1.0	V4.0.0	V6.1.3
	EtherCAT	MCE	V9.4	V7.0.0	V1.0	no	no

[1]: RP: Rapid Prototyping, MC: Measurement and Calibration, MCE: Measurement and Calibration Embedded
[2]: INCA/INCA-EIP: Measurement access via INCA-EIP (ab V6.2.1 and higher) to signals/ Rapid prototyping model values of the RP model
[3]: INCA V6.2.1 with Hotfix 7 and additionally INCA-ES9xx Add-On V6.2.1 and higher
[4]: INCA V6.2.1 with Hotfix 13 and additionally INCA-ES9xx Add-On V6.2.2 and INCA-LIN Add-On V6.2.3 and higher
[5]: planned

Note

Please observe the notes about supported ETK types and their use for bypass applications in chapter 7.7.6 on page 83.

7.6.3 Compatibility between Rapid Prototyping Models and ES910.3-A Firmware

Rapid prototyping models that were generated with INTECRIO V3.2.0 / ASCET-RP V6.1.2 or with earlier versions, cannot be executed on ES910.3-A systems containing the firmware from HSP V9.4.0 or from newer HSP versions.

If you want to use the aforementioned Rapid Prototyping models and INCA_EIP databases containing such models, they have to be generated again with INTE-CRIO V4.0.0 / ASCET-RP V6.1.3 or with newer versions so that the models can be executed on ES910.3-A systems containing the firmware from HSP V9.4.0 or newer HSP versions.

In the reverse case, Rapid Prototyping models generated with INTECRIO V4.0 / ASCET-RP V6.1.3 or with newer versions do not run ES910.3-A systems containing firmware from HSP versions earlier than HSP V9.4.0.

7.6.4 Information about the Combination ES910.3-A with ES715 Drive Recorder

Modules with Firmware of Version HSP V8.0.x or older

The combination of the modules ES910.3-A and ES715 Drive Recorder works together if the modules contain firmware of version HSP V8.0.x or older.

> **Note**
>
> *Please note that the described joint operation of both modules is neither released nor supported by the Technical Support.*

Modules with Firmware of Version HSP V8.1.x or newer

The combination of the modules ES910.3-A and ES715 Drive Recorder does **no** longer work together starting with HSP V8.1.x or newer since the working memory of the ES715 Drive Recorders is too small.

7.7   Electrical Data

7.7.1   Power Supply

Operating voltage range	7 to 29 V DC
Operating voltage, typ.	12 V DC
Current consumption, operation	1,2 A, typ. (at 12 V) 1,7 A, max. (at 12 V)
Current consumption, standby	< 25 mA
Current consumption, max.	5 A
Protection [1]	Protected against polarity inversion and Load Dump protection

[1]: The module may be used only with central load dump protection.

7.7.2   Simulation Controller

Controller	Freescale PowerPC PowerQUICC™ III MPC8548, 800 MHz
Memory	512 MByte DDR2-RAM (400 MHz clock) 64 MByte Flash 128 kByte NVRAM (32 kByte address-able)
Operating system	OSEK Real-Time

7.7.3   PC Interface (PC)

Connection	10/100/1000 Mbit/s Ethernet, Full Duplex
Protocol	TCP/IP
IP address	Dynamic via INTECRIO or INCA
Support of the ETAS synchronization mechanism	SYNC IN functionality

Note

To ensure successful initialization of the network card of your PC, refer to chapter 7.6.1 on page 77.

7.7.4   CAN Interfaces (CAN1/LIN1 and CAN2/LIN2)

CAN1 to CAN2	2 independent interfaces, galvanically isolated from each other and from the other interfaces, every channel separately configurable (High-Speed CAN and Low-Speed CAN)
Protocols	CAN V2.0a (Standard Identifier), CAN V2.0b (Extended Identifier)
Controller	IP-Core (FPGA)

Low-Speed CAN

Transceiver (Physical Layer)	TJA1054
Transfer speed	Max. 125 kBaud

High-Speed CAN

Transceiver (Physical Layer)	TJA1040
Transfer speed	Max. 1 MBaud with a bus length of 20 m
Differential internal resistor Ri	10 kOhm

High-Speed CAN "Wake Up" Signal Conditions

Differential input voltage (min.)	V_diff,min = 0.2 V
Signal edge increase rate	t/dV < 150 ns/V
Differential input resistor	R i,diff = 10 kOhm

At least two signal edges of the same polarity must be within a period of 100 ms.

7.7.5   LIN Interfaces (CAN1/LIN1 and CAN2/LIN2)

LIN1 to LIN2	2 independent interfaces, galvanically isolated from each other and from the other interfaces, every channel separately configurable
Specification	LIN V2.1
Controller	LIN-Core (FPGA)
Transceiver (Physical Layer)	MCZ33661EF
Operating mode	Master or Slave (configurable in the ES910.3-A web interface)

7.7.6   ETK Interface (ETK)

Operating modes	Basic, Compatibility, Advanced
ETK protocol speed	8 Mbit/s / 100 Mbit/s
ETK protocol transfer	Single Mode / Block Mode
Bypass support	Hooked-Based Bypass
	Service-Based Bypass V2.0
	Service-Based Bypass V3.0 (for notes about the support of ETK types, see the table below)

> **Note**
>
> *ES910.3-A supports all current ETK types.*
> *Exception:*
> *The ETK types not supported by ES910.3-A are listed in the following table. Detailed information can be found on the Internet pages of ETAS GmbH (ETK System Feature PDF document).*

ETKs not supported by ES910.3-A	ETKM, ETK3.x, ETK4, ETK6.x, ETK7.0, ETK8.0, ETK8.1
	µETK1, µETK2
	ETKS1.0-A, ETKS1.0-B
	ETKP1.0

Support of Service-Based Bypass V3.0 depending on the ETK Type

> **Note**
>
> *The type of support of Service-Based Bypass V3.0 by different ETK types is listed in the following table. Detailed information can be found on the Internet pages of ETAS GmbH (ETK System Feature PDF document).*

Support of Service-Based Bypass V3.0	ETK type
Support of Service-Based Bypass V3.0	ETK-T2.1, ETK-S4.2B
Support of Service-Based Bypass V3.0 with additional hardware adaptations of the RAM in the ECU	ETK8.2 (no error-free support, no support through HSP), ETK11
No support of Service-Based Bypass V3.0	ETK6.x, ETK7.x, ETK8, ETK10, ETKP1.x
	µETKx (all µETK types, e.g. µETK1.0 to µETK3.0, µETKP1.0)
	all ETK types that are generally not being supported by ES910.3-A (see table above)

Prerequisites for using Service-Based Bypass V3.0

Before Service-Based Bypass V3.0 can be used, the HDC of the ETK used must be updated (except for serial ETKs [ETKSx]). The update is carried out either with HSP or with the (X)ETK configuration tool.

Note

The minimum requirements for the HDC/FW version of the ETK used for Service-Based Bypass V3.0 can be found on the Internet pages of ETAS GmbH (ETK System Feature PDF document).

7.7.7   Service Interface (SP)

"Manual Trigger" Pins

Overvoltage protection	Max. +/-80 V
Pulse width	Min. 25 ms or min. 250 ms (configurable in the application software)
Power-on threshold	3.3 V
Power-off threshold	1.3 V
Hysteresis	2 V

"Wake Up" Control Pin (Schmitt Trigger Input)

Logical "Low"	Vi = 0 V to 0.8 V
Logical "High"	Vi = 2.0 V to 32.0 V

7.7.8   IO Interface

Operational Mode "Daisy Chain"

Connection	100Base-T Ethernet; 100 Mbit/s, Full Duplex
Protocol	XCP on UDP/IP

Operational Mode "EtherCAT"

Connection	100Base-T Ethernet; 100 Mbit/s, Full Duplex
Protocol	EtherCAT
EtherCAT IP Core	Beckhoff EtherCAT, V2.0.0
Synchronization funktionality	EtherCAT slave

7.7.9   ECU Interface (ECU)

Operational Mode "ECU Interface"

Connection	1000Base-T Ethernet; Full Duplex
Protocol	XCP on UDP/IP, TCP/IP
Support of the ETAS synchronization mechanism	SYNC OUT functionality

Operational Mode "iLinkRT"

Connection	1000Base-T Ethernet; Full Duplex
Protocol	XCP on iLinkRT^{TM}, TCP/IP
Version	iLinkRT^{TM} V1.2
Support of the ETAS synchronization mechanism	SYNC OUT functionality deactivated
Synchronization funktionality	iLinkRT^{TM} slave

7.7.10   Miscellaneous

Buffer time Real Time Clock (RTC) [1]	Min. 48 hours (over the entire temperature range)
	Typ. 1 week (at 25 °C / 77 °F)
Boot time [2]	< 5 s (HSP V9.3.1 or older) < 10 s (HSP V9.4 and newer)
Fan	Temperature-specific fan speed
Slot for extension modules (extension slot)	Accommodation of an additional module, e.g. ES920.1, ES921.1, ES922.1

[1] is not used if the ES910.3-A is on standby
[2] In the standalone Mode: time to boot the operating system and to start the flashed model until the "Init Task"

7.8   Pin Assignment

> **Note**
>
> *All connectors are shown with a view of the interfaces of the ES910.3-A.*
> *All shields are at case potential.*

7.8.1   Power Supply Interface (7-29V DC)
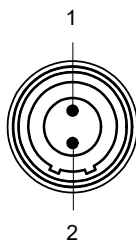
Fig. 7-2   Power Supply Interface (7-29V DC)

Socket at the ES910.3-A module: Lemo EPJ.1B.302

Pin	Signal	Meaning
1	UBATT+	Supply voltage, plus
2	Ground	Ground

7.8.2   PC Interface (PC)
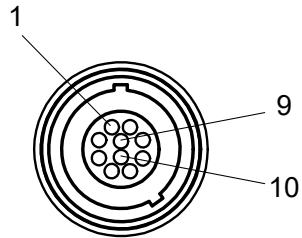
Fig. 7-3   PC Interface (PC)

Socket at the ES910.3-A module: Lemo EPE.1B.310

Pin	Signal	Meaning
1	TXD1+	
2	BID3-	
3	BID3+	
4	RXD2-	
5	RXD2+	
6	BID4-	
7	BID4+	
8	TXD1-	
9	-	Reserved
10	-	Reserved

7.8.3   CAN/LIN Interface (CAN1/LIN1 and CAN2/LIN2)
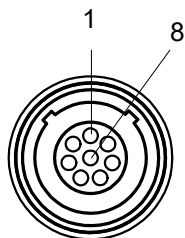
Fig. 7-4   CAN/LIN Interface (CAN1/LIN1 and CAN2/LIN2)

Socket at the ES910.3-A module: Lemo EPC.1B.308

Pin	Signal	Meaning
1	UBATT (LIN)	
2	CAN_LOW	
3	CAN_GND	
4	LIN	
5	LIN_GND	
6	CAN_GND	
7	CAN_HIGH	
8	-	Reserved

7.8.4 ETK Interface (ETK)
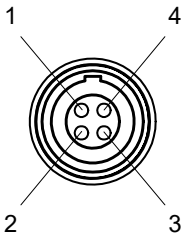
Fig. 7-5 ETK Interface (ETK)

Socket at the ES910.3-A module: Lemo EPG.1B.304

Pin	Signal	Meaning
1	TX+	Send data, plus
2	TX-	Send data, minus
3	RX+	Received data, plus
4	RX-	Received data, minus

7.8.5   SP Interface (SP)
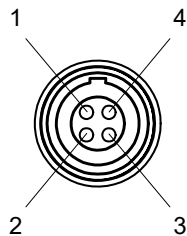
Fig. 7-6   SP Interface (SP)

Socket at the ES910.3-A module: Lemo EPG.1B.304

The suitable Lemo connector for the socket: FGG.0B.304

Pin	Signal	Meaning
1	TRIG IN+	Man. trigger input, plus
2	TRIG IN-	Man. trigger input, minus
3	WAKE UP	Wake-Up control
4		Reserved/not connected

Note

The necessary connector is not part of the delivery scope or accessories of the ES910.3-A.

7.8.6   IO Interface (IO)
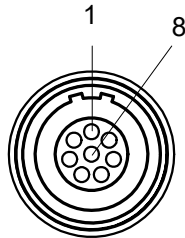
Fig. 7-7   IO Interface (IO)

Socket at the ES910.3-A module: Lemo EPA.1B.308

The suitable Lemo connector for the socket: Lemo FGA.1B.308

> **Note**
>
> *The IO interface (IO) can be used either as connection for daisy chain modules or as connection for EtherCAT. The function of the interface is selected or configured on the web interface of ES910.3-A (see chapter 5.6 on page 60).*

Operational Mode "Daisy Chain": Pin Assignment

Pin	Signal	Meaning
1	UBATT	Operating voltage
2	UBATT	Operating voltage
3	GND	Ground
4	RX+	Received data, plus
5	TX-	Send data, minus
6	RX-	Received data, minus
7	GND	Ground
8	TX+	Send data, plus

Operational Mode "EtherCAT": Pin Assignment

Pin	Signal	Meaning
1	-	Reserved, do not connect
2	-	Reserved, do not connect
3	-	Reserved, do not connect
4	RX+	Received data, plus
5	TX-	Send data, minus
6	RX-	Received data, minus
7	-	Reserved, do not connect
8	TX+	Send data, plus

7.8.7   ECU Interface (ECU)
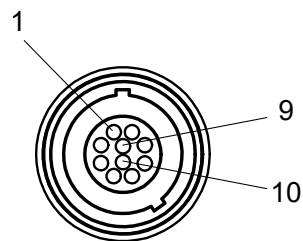
Fig. 7-8   ECU Interface (ECU)

Socket at the ES910.3-A module: Lemo EPE.1B.310

Pin	Signal	Meaning
1	TXD1+	
2	BID3-	
3	BID3+	
4	RXD2-	
5	RXD2+	
6	BID4-	
7	BID4+	
8	TXD1-	
9	-	Reserved
10	-	Reserved

8   Cables and Accessories

Note

Only use the ETAS cables named in this User's Guide at the interfaces of the ES910.3-A. The maximum admissible cable lengths must be adhered to.

8.1   Power Supply Cable

DANGER!

Dangerous electrical voltage!
Connect the power cable only with a suitable vehicle battery or with a suitable lab power supply! The connection to power outlets is not allowed!
To prevent an inadvertent insertion in power outlets, ETAS recommends to equip the power cables with safety banana plugs CBP1205 in areas with power outlets.

Power supply cables suitable for the ES910.3-A module can be delivered in two designs:

- power supply cable CBP120 with standard banana plugs (current design) and
- power supply cable CBP1205 with safety banana plugs (new design).

Note

Application, permissible voltages and all the other technical data of the power supply cables are identical for both designs.
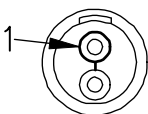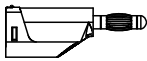
8.1.1   CBP120 Cable

Side A   Side B

Fig. 8-1   CBP120-2 (power supply cable with standard banana plugs)

Side A		Side B	
Pin	**Signal**	**Plug**	**Signal**
1	UBATT-	Red	UBATT-
2	Ground	Black	Ground

Order Name	Short Name	Order Number
Power Supply Cable, Lemo 1B FGJ Banana (2mc-2mc), 2 m	CBP120-2	F 00K 102 584

8.1.2 CBP1205 Cable
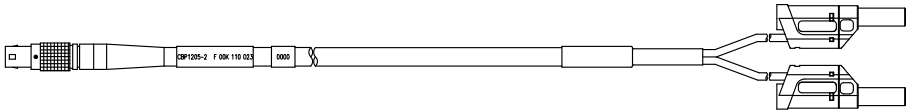
Side A   Side B

Fig. 8-2   CBP1205 (power supply cable with safety banana plugs)

Side A		Side B	
Pin	**Signal**	**Plug**	**Signal**
1	UBATT	Red	UBATT
2	Ground	Black	Ground

Order Name	Short name	Order Number
Power Supply Cable, Lemo 1B FGJ – Safety Banana (2mc-2mc), 2 m	CBP1205-2	F 00K 110 023

> **Note**
> *Power supply cables with safety banana plug are suitable only for connection to voltage sources with safety socket.*

8.2   PC Interface Cable

Fig. 8-3   CBE200-x Cable

Order Name	Short Name	Order Number
Ethernet PC Connection Cable 1Gbit/s, Lemo 1B FGE - RJ45 (10mc-8mc), 3 m	CBE200-3	F 00K 104 373
Ethernet PC Connection Cable 1Gbit/s, Lemo 1B FGE - RJ45 (10mc-8mc), 8 m	CBE200-8	F 00K 104 374

8.3   Ethernet Adapter Cable (1 Gbit/s / 100 Mbit/s)
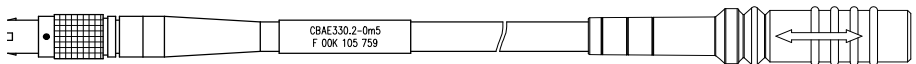
Fig. 8-4   CBAE330.2 Cable

Order Name	Short Name	Order Number
Ethernet Connection Adapter Cable 1 Gbit/ s to 100 Mbit/s, Lemo 1B PHE - Lemo 1B FGF (10fc-8mc), 0m5	CBAE330-0m5	F 00K 105 759

8.4   Combined CAN and LIN Cable

Side B/C
gray

Side A   Side D/E
black
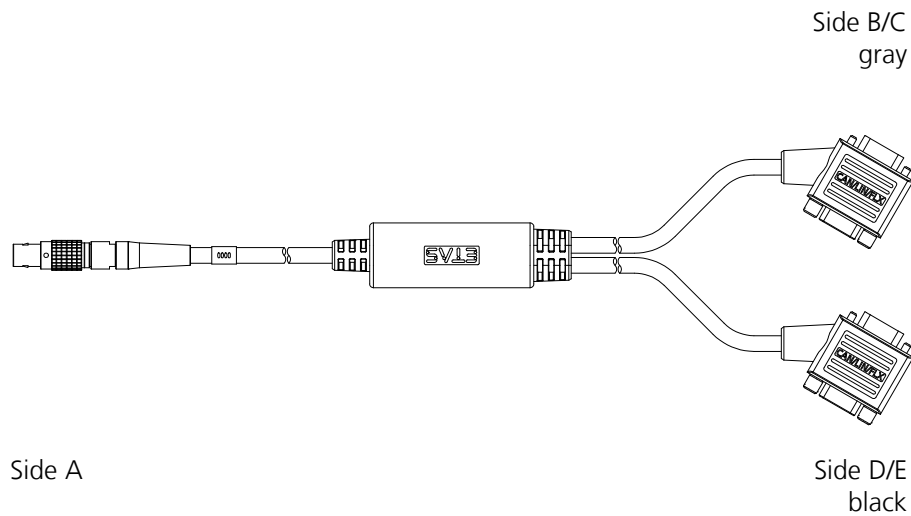
Fig. 8-5   CBCFI100 Cable

Order Name	Short Name	Order Number
CAN, FlexRay and LIN Interface Y-Cable, Lemo 1B FGC - 2xDSUB (8mc-9fc + 9mc), 2 m	CBCFI100-2	F 00K 106 893

Mapping of DSUB Socket Plug Combinations of the Cable

The 8-pin Lemo plug of the CBCFI100 cable can be connected either to the CAN1/LIN1 interface or the CAN2/LIN2 interface. At the other end of the CBC-FI100 cable are two 9-pin DSUB socket plug combinations:

- a socket plug combination (side B and C) marked in gray for connection to the CAN bus, and
- a socket plug combination (side D and E) marked in black for connection to the LIN bus.

Mapping of DSUB Socket Plug Combinations to ES910.3-A

If one CBCFI100 cable each is used at the interfaces CAN1/LIN1 and CAN2/LIN2 of ES910.3-A, these interfaces are mapped to the DSUB socket plug combinations of both cables as follows:

ES910.3-A Connection	Cable	Cables in CBCFI100 Fig. 8-5	
		Socket (B) / plug (C) (DSUB, color: gray)	Socket (D) / plug (E) (DSUB, color: black)
CAN1/LIN1	1	CAN1	LIN1
CAN2/LIN2	2	CAN2	LIN2

Connector Pin assignment of Cable at the CAN1/LIN1 or CAN2/LIN2 Interface

The DSUB socket plug combinations of the CBCFI100 cable are assigned the signals of the CAN1/LIN1 or CAN2/LIN2 interface of ES910.3-A as follows:

Lemo [Side A]			DSUB, Color: gray [Side B, Side C]	
Pin	**Signal**		**Pin**	**Signal**
1	LIN_UBATT		1	-
2	CAN_LOW		2	CAN_LOW
3	CAN_GND		3	CAN_GND
4	LIN		4	-
5	LIN_GND		5	-
6	CAN_GND		6	CAN_GND
7	CAN_HIGH		7	CAN_HIGH
8	CAN_UBATT		8	-
			9	-

			DSUB, Color: black [Side D, Side E]	
			Pin	**Signal**
			1	-
			2	Reserved, do not use
			3	LIN_GND
			4	-
			5	-
			6	-
			7	LIN
			8	-
			9	LIN_UBATT

8.5   CAN Interface Cable

8.5.1   K106 Cable
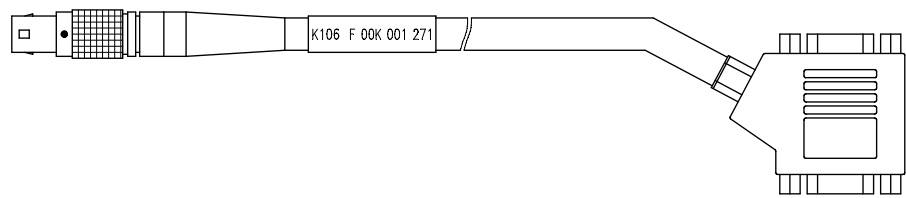
Fig. 8-6   K106 Cable

Order Name	Short Name	Order Number
CAN Interface Y-Cable, Lemo 1B FGC 2xD-SUB (8mc-9fc+9mc), 2 m	K106	F 00K 001 271

8.5.2   K107 Cable
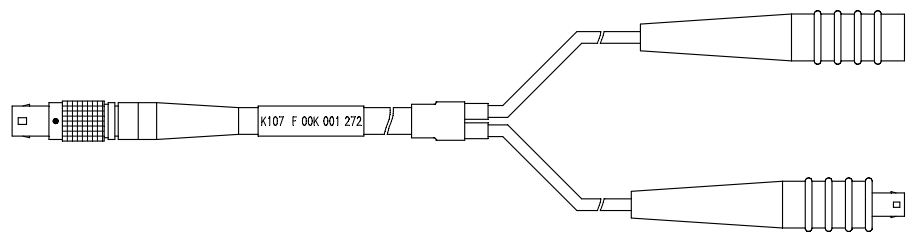
Fig. 8-7   K107 Cable

Order Name	Short Name	Order Number
CAN Interface Y-Cable, Lemo 1B FGC Lemo 0S PCA Lemo 0S FFA (8mc,-2fc+2mc) , 2 m	K107	F 00K 001 272

8.5.3   CBCX130-2 Cable
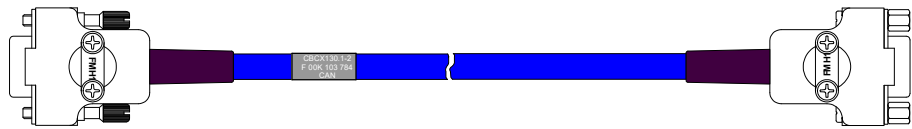
Fig. 8-8   CBCX130-x Cable

Order Name	Short Name	Order Number
CAN Interface Cable, DSUB DSUB (9fc-9mc), 2 m	CBCX130-2	F 00K 103 784

8.5.4   CBAC130-3 Cable
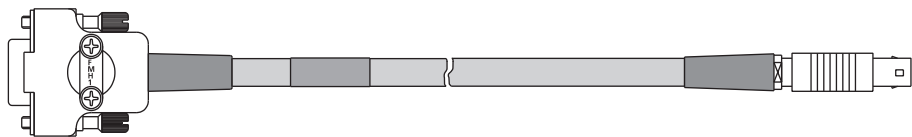
Fig. 8-9   CBAC130-x Cable

Order Name	Short Name	Order Number
CAN Interface Cable, DSUB Lemo 0S FFA (9fc-2mc), 3 m	CBAC130-3	F 00K 103 780

8.5.5   CBAC140-3 Cable

Fig. 8-10   CBAC140-3 Cable

Order Name	Short Name	Order Number
CAN ECU Adapter Cable, DSUB Lemo 2B FGG (9fc-10mc), 3 m	CBAC140-3	F 00K 103 783

8.5.6   CBAC150-2m5 Cable
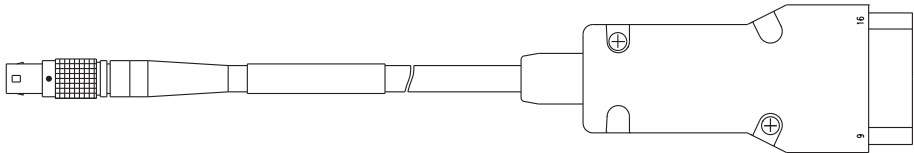
Fig. 8-11   CBAC150-2m5 Cable

Order Name	Short Name	Order Number
CAN Interface Cable, OBDII J1962 Lemo 1B FGC (16mc-8mc), 2m5	CBAC150-2m5	F 00K 104 159

8.6   CAN Terminating Resistor
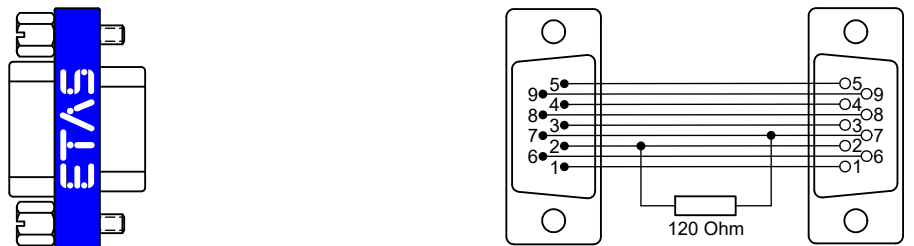
Fig. 8-12   CBCX131-0 Terminating Resistor

Order Name	Short Name	Order Number
CAN 120 & Termination Resistor, 2xDSUB (9fc+9mc)	CBCX131-0	F 00K 103 786

8.7   ETK Interface Cable CBM150-x
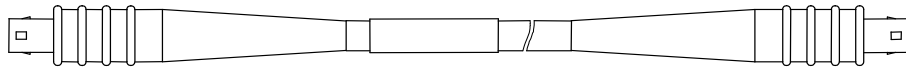
Fig. 8-13   CBM150-x Cable

Order Name	Short Name	Order Number
ETK Interface Cable 100 Mbit/s, Lemo 1B FFG Lemo 1B FFG (4mc-4mc), 3 m	CBM150-3	F 00K 102 556
ETK Interface Cable 100 Mbit/s, Lemo 1B FFG Lemo 1B FFG (4mc-4mc), 5 m	CBM150-5	F 00K 102 557
ETK Interface Cable 100 Mbit/s, Lemo 1B FFG Lemo 1B FFG (4mc-4mc), 10 m	CBM150-10	F 00K 102 553

8.8   ECU Interface Cable
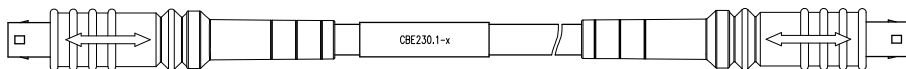
Fig. 8-14   CBE230.1 Cable

Order Name	Short Name	Order Number
Ethernet Connection Cable 1 Gbit/s, Lemo 1B FGE - Lemo 1B FGE (10mc- 10mc), 3 m	CBE230.1-3	F 00K 105 757
Ethernet Connection Cable 1 Gbit/s, Lemo 1B FGE - Lemo 1B FGE (10mc- 10mc), 8 m	CBE230.1-8	F 00K 105 758

8.9 Ethernet Chain Connection and Power Supply Cable (Daisy Chain Modules)

8.9.1 CBEP430.1 Cable
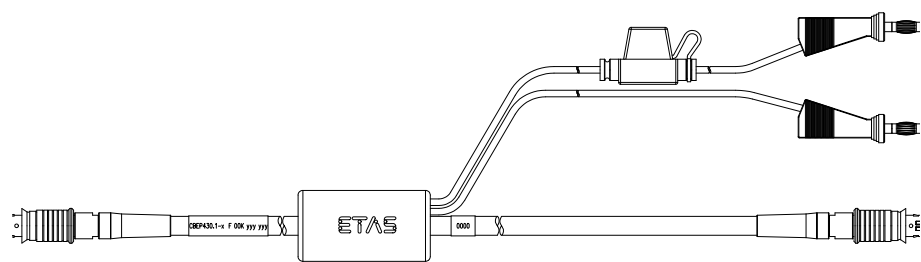
Fig. 8-15   Cable CBEP430.1

Order name	Short name	Order number
Ethernet Chain Connection and Power Supply Cable, Lemo 1B FGL - Lemo 1B FGA - Banana (8fc-8mc-2mc), 0m5	CBEP430.1-0m5	F 00K 104 928

8.9.2 CBEP4305.1 Cable
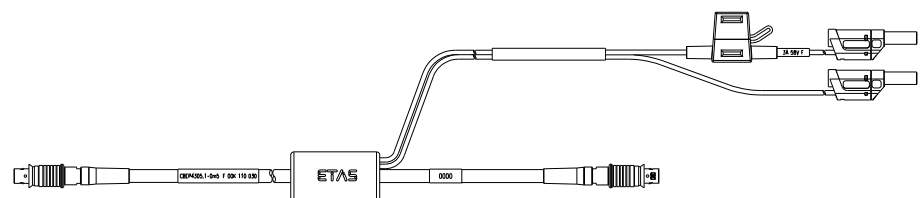
Fig. 8-16   Cable CBEP4305.1

Order name	Short name	Order number
Ethernet Chain Connection and Power Supply Cable, Lemo 1B FGL - Lemo 1B FGA - Safety Banana (8fc-8mc-2mc), 0m5	CBEP4305.1-0m5	F 00K 110 030

> **Note**
>
> *The wiring of the modules of the Daisy Chain product family with each other and the cables required by the modules are described in the documentation of the modules.*

9   Ordering Information

9.1   ES910.3-A

9.1.1   ES910.3-A with CBP120 Power Supply Cable

Order Name	Short Name	Order Number
ES910.3-A Prototyping and Interface Module	ES910.3-A	F 00K 106 565
Package Contents		
ES910.3-A Prototyping and Interface Module, cable CBE200-3, cable CBP120-2, T-Bracket for Housing, List "Content of this Package", QNX Licence for ES910, ES910 Safety Advice, China-RoHS-leaflet_Compact_green_cn		

> **Note**
>
> *The cables for additional interfaces of the module are not part of the delivery scope and must be ordered separately (see chapter 9.2 on page 106).*

9.1.2   ES910.3-A with CBP1205 Power Supply Cable

Order Name	Short Name	Order Number
ES910.3-A Prototyping and Interface Module with Safety Cable	ES910.3-A-S	F 00K 110 484
Package Contents		
ES910.3-A Prototyping and Interface Module, cable CBE200-3, cable CBP1205-2, T-Bracket for Housing, List "Content of this Package", QNX Licence for ES910, ES910 Safety Advice, China-RoHS-leaflet_Compact_green_cn		

> **Note**
>
> *The cables for additional interfaces of the module are not part of the delivery scope and must be ordered separately (see chapter 9.2 on page 106).*

9.2   Cables and Accessories

> **Note**
>
> *Only use the ETAS cables named in this User's Guide at the interfaces of the ES910.3-A. The maximum admissible cable lengths must be adhered to.*

> **Note**
>
> *Custom cables can be produced according to your specifications. For more information on custom cables, please contact your local ETAS sales representative.*

9.2.1   Power Supply Interface Cable

Order Name	Short Name	Order Number
Power Supply Cable, Lemo 1B FGJ Banana (2fc-2mc), 2 m	CBP120-2	F 00K 102 584
Power Supply Cable, Lemo 1B FGJ – Safety Banana (2fc-2mc), 2 m	CBP1205-2	F 00K 110 023

9.2.2   PC Interface Cable

Order Name	Short Name	Order Number
Ethernet PC Connection Cable 1Gbit/s, Lemo 1B FGE - RJ45 (10mc-8mc), 3 m	CBE200-3	F 00K 104 373
Ethernet PC Connection Cable 1Gbit/s, Lemo 1B FGE - RJ45 (10mc-8mc), 8 m	CBE200-8	F 00K 104 374

9.2.3   CAN/LIN Interface Cable and Adapter

CAN Interface Cable

Order Name	Short Name	Order Number
CAN Interface Y-Cable, Lemo 1B FGC 2xD-SUB (8mc-9fc+9mc), 2 m	K106	F 00K 001 271
CAN Interface Y-Cable, Lemo 1B FGC Lemo 0S PCA Lemo 0S FFA (8mc,-2fc+2mc) , 2 m	K107	F 00K 001 272
CAN Interface Cable, DSUB DSUB (9fc-9mc), 2 m	CBCX130.1-2	F 00K 103 784
CAN Interface Cable, DSUB Lemo 0S FFA (9fc-2mc), 3 m	CBAC130.1-3	F 00K 103 780
CAN ECU Adapter Cable, DSUB Lemo 2B FGG (9fc-10mc), 3 m	CBAC140.1-3	F 00K 103 783
Cable CARB - Lemo 1B FGC (16mc - 8mc, 2.5 m)	CBAC150-2m5	F 00K 104 159

CAN Termination Resistor

Order Name	Short Name	Order Number
CAN 120 & Termination Resistor, 2xDSUB (9fc+9mc)	CBCX131-0	F 00K 103 786

Combined CAN and LIN Interface Cable

Order Name	Short Name	Order Number
CAN, FlexRay and LIN Interface Y-Cable, Lemo 1B FGC - 2xDSUB (8mc-9fc+ 9mc), 2 m	CBCFI100.1-2	F 00K 106 893

9.2.4 ETK Interface Cable

Order Name	Short Name	Order Number
ETK Interface Cable 100 Mbit/s, Lemo 1B FFG Lemo 1B FFG (4mc-4mc), 3 m	CBM150-3	F 00K 102 556
ETK Interface Cable 100 Mbit/s, Lemo 1B FFG Lemo 1B FFG (4mc-4mc), 5 m	CBM150-5	F 00K 102 557
ETK Interface Cable 100 Mbit/s, Lemo 1B FFG Lemo 1B FFG (4mc-4mc), 10 m	CBM150-10	F 00K 102 553

9.2.5 IO Interface Cable

Ethernet Chain Connection and Power Supply Cable

Order Name	Short Name	Order number
Ethernet Chain Connection and Power Supply Cable, Lemo 1B FGL - Lemo 1B FGA - Banana (8fc-8mc-2mc), 0m5	CBEP430.1-0m5	F 00K 104 928
Ethernet Chain Connection and Power Supply Cable, Lemo 1B FGL - Lemo 1B FGA - Safety Banana (8fc-8mc-2mc), 0m5	CBEP4305.1-0m5	F 00K 110 030

9.2.6 ECU Interface Cable and Adapter

Connection Cable

Order Name	Short Name	Order Number
Ethernet Connection Cable 1 Gbit/s, Lemo 1B FGE - Lemo 1B FGE (10mc- 10mc), 3 m	CBE230-3	F 00K 105 757
Ethernet Connection Cable 1 Gbit/s, Lemo 1B FGE - Lemo 1B FGE (10mc- 10mc), 8 m	CBE230-8	F 00K 105 758

Adapter Cable

Order Name	Short Name	Order Number
Ethernet Connection Adapter Cable 1 Gbit/s to 100 Mbit/s, Lemo 1B PHE - Lemo 1B FGF (10fc-8mc), 0m5	CBAE330-0m5	F 00K 105 759

9.2.7   SP Interface Cable

Note

The cable for using the ES910.3-A "Manual Trigger" and "Wake Up" functions has to be customized by the customer (see chapter 7.7.7 on page 84). The necessary connector is not part of the delivery scope or accessories of the ES910.3-A.

9.2.8   Extension Module

ES920.1

Order Name	Short Name	Order Number
ES920.1 FlexRay Module (2-CH)	ES920.1	F 00K 104 540

Package Contents

ES920.1 FlexRay Module (2-CH),
2 x cable CBF100-2,
2 x FlexRay termination resistor CBFX131-0,
ES900_Screws,
List "Content of this Package",
FlexRay Bosch IPCore Licence,
ES910 Safety Advice,
China-RoHS-leaflet_Compact_green_cn

ES921.1

Order Name	Short Name	Order Number
ES921.1 CAN Module (2-CH)	ES921.1	F 00K 105 672

Package Contents

ES921.1 CAN Module (2-CH),
Cable: 2 x K106,
Termination resistor: 2 x CBCX131-0,
ES900_Screws)
List "Content of this Package",
FlexRay Bosch IPCore Licence,
ES910 Safety Advice,
China-RoHS-leaflet_Compact_green_cn

9.2.9   Housing Accessories

Order Name	Short Name	Order Number
T-Bracket for ES600 Housing	ES600_H_TB	F 00K 001 925
ES900 Spare Screws for Extension Slot	ES900_Screws	F 00K 105 362

10   ETAS Contact Addresses

ETAS HQ

ETAS GmbH

Borsigstraße 24	Phone:	+49 711 3423-0
70469 Stuttgart	Fax:	+49 711 3423-2106
Germany	WWW:	www.etas.com

ETAS Subsidiaries and Technical Support

For details of your local sales office as well as your local technical support team and product hotlines, take a look at the ETAS website:

ETAS subsidiaries	WWW:	www.etas.com/en/contact.php
ETAS technical support	WWW:	www.etas.com/en/hotlines.php

Figures

Index