

ES5392.1 High Current Switch Board (6-CH)

User's Guide



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1 Introduction

This manual contains the description for the ES5392.1 High Current Switch Board (6-CH).

This chapter contains information about the following topics:

- "Application Areas and Properties" on page 5
- "Properties" on page 6
- "Basic Safety Notices" on page 8
- "Identifications on the Product" on page 13
 - "CE Mark" on page 13
 - "KC Mark" on page 13
 - "RoHS Conformity" on page 14
- "Product Return and Recycling" on page 14
- "Materials Subject to Declaration" on page 14
- "About this Manual" on page 15

1.1 Application Areas and Properties

Application Areas

The ES5392.1 High Current Switch Board (6-CH) is an add-on card for the ES5300.1-A Housing or for the ES5300.1-B Housing. It is used in Hardware-in-the-Loop (HiL) systems.

The ES5392.1 allows controlling an external power supply which maps the vehicle battery within an HiL system. As such, it is possible to simulate, e.g. voltage fluctuations of the battery and feedback from the battery (such as error, overload). ECUs or loads can be connected to the voltage of the external power supply via the high current outputs of the ES5392.1.

A total of 6 high current channels for connecting ECUs or loads are available. The ES5392.1 features a current measurement for each channel.

Each of the six channels of the ES5392.1 can be configured as battery node simulation or as independent high current switch.

In the vehicle, loads, sensor supplies or battery nodes are switched in depending on a main relay. This function is called MRC (Main Relay Control). The ES5392.1 can measure the MRC signal and map the main relay through a controlled current source. With the help of RTIO, channels can then be selected that are switched in depending on the main relay.

In addition, the ES5392.1 features TTL outputs at the connector X2 SwCtrl and X4 Power I/O. The TTL signals can be configured in the RTIO, e.g. as status signals BN0...BN5 for the ES4408CON.1 or other external components. These signals can be fed in from the connector X2 SwCtrl via the connector SwCtrl of the ES4408CON.1. The status signals BN0...BN5 are then fed to the backplane of the ES4408.1 Load Chassis, and from there to the slots of the low-current loads (e.g. ES4435 Current Source Load Board).

The connecting cable CBV305.1-2 for connecting the connectors X2 SwCtrl (ES5392.1) and SwCtrl (ES4408CON.1) can be ordered from ETAS (see "Ordering Data" on page 50).

Properties

The ES5392.1 High Current Switch Board (6-CH) has the following functions and properties:

- Control of an external power supply for battery simulation
- 6 independent high current switches - mapping of battery nodes possible
- Maximum current per channel: +/- 15 A, voltage range -60 V... +60 V
- Maximum total current (sum of absolute current values of all channels): 40 A
- Direct current measurement for each channel
- Main Relay Control (MRC): Switching defined battery nodes on and off depending of the main relay possible by using an MRC ECU signal
- Configuration of MRC signal as Active High or Active Low via RTIO
- Configurable status outputs via RTIO
- Feeding the battery voltage to the measurement outputs -VBat and +VBat and controlling the LED of the ES5300.1-A Housing

Block Diagram

Fig. 1-1 shows a block diagram of the ES5392.1 High Current Switch Board (6-CH)

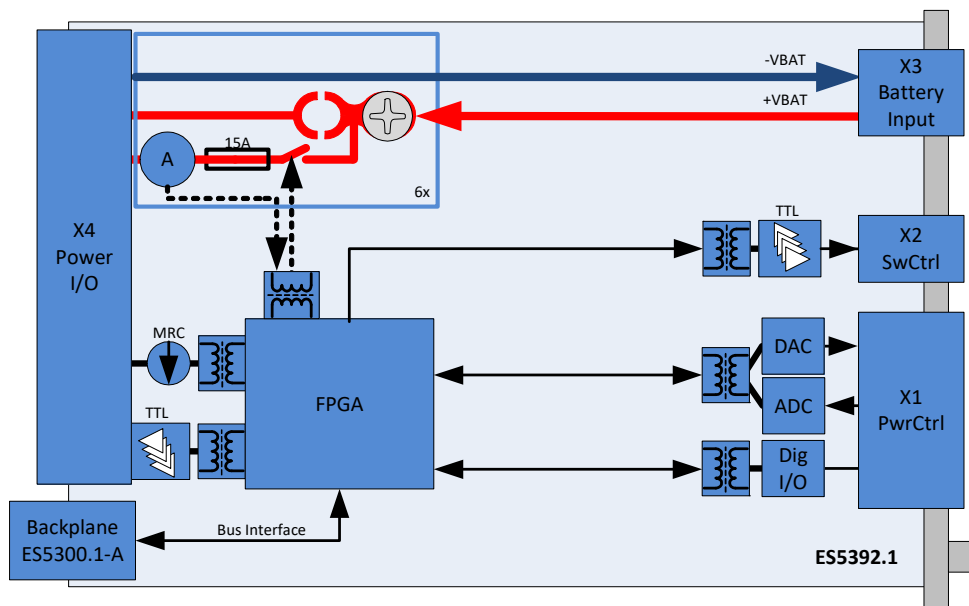


Fig. 1-1 Block diagram of ES5392.1

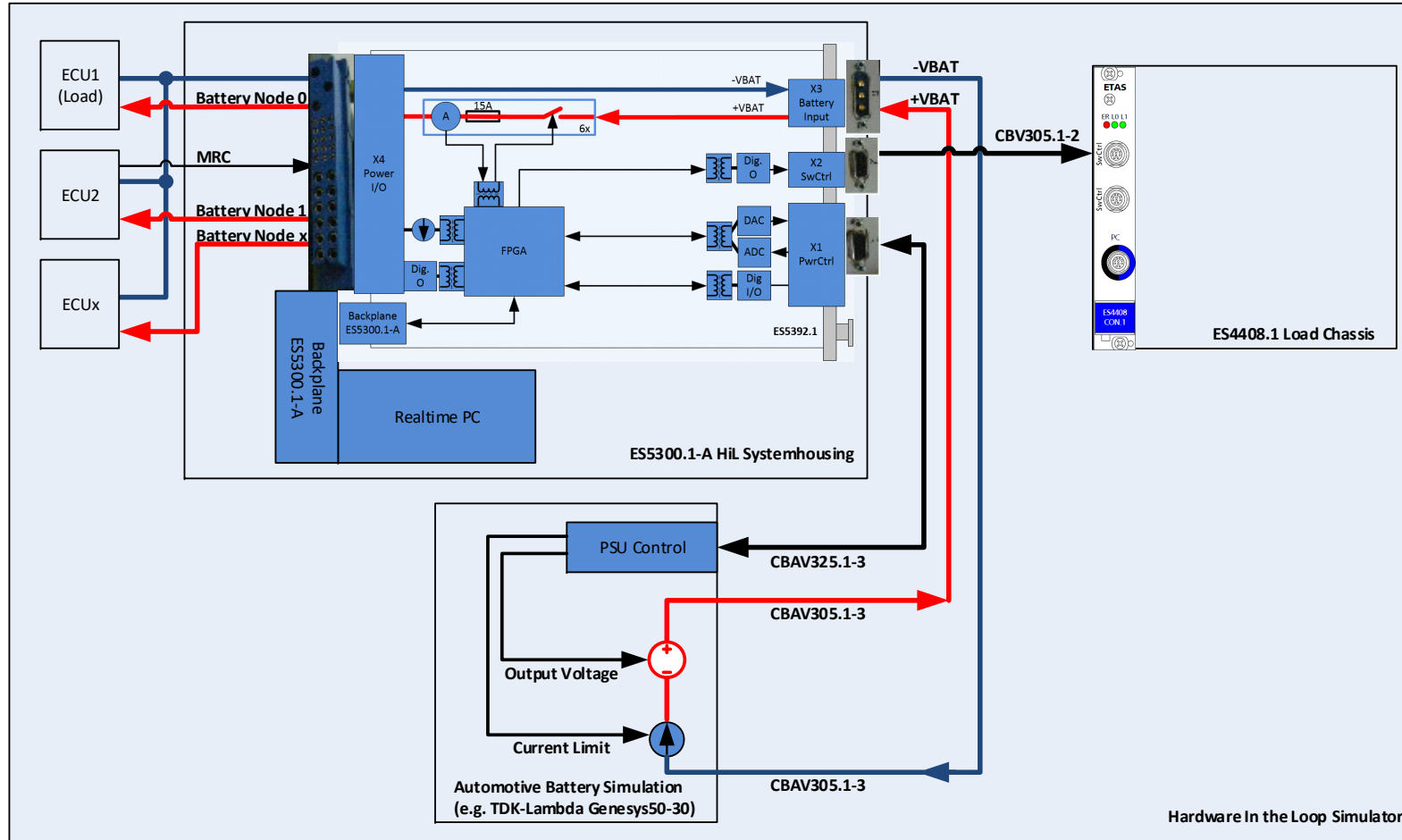


Fig. 1-2 ES5392.1 in an HiL system

1.2 Basic Safety Notices

Please observe the following safety notices to avoid health issues or damage to the device.

1.2.1 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.

**CAUTION!**

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

**WARNING!**

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

**DANGER!**

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

1.2.2 General Safety Information

Observe the following safety notices to avoid health issues or damage to the device.

Note

The User's Guide and the Product Safety Advice must be read carefully prior to the startup of the product!

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

1.2.3 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 system integrator is responsible for the safety of systems that use the product.

General Safety at Work

Follow the existing regulations for work safety and accident prevention. All applicable regulations and laws regarding operation must be strictly adhered to when using this product.

1.2.4 Intended Use

The ES5392.1 is an add-on card for the ES5300.1-A Housing and the ES5300.1-B Housing for mapping battery nodes (KL15, KL30,...), for mapping high current switches and for remote control of power supplies.

The ES5392.1 add-on card has the following components:

- Battery node simulation (KL15, KL30, ...) for connecting ECUs and loads
- Current measurement for every battery node / high current switch
- MRC simulation
- Digital and analog input / output interfaces for remote control of a power supply that simulates the vehicle battery
- Interface to the ES5300.1-A Housing and ES5300.1-B Housing

The ES5392.1 may be installed and operated only in the ES5300.1-A Housing and the ES5300.1-B housing.

The intended use of the ES5392.1 in an ES5300.1-A Housing or ES5300.1-B Housing is:

- Use in industrial lab facilities or workplaces.
- Hardware interface for ECUs in a hardware-in-the-loop test system.
- Cooperation with ETAS software which supports the ES5300.1-A Housing or the ES5300.1-B Housing.
- Interface in cooperation with software programs that operate the standardized, documented and open APIs of ETAS software products.

The ES5392.1 is not intended to be used:

- Within a vehicle on the road.
- As part of a life support system.
- in applications where misuse can lead to injuries or damages.
- In environments in which conditions prevail that fall outside the specified ranges: see "Ambient Conditions" on page 49.
- With signal conditioning that falls outside the specified ranges: see "Technical Data and Standards" on page 47 (voltages, currents and power consumption).

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

The following requirements are necessary for safe 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.
- 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!

**WARNING!**

Fire hazard!

Use only fuses that meet the specification in Tab. 2-1 on page 21!

Never bridge defective fuses!

Failure to observe the fuse specification can lead to excess currents, short circuits and fires.

Power Supply

The product is powered by the ES5300.1-A Housing or the ES5300.1-B Housing via the PCIe Backplane Connector.

Insulation Requirements for Lab Power Supplies to Circuits Connected to the HIL System:

- The power supply to live circuitry must be safely isolated from the supply voltage. For example, use a car battery or a suitable lab power supply.
- Only use lab power supplies with dual protection for the supply network (with double/reinforced insulation (DI/RI)). This requirement is met by lab power supplies that comply with IEC/EN 60950 or IEC/EN 61010.
- The lab power supply must be approved for use at a height of 2000 m and in ambient temperatures of up to 40 °C.

De-energizing a Plug-in Board

Switch off the ES5300.1-A Housing or the ES5300.1-B Housing and external power supplies, and unplug the power plug and other connectors attached to the plug-in board. Wait at least three minutes before removing the plug-in board.

Approved Cables

The signal lines must not exceed a maximum length of 3 m.



WARNING!

Fire hazard!

Use only approved cables for creating cable assemblies (e.g. for connecting the ECU and external loads). The cables used must be suitable particularly for occurring currents, voltages and temperatures and flame-retardant in accordance with one of the following standards IEC 60332-1-2, IEC 60332-2-2, UL 2556/UL1581VW-1!

For connecting lab power supplies and connecting an ES4408.1, use only cables that are approved by ETAS. Appropriate cables are specified in this User's Guide in the chapter "Accessories" on page 29.

When ordering a power supply from ETAS (e.g. SM52-AR-60 from Delta Elektronika), the matching cable is included in the scope of supply.

A list of the power supplies supported by the LCO software is located in the RTC User's Guide in the section of the ES5392 description.

Requirements for the Installation Location



WARNING!

This is class A equipment. This equipment can cause radio interference in residential areas. Should that be the case, the operator may be requested to institute reasonable measures.

Requirements for Ventilation



CAUTION!

The air circulation inside the ES5300.1-A Housing and the ES5300.1-B Housing can be ensured only if all free slots are covered with front plates. Otherwise, it may lead to overtemperatures and trip the overtemperature protection of the ES5300.1-A or the ES5300.1-B. For this reason, install front plates in all free slots!

Transport and Installation

To avoid damages to the hardware from electrostatic discharge, please observe the following precautionary measures:



CAUTION!

Some components of the ES5392.1 can be damaged or destroyed by electrostatic discharges. Leave the plug-in card in its transport packaging until its installation.

The ES5392.1 may be removed from the transport packaging, configured and installed only at a workplace that is secured against electrostatic discharges.

**CAUTION!**

In order to prevent damage to the plug-in boards and the LABCAR housing, and thereby also avoid damage to property or health, observe the installation instructions and information contained in the relevant User's Guides.

**CAUTION!**

If cards (e.g. for startup or calibration) are unlocked but not completely removed from the housing, they must be pulled out far enough that the distance between the respective card and the back-plane of the housing is at least 1 cm. Otherwise, contacts may be established between the cards and lead to their destruction.

1.2.5 Connecting/Disconnecting Devices

To avoid injuries and hardware damages, please observe the following precautionary measures:

- Do not apply any voltages to the connections of the ES5392.1 that do not correspond to the specifications of the respective connection. The exact specification of the I/O hardware is located in the manuals of the corresponding boards.
- Do not connect or disconnect any devices while the ES5300.1-A Housing, the ES5300.1-B Housing or external devices are switched on. First, switch off the ES5300.1-A Housing or the ES5300.1-B Housing by shutting down the real-time PC and by activating the On/Off switch at the rear and unplug the power cable.
- When plugging in connectors, ensure that they are inserted straight and no pins are bent.
- For the crimp contacts of the Positronic connector, use only the appropriate pliers.

Maintenance

The product does not require maintenance.

Repairs






If an ETAS hardware product needs to be repaired, return the product to ETAS.

Cleaning

The product is not expected to require cleaning.

1.3 Identifications on the Product

The following symbols are used for product labeling:

Symbol	Description
	The User's Guide must be read prior to the startup of the product
	Marking for CE conformity (see "CE Mark" on page 13)
	Marking for KCC conformity (see "KC Mark" on page 13)
	Marking for China RoHS, see chapter (see "RoHS Conformity" on page 14)
	Marking for conformity with WEEE directive (see "Product Return and Recycling" on page 14)

Please observe the information in the chapter "Technical Data and Standards" on page 47.

1.3.1 CE Mark

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.

1.3.2 KC Mark

With the KC mark attached to the product and its packaging, ETAS confirms that the product has been registered in accordance with the product-specific KCC guidelines of the Republic of Korea.

1.3.3 RoHS Conformity

European Union

The EU directive RoHS 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.

China

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

1.4 Product Return and Recycling

The European Union (EU) released the Directive for Waste Electrical and Electronic Equipment - WEEE to ensure the setup of systems for collecting, treating and recycling electronic waste in all countries of the EU.

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. 1-3 WEEE symbol

The WEEE symbol 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 separately collect old devices and provide them to the WEEE return system for recycling.

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 "ETAS Contact Addresses" on page 51).

1.5 Materials Subject to Declaration

Some products from ETAS GmbH (e.g. modules, boards, cables) use components with materials that are subject to declaration in accordance with the REACH regulation (EC) no.1907/2006.

Detailed information is located in the ETAS download center in the customer information "REACH Declaration" < www.etas.com/Reach >. This information is continuously being updated.

1.6 About this Manual

This manual consists of the following chapters:

- "Introduction" on page 5
This chapter
- "Design, Installation and Fuses" on page 17
This chapter contains information about the design and installation of ES5392.1, as well as information about the fuses.
- Signals
This chapter features a description of the input and output signals of the ES5392.1 High Current Switch Board (6-CH).
- "Connections and Connectors" on page 39
This section provides a description of the different connections, connectors and pin assignments of the ES5392.1.
- "Technical Data and Standards" on page 47
This chapter contains the technical data of the ES5392.1. It also contains the norms and standards met.
- "Ordering Data" on page 50

1.6.1 Working with this Manual

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:

Target definition

Any advance information...

1. Step 1
Any explanation for step 1...
2. Step 2
Any explanation for step 2...

Any concluding comments...

Specific example:

Creating a new file

Before creating a new file, no other file may be open.

1. Select **File** → **New**.
The "Create File" dialog box appears.
2. Enter the name of the new file in the "File name" field.
The file name may not have more than 8 characters.
3. Click on **OK**.

The new file is being created and saved under the name you specified. You can now work with the file.

Typographical Conventions

The following typographical conventions are used:

Select File → Open .	Menu commands are displayed in bold/blue.
Click on OK .	Buttons are displayed in bold/blue.
Press <ENTER>.	Keyboard commands are presented in angled brackets starting with capital letter.
The "Open file" dialog window appears.	Names of program windows, dialog windows, fields and similar are set in quotation marks.
Select the <code>setup.exe</code> file.	Text in selection lists, program code, as well as path and file names are displayed in <code>Courier</code> font.
A conversion between the logical and arithmetic data types is <i>not</i> possible.	Content-based highlights and newly introduced terms are placed in <i>italics</i> .

Important notes for the user are presented as follows:

Note

Important note for the user.

2 **Design, Installation and Fuses**

This chapter contains information about the design and installation of ES5392.1, as well as information about the fuses.

- "Design of ES5392.1" on page 18
- "Connectors CO200, X1 PwrCtrl, X2 SwCtrl, X3 Battery Input and X4 Power I/O" on page 19
- "Installation in the ES5300.1-A/B Housing" on page 21
- "Configuration" on page 23
- "Accessories" on page 29



CAUTION!

Some components of the ES5392.1 can be damaged or destroyed by electrostatic discharges. Leave the plug-in card in its transport packaging until its installation.

The ES5392.1 may be removed from the transport packaging, configured and installed only at a workplace that is secured against electrostatic discharges. Avoid any contact with the connections of the plug-in card or with conductor paths on the card.

2.1 Design of ES5392.1

Fig. 2-1 and Fig. 2-2 show the ES5392.1 High Current Switch Board (6-CH) and its components.

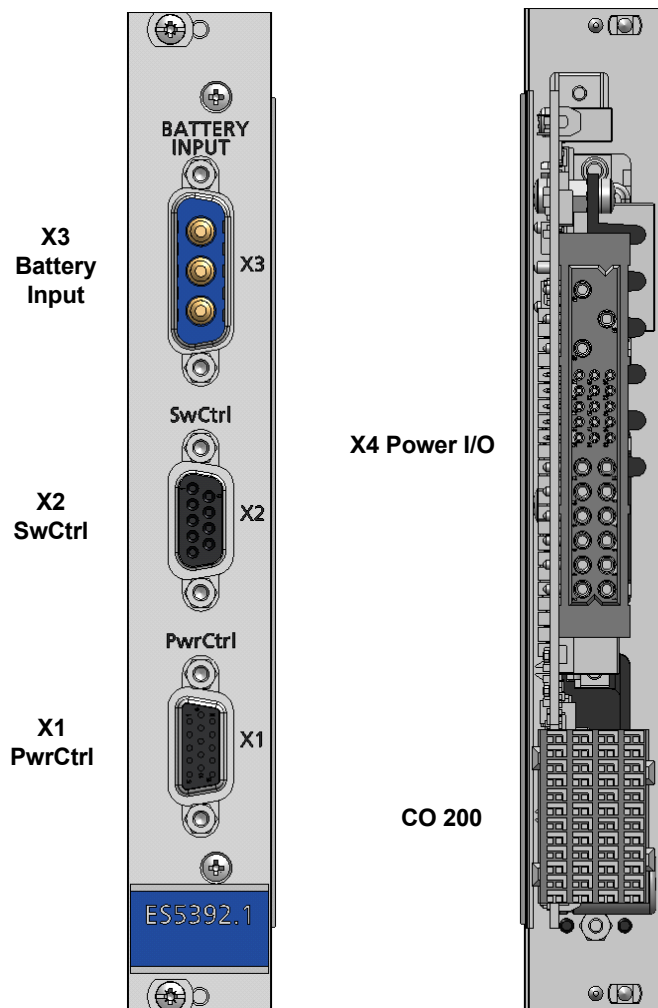


Fig. 2-1 Front plate and plug side of the ES5392.1

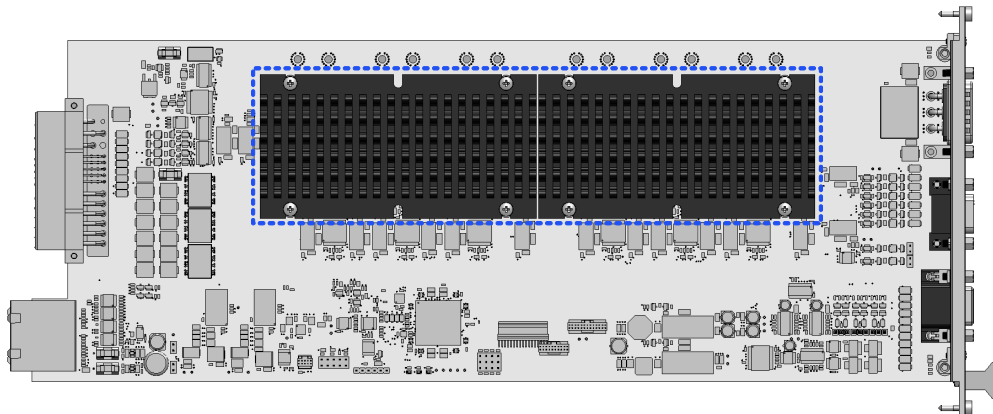


Fig. 2-2 Top view of the ES5392.1 High Current Switch Board (6-CH)
Blue frame: heat sink

2.2 Connectors CO200, X1 PwrCtrl, X2 SwCtrl, X3 Battery Input and X4 Power I/O

The connectors of the ES5392.1 are shown in Fig. 2-1 on page 18.

The pin assignment of the plugs are listed in the chapter "Connections and Connectors" on page 39. The input and output signals are described in "Signals" on page 31.

Backplane Connector CO200

The connection of ES5392.1 to the ES5300.1-A Housing or to the ES5300.1-B housing is done via the PCIe connector CO200 (Fig. 2-1 on page 18). CO200 is also used to provide the voltage supply of the ES5392.1.

Connector X1 PwrCtrl

The connector X1 allows controlling an external power supply.

Connector X2 SwCtrl

The connector X2 provides generic digital TTL signals that can be used, e.g. to switch external relays or connect an ES4408CON.1 (via CBV305.1-2 cable).

Connector X3 Battery Input

The output DC voltage of an external power supply is connected to the connector X3 (see Fig. 1-2 on page 7).

Connector X4 Power I/O

The connector X4 Power I/O can be used to connect ECUs or external loads. Furthermore, the connector features digital TTL outputs and an input for the MRC signal.

2.3 Fuses

The high current paths of the ES5392.1 are protected with fuses (60 V / 15 A). Additional fuses are used for protecting voltages of the backplane, the MRC signal and VBat.

In case of a fuse defect, we recommend to send the board to ETAS for further testing. For this purpose, the device should be sent to ETAS (see "ETAS Contact Addresses" on page 51).

If a fuse trips multiple times, the device must be sent to ETAS.



WARNING!

Fire hazard!

Failure to observe the fuse specification can lead to excess currents, short circuits and fires.

Use only fuses that meet the specification in Tab. 2-1 on page 21!

Never bridge defective fuses!

Position of Fuses

Fig. 2-3 shows the position of the fuses. Tab. 2-1 on page 21 lists the specifications of the fuses. The fuses FU1300, FU1400, FU1500, FU1600, FU1700 and FU1800 are located underneath the heat sinks.

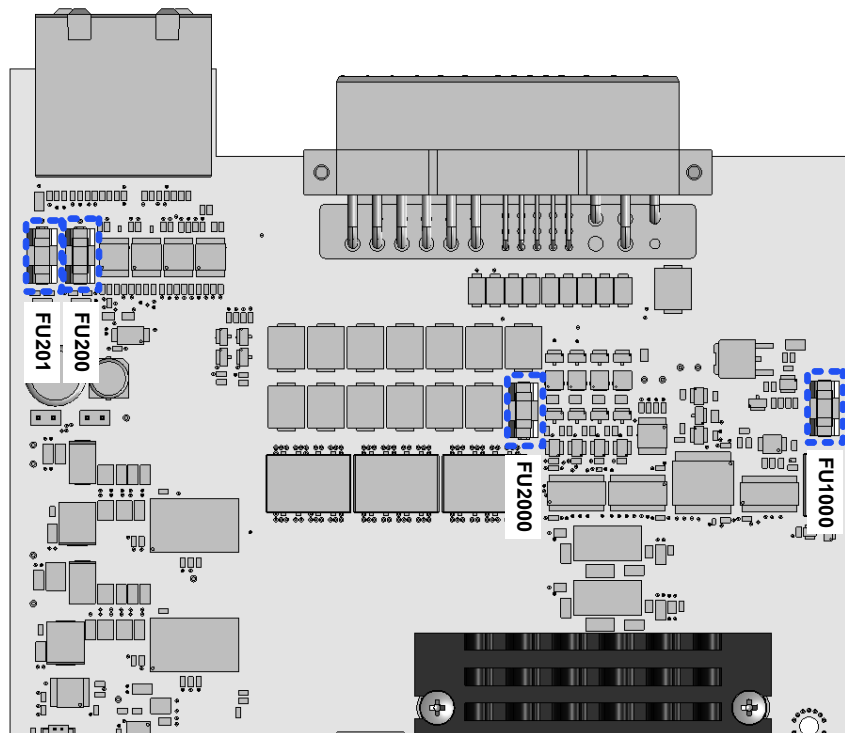


Fig. 2-3 Position of fuses on the ES5392.1

**CAUTION!**

The high current path fuses are underneath the heat sinks (see Fig. 2-2 on page 19). The heat sinks must not be disassembled. Defective fuses can be recognized, e.g. as software feedback in the RTIO. In case of a fuse defect, please send the ES5392.1 to ETAS (see "ETAS Contact Addresses" on page 51), since a professional replacement and reassembly must be ensured.

Specification of Fuses

The specification of the fuses is as follows:

Fuse	Type	Spec.	Fuse protection of	Order no.
FU200	Littlefuse NANO2® Slo-Blo® 452/454 Series	T 2 A	3.3 V	154 002.T
FU201	Littlefuse Very Fast-Acting	3 A	12 V	154 003
FU1000	Littlefuse NANO2® Slo-Blo® Fuse 452/454 Series	T 1 A	MRC	154.001.T
FU2000	Littlefuse NANO2® Slo-Blo® Fuse 452/454 Series	T 5 A	ES5300 Chassis, VBat	154 005.T

Tab. 2-1 Specification of fuses

2.4 Installation in the ES5300.1-A/B Housing

The installation of the ES5392.1 may be performed only by trained personnel in an ESD-safe area.

**CAUTION!**

Do not install the ES5392.1 while the ES5300.1-A/B Housing is switched on. First, switch off the ES5300.1-A/B Housing by shutting down the real-time PC and pressing the On/Off switch at the rear.

**CAUTION!**

Some components of the ES5392.1 can be damaged or destroyed by electrostatic discharges. Leave the plug-in card in its transport packaging until its installation.
The ES5392.1 may be removed from the transport packaging, configured and installed only at a workplace that is secured against electrostatic discharges. Avoid any contact with the connections of the plug-in card or with conductor paths on the card.

**CAUTION!**

The air circulation inside the ES5300.1-A/B Housing can be ensured only if all free slots are covered with front plates. Otherwise, it may lead to overtemperatures and trip the overtemperature protection of the ES5300.1-A/B. For this reason, install front plates in all free slots!

**CAUTION!**

If cards (e.g. for startup or calibration) are unlocked but not completely removed from the housing, they must be pulled out far enough that the distance between the respective card and the backplane of the housing is at least 1 cm. Otherwise, contacts may be established between the cards and lead to their destruction.

Installation of the ES5392.1 in the ES5300.1-A/B Housing

1. Ensure that ESD-compliant conditions exist at your workplace.
2. Shut down the real-time PC and switch off the power supply of the ES5300.1-A/B using the switch at the rear of the housing.
3. Wait a few minutes for the components (capacitors, etc.) to be discharged.
4. Place the ES5392.1 in the upper and lower rail of the slot and push it in a little bit. The backplane connector CO200 must be located at the lower rail so that it is possible to insert it in the backplane.
5. Carefully push in the carrier board until the backplane connector of the ES5392.1 is completely inserted in the socket of the backplane.

Note

Watch for cables in the insertion area while pushing in the board – pull the lines to the front door area if necessary.

6. Secure the carrier card by fastening the front plate with screws.
7. Install front plates at all open slots before starting up the ES5392.1. This ensures an optimal cooling of the components.

2.5 Configuration

With the help of screws, the ES5392.1 can be configured as battery node simulation with voltage supply from an external power supply or as high current switch. The digital inputs and outputs of the ES5392.1 can be adjusted to an external power supply with the help of jumpers.

2.5.1 Configuration as Battery node Simulation or High Current Switch

By installing screws (with combined hexagon nuts, lock washer and washer) in the screw positions shown in Fig. 2-4, you can configure the ES5392.1 as battery node simulation or as high current switch.

What is meant by battery node configuration or high current switch configuration is explained by the block diagram Fig. 3-1 on page 32.

Left screw (blue circle)	High current switch
Right screw (green diamond)	Battery node simulation
Torque	0.8 Nm

Every individual channel can be configured independently of the others either as battery node simulation or as high current switch.

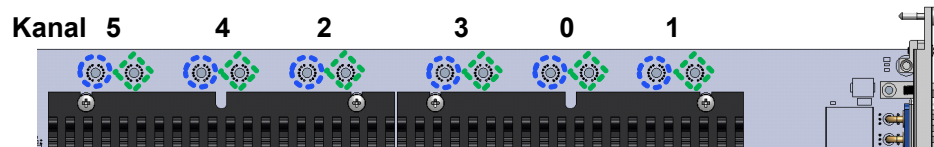


Fig. 2-4 Screw in blue circle: high current switch
Screw in green diamond: battery node simulation



WARNING!

Fire hazard!
The reconfiguration of the channels with screws may not be performed more than 25 times. The maximum permissible torque of 0.8 Nm must not be exceeded. Non-observance may lead to damage to the contacts.
If the screws are loosened and tightened too many times or tightened too loosely, the electrical contacts could deteriorate. This can lead to high thermal losses (hot spots), arc discharges and high voltage drop.

2.5.2 Configuration of Digital Inputs/Outputs of X1 PwrCtrl

There are five connection strips on the ES5392.1 for jumpers that are used for configuring the digital inputs/outputs of X1 (PwrCtrl) to an external power supply. Fig. 2-5 shows the position of the jumpers.

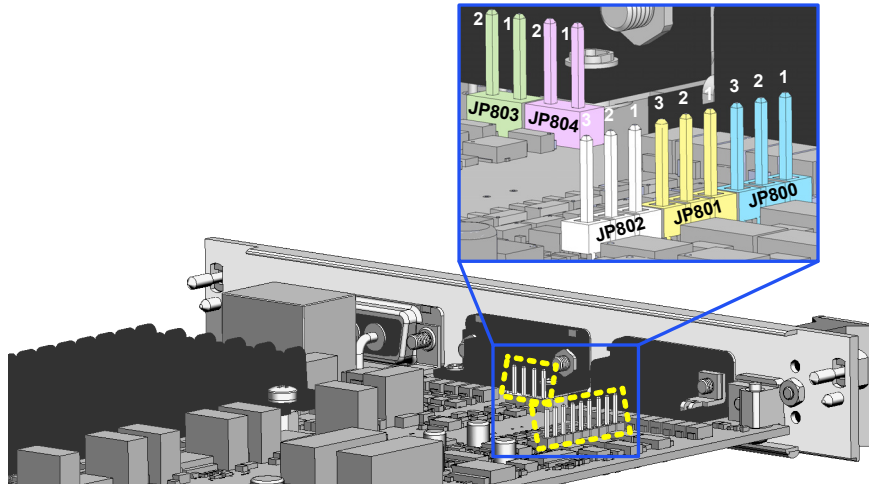


Fig. 2-5 Position of jumper connection strips

Mapping of connection strips for the jumpers to the digital inputs of X1 PwrCtrl

Jumper	Dig. input
JP800	DIG_IN_0
JP801	DIG_IN_1
JP802	DIG_IN_2

Tab. 2-2 Mapping of jumper connection strip to the digital inputs

Position of Jumpers on the Connection Strips JP800, JP801 and JP802 for the Digital Inputs of X1 PwrCtrl)

Position	Function
Pin 2-3	Pull-up circuit active (default configuration)
Pin 1-2	Pull-down circuit active
Unpopulated	Push-pull mode

Tab. 2-3 Position of jumpers for the digital inputs of X1 PwrCtrl

The block diagram of the digital inputs is located in Fig. 3-2 on page 33.

Note

Ensure that Pin 1 and Pin 3 of neighboring connection strips are not connected by a jumper.

Mapping of Connection Strips of the Jumpers to the Digital Outputs at X1 PwrCtrl

Jumper	Dig. output
JP803	DIG_OUT_0
JP804	DIG_OUT_1

Position of Jumpers for the Digital Outputs of X1 PwrCtrl

Position	Function
Pin 1-2	Pull-up circuit active (default configuration)
Open	Open-Drain

Tab. 2-4 Configuration of jumpers for the digital outputs of X1 PwrCtrl

The block diagram for the digital outputs is located in Fig. 3-3 on page 34.

Note

Ensure that Pin 1 and Pin 2 of neighboring connection strips are not connected by a jumper.

2.5.3 Internal Connections to ES5300 Chassis Connections +/-VBAT and LED

On the front plate of the ES5300.1-A Housing at the bottom right are two sockets, -VBAT and +VBAT. Next to the sockets is an LED (Fig. 2-6 on page 26).

If the ES5392.1 is connected with the contacts of -VBAT, +VBAT and the LED on the inside, then they have the following functions:

- -VBAT, +VBAT: Voltage measurement of the battery node voltage of the ES5392.1 using a measurement device.
- Connection to further devices, for example from the ES5xx/ES6xx series. Read about the exact function in your LABCAR HiL System documentation.
- LED lights: Voltage of ES5392.1 at battery node 5 measures more than 4.5 V

Alternatively, the +VBAT and -VBAT contacts on the inside can be connected to an other high-current switch or to a separate power supply. In this case, read about the exact function in your LABCAR HiL System documentation.

The contacts on the inside of the ES5300.1-A front plate are shown in Fig. 2-6 on the right. The cabling is done according to Fig. 2-7

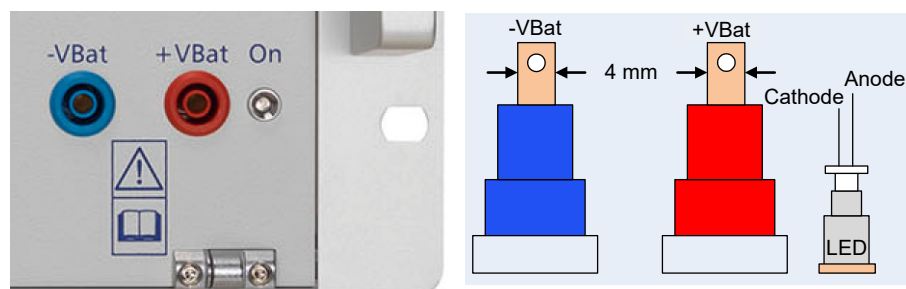


Fig. 2-6 Left: Connections -VBAT, +VBAT for a voltage measurement device and LED on the front plate of the ES5300.1-A Housing
Right: Connector and LED contacts on the inside of the front plate for cabling with the ES5392.1 or cabling with an other high-current switch or a separate power supply

Connector type: 4-mm contact-protected safety connectors

Connecting -VBAT, +VBAT and LED with X4 Power I/O of the ES5392.1

Fig. 2-7 shows the connection of -VBAT and +VBAT to X4 Power I/O of the ES5392.1. The connection is done via channel 5 of the ES5392.1. This channel is equipped with a 5-A fuse.

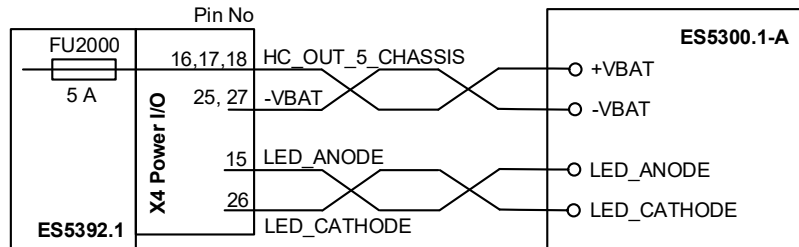


Fig. 2-7 Connecting -VBAT, +VBAT and LED with X4 Power I/O of the ES5392.1

The +VBAT contact must be connected in parallel to the pins 16, 17 and 18 of connector X4.

The -VBAT contact must be connected in parallel to the pins 25 and 27 of X4.

Note

The connections +VBAT and -VBAT of the ES5300.1-A Housing are for the ES5392.1 or for another high current switch in the system. The internal cabling of the connections -VBAT, +VBAT and the LED shall be performed by ETAS personnel. If you should decide to perform the cabling yourself, please contact the Technical Support first (see "ETAS Contact Addresses" on page 51).

Note

The +VBAT and -VBAT contacts on the inside can also be connected to a separate power supply. In this case, read about the exact function in your LABCAR HiL System documentation.

Connecting Cables and Connectors



WARNING!

Fire hazard!

The cables used must be suitable particularly for occurring currents, voltages and temperatures and flame-retardant in accordance with one of the following standards IEC 60332-1-2, IEC 60332-2-2, UL 2556/UL1581VW-1!

To connect the cable to the +/- VBAT sockets, fully insulated female receptacles with the following properties are required:

- Connecting side: 6.35 mm x 0.8 mm
- Crimp socket contacts
- Matching the cross section of the cable (0,34 mm²)
- Operating temperature: max. 60 °C
- RoHS conformity

Cable type for the cable between ES5392.1 and +/- VBAT:

- Flexible single core line with fine copper strands (e.g. H05V-K)
- Cross section: 0,34 mm²
- Operating voltage / rated current: min. 450 V / 10 A
- Operating temperature: max. 60 °C
- RoHS conformity

Note

The cables must be routed so that they cannot get caught in the door of the ES5300.1-A. The cables for +/-VBAT must be twisted. It must be ensured that the maximum permissible bending radius is not being undercut. The cables should be routed without strain using cable ties at the ES5300.1-A backplane cover.

The connection with the LED is done with soldered contacts.

Cable type for the cable between ES5392.1 and LED:

- Flexible single core line with fine copper strands
- Cross section: min. 0.14 mm²
- Operating voltage / rated current: min. 450 V / 0.5 A
- Operating temperature: max. 60 °C
- RoHS conformity

Note

The cables must be routed so that they cannot get caught in the door of the ES5300.1-A. The lines for anode and cathode must be twisted. It must be ensured that the maximum permissible bending radius is not being undercut. The pins of the LED must not protrude beyond the door area. During soldering, ensure that the lowest possible temperature effect on the LED is used.

2.6 Accessories

2.6.1 Connecting Cable

ETAS offers the following cables as a product:

Name	Short name	Application
Power Supply Controller Connection Cable, HD-DSUB15-DSUB25 (14mc-25mc), 3 m	CBAV325.1-3	Connection of control and feedback signals (X1 of ES5392.1) to a TDK Lambda GEN-50-30 lab power supply*
High Current Switch Board Connection Cable, DSUB-3W3-Ring Tongue M8 (3fc-2xmc), 3 m **	CBAV305.1-3 **	Connection of high current (X3 Battery Input) to a TDK Lambda GEN-50-30 lab power supply
Connection Cable, DSUB9-Lemo 1B FGG (9mc - 14mc), 3 m	CBV305.1-2	Connection of an ES4408.1 Load Chassis (X2 SwCtrl)

* Or a power supply with the same pin assignment

** The cable pair of the wire with ring terminals is imprinted with numbers. The numbers' meaning is as follows:

Cable Imprint	Signal
1	+VBAT
2	-VBAT

When ordering a power supply from ETAS (e.g. SM52-AR-60) from Delta Elektronika, the matching cable is included in the scope of supply.

2.6.2 External Power Supplies

A list of the power supplies supported by the software is located in the RTC User's Guide in the section of the ES5392 description.

3 Signals

This chapter features a description of the input and output signals of the ES5392.1 High Current Switch Board (6-CH).

- "Voltage Supply of Loads via External Power Supply to X3 Battery Input" on page 31
- "Battery Node and High Current Switch with Current Measurement via X4 Power I/O" on page 31
- "Control of an External Power Supply via X1 PwrCtrl" on page 33
 - "Digital Inputs at X1 PwrCtrl" on page 33
 - "Digital Outputs at X1 PwrCtrl" on page 34
 - "Analog Inputs at X1 PwrCtrl" on page 35
 - "Analog Outputs at X1 PwrCtrl" on page 35
- "Generic TTL Signals at X2 SwCtrl and X4 Power I/O Outputs" on page 36
- "Main Relay Control MRC (X4 Power I/O)" on page 37

3.1 Voltage Supply of Loads via External Power Supply to X3 Battery Input

The voltage of an external power supply can be connected at the connector X3 Battery Input.

Technical Data for X3 Battery Input

Input quantity	Data
Max. voltage	+/-60 V DC
Max. sum of absolute current values (+VBAT / -VBAT)	< 40 A

3.2 Battery Node and High Current Switch with Current Measurement via X4 Power I/O

The connections for the high current channels are located at the connector X4 Power I/O.

The configuration as battery node or high current switch is done via screws. For one channel, the high current unit and the positioning of the screw is shown in Fig. 3-1 on page 32. (see also "Configuration as Battery node Simulation or High Current Switch" on page 23).

In the case of battery node simulation, install the screw on the right. Then the signals OUT15A_0,...OUT15A_5 are active.

When it is used as high current switch, install the screw on the left. Then the signals HS_UBAT15A_0,...HS_UBAT15A_5 are active.

For every channel, the current is measured and is available as physical value in the RTIO and, as such, for the model.

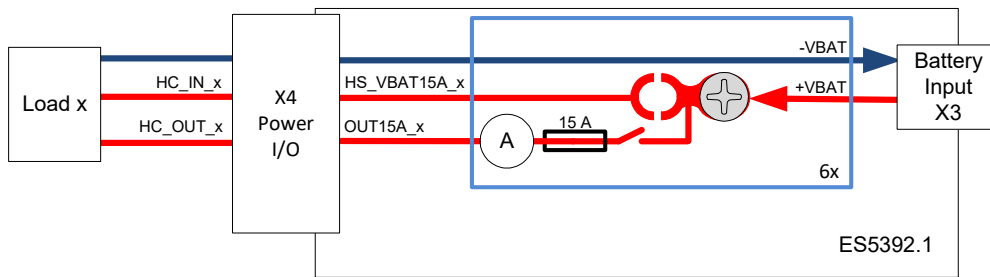


Fig. 3-1 Block diagram of the high current unit of the ES5392.1
 Right screw: battery node simulation
 Left screw: high current switch

The pin assignment of X4 Power I/O is located in Tab. 4-4 on page 46.

High current path configuration

- Battery node configuration (right screw as shown in Fig. 3-1) = Potential of +VBAT is switched from X3 to HC_OUT_X
- High current switch configuration (screw installed on the left) = Potential of HC_IN_X is switched to HC_OUT_X

Note

For the high current switch configuration, ensure a defined polarity (e.g. positive potential between HC_IN_X to HC_OUT_X) between HC_IN_X and HC_OUT_X. In case of non-observance, the current measurement will have an inverted sign.



CAUTION!

For the high current switch configuration, ensure an external protective circuit (e.g. free-wheeling diodes, varistors, RCD networks...) to protect against overvoltage/overload. Non-observance can destroy the components or trip the inaccessible fuse of the respective channel.

Technical Data of the High Current Connections of X4 Power I/O

Input quantity	Data
Max. voltage	+/- 60 V
Max. current per channel	+/- 15 A
Current measurement	+/- 15 A
Accuracy of current measurement	1.5 %

3.3 Control of an External Power Supply via X1 PwrCtrl

The ES5392.1 can control an external power supply via the connector X1 PwrCtrl (pin assignment on page 41). The inputs and outputs of X1 PwrCtrl have the following functions:

- Switching an external power supply on and off via the digital outputs
- Receiving status signals from the external power supply via the digital inputs
- Setting the target value of the voltage of the external power supply via the analog outputs
- Measuring voltage and current of the external power supply via the analog inputs
- Galvanic isolation of all analog and digital inputs and outputs

3.3.1 Digital Inputs at X1 PwrCtrl

The connector X1 PwrCtrl has three digital inputs DIG_IN_0... DIG_IN_2 that can be used, e.g. for connecting status signals of the power supply, such as "over-voltage", "overcurrent" or "overtemperature".

Fig. 3-2 shows the block diagram of a digital input.

Block diagram for digital inputs of X1 PwrCtrl

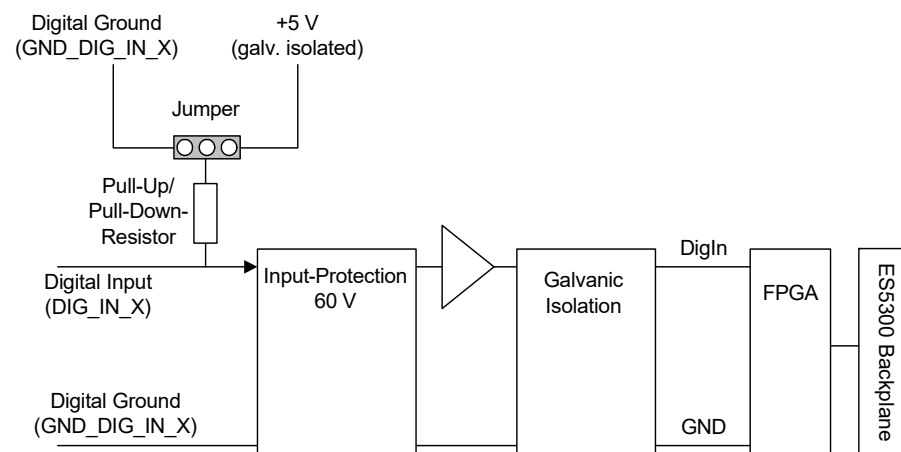


Fig. 3-2 Block diagram of the digital inputs of X1 PwrCtrl

For power supplies, whose status lines feature an "Open Collector" stage at the output, every digital input features either a Pull-Up or Pull-Down wiring. The wiring can be configured with jumpers via the connection strips JP800, JP801 and JP802.

The configuration for the digital inputs via jumper is described in "Configuration of Digital Inputs/Outputs of X1 PwrCtrl" on page 24.

The pin assignment of X1PwrCtrl is located in Tab. 4-1 on page 41.

Technical Data of the Digital Inputs of X1 PwrCtrl

Input quantity	Data
Input voltage range	TTL
Input current	< 3.5 mA
Overvoltage protection	yes, up to ± 60 V
Galvanic isolation	yes
Sampling rate	1 ms

3.3.2 Digital Outputs at X1 PwrCtrl

The connector X1 PwrCtrl has two digital outputs DIG_OUT_0 and DIG_OUT_1, which can be configured with LABCAR Operator and can be used, for example, for the connect/disconnect of the external power supply.

Fig. 3-3 shows the block diagram for the digital outputs.

Block Diagram of Digital Outputs at X1 PwrCtrl

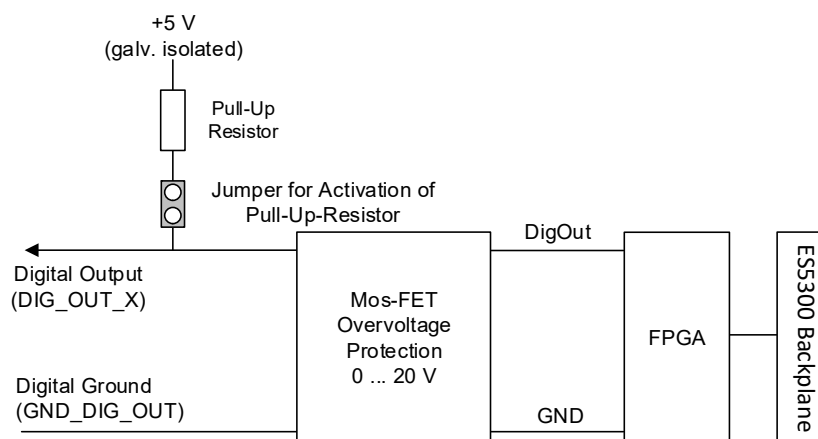


Fig. 3-3 Block diagram of digital outputs at X1 PwrCtrl

The digital outputs can be configured via jumper as Open-Drain output or fitted with a Pull-Up resistor.

The configuration for the digital outputs via jumper is described in "Configuration of Digital Inputs/Outputs of X1 PwrCtrl" on page 24.

The pin assignment of X1 PwrCtrl is located in Tab. 4-1 on page 41.

Technical Data of the Digital Outputs of X1 PwrCtrl

Output	Data
Output voltage	Open drain TTL
Output current	max. 11 mA
Overvoltage protection	yes, up to ± 20 V
Galvanic isolation	yes
Switching frequency	max. 5 kHz

3.3.3 Analog Inputs at X1 PwrCtrl

The connector X1 PwrCtrl has two analog inputs ANA_IN_0 and ANA_IN_1, that can be used, e.g. to measure the actual values of current and voltage of the external power supply.

Block diagram of analog inputs

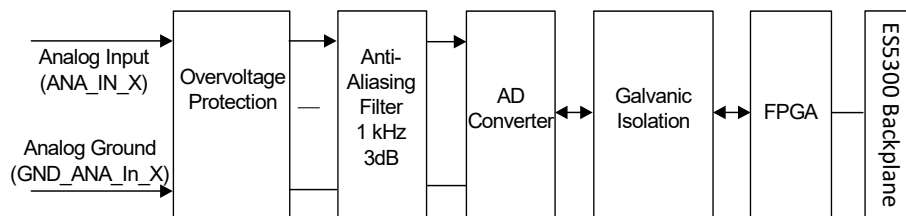


Fig. 3-4 Block diagram of analog inputs at X1 PwrCtrl

The pin assignment of X1 PwrCtrl is located in Tab. 4-1 on page 41.

Technical Data of the Analog Inputs of X1 PwrCtrl

Input quantity	Data
Input voltage	0 V to 10 V
Input impedance	>1 M Ω
Accuracy	± 10 mV
Resolution	16 bit
Sampling rate	1 ms
Galvanic isolation	yes
Overvoltage protection	up to ± 60 V

3.3.4 Analog Outputs at X1 PwrCtrl

To adjust the target voltage and target current at the external power supply, two analog outputs ANA_OUT_0 and ANA_OUT_1 are available at X1 PwrCtrl.

Block Diagram of the Analog Outputs of X1 PwrCtrl

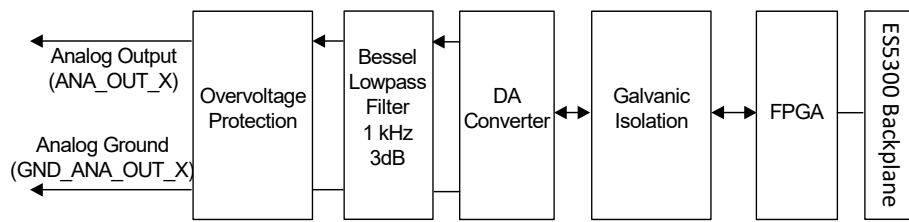


Fig. 3-5 Block diagram of the analog outputs at X1 PwrCtrl
The pin assignment of X1PwrCtrl is located in Tab. 4-1 on page 41.

Technical Data of the Analog Outputs of X1 PwrCtrl

Output	Data
Output voltage	0 V to 10 V
Max. output current	10 mA
Resolution	14 bit
Accuracy	±10 mV
Galvanic isolation	yes
Overvoltage protection	up to ±60 V

Tab. 3-1 Technical data of the analog outputs

3.4 Generic TTL Signals at X2 SwCtrl and X4 Power I/O Outputs

The connectors X2 SwCtrl and X4 Power I/O have generic digital TTL outputs that can be used, e.g. to control external relays.

Digital Outputs DIG_OUT_X at X2 SwCtrl

The digital outputs DIG_OUT_0...DIG_OUT_5 at X2 SwCtrl have the following properties:

- 6 TTL outputs, galvanically isolated, with common reference potential GND_DIG_OUT
- Possibility for switching external relays
- Possibility for connection with an ES4408CON.1 (via CBV305.1-2 cable, see also Fig. 1-2 on page 7)
- Configuration via RTIO

The pin assignment of X2 SwCtrl is located in Tab. 4-2 on page 42.



WARNING!

The connector X2 SwCtrl is intended for connecting an ES4408.1 Load Chassis and does not offer overload protection. Connecting the Switch Control outputs to non-intended devices may lead to the destruction of the outputs or to an undefined behavior .

Fig. 3-6 shows the block diagram for the digital outputs at X2 SwCtrl and X4 Power I/O.

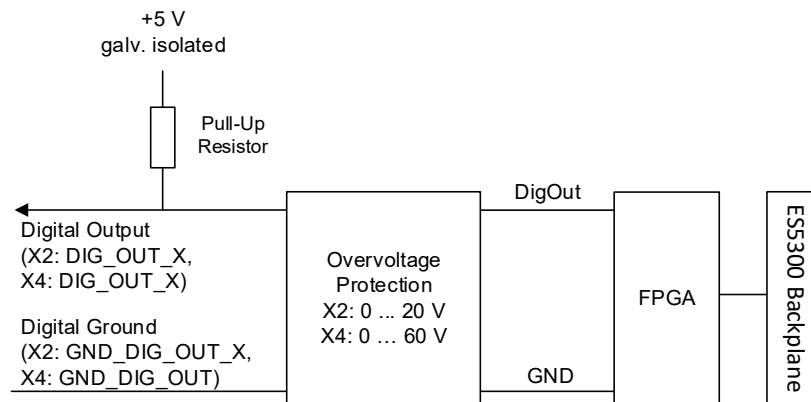


Fig. 3-6 Digital outputs at X2 SwCtrl and X4 Power I/O

Digital Outputs DIG_OUT_X at X4 Power I/O

The digital outputs DIG_OUT_0...DIG_OUT_3 at X4 Power I/O have the following properties:

- 4 TTL outputs, galvanically isolated, with a common reference potential GND_DIG_OUT
- Possibility for switching external relays
- Configurable via RTIO
- Display of error signals in case of overload (see RTC User's Guide)

The pin assignment of X4 Power I/O is located in Tab. 4-4 on page 46.

Technical Data of TTL Signals at X2 SwCtrl and X4 Power I/O Outputs

Output	Data
Output voltage	Open drain TTL
Output current	max. 11 mA
Overvoltage protection	X2: up to ±20 V X4: up to ±60 V
Galvanic isolation	yes
Switching frequency	max. 5 kHz

3.5 **Main Relay Control MRC (X4 Power I/O)**

The MRC (Main Relay Control) signal has the following properties:

- Controllable current source/drain
- Use as main relay simulation is possible, +VBAT drawn from Battery Input X3 (before the switches)
- Switching between +/-VBAT possible via software
- Minimum voltage of 6 V must be present to generate a usable MRC signal
- Setting range of current source/drain possible from 0 mA to 150 mA in increments of 1 mA

The ECU can be connected at the connector X4 Power I/O at MRC_IN.

In LABCAR Operator, it is possible to define via RTIO which battery nodes depend on the main relay and whether the MRC signal is high-active or low-active.

The current can be adjusted via the RTIO.

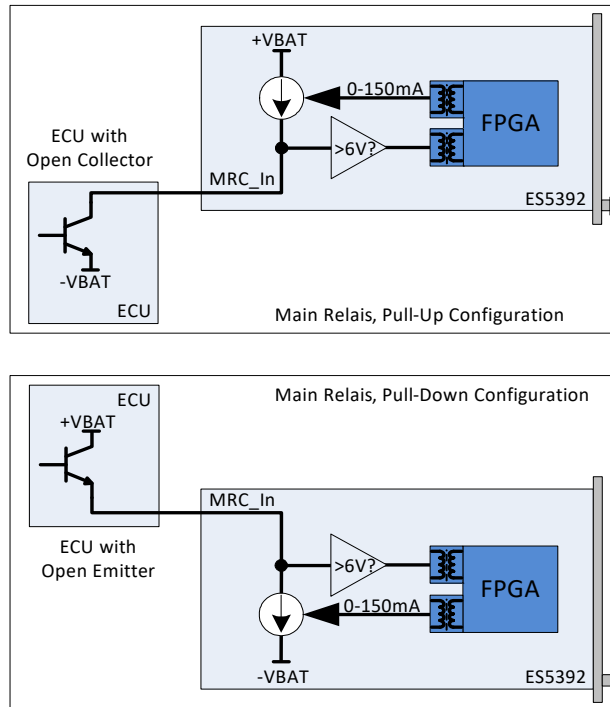


Fig. 3-7 Logic for MRC function

The pin assignment of X4 Power I/O is located in Tab. 4-4 on page 46.

Technical Data of MRC Input.

Main relay input	Data
Input voltage	0 V to 60 V
Input current	0 mA -150 mA
Accuracy	3 mA
Galvanic isolation	yes
Overvoltage protection	up to +/- 60 V

Tab. 3-2 Technical data of MRC input

4 Connections and Connectors

This section provides a description of the different connections, connectors and pin assignments of the ES5392.1.

- "Backplane Connector CO200" on page 39
- "Connector X1 PwrCtrl" on page 41
- "Connector X2 SwCtrl" on page 42
- "Connector X3 Battery Input" on page 43
- "Connector X4 Power I/O" on page 44
- "Connecting Cable" on page 46

4.1 Backplane Connector CO200

Type: ERNI ERMet ZD 4-pair angled female multipoint connector (4-12) (order no. 973099)

Counterplug (in ES5300): ERNI ERMet ZD 4-pair straight male multipoint connector (4-12) (order no. 973096)

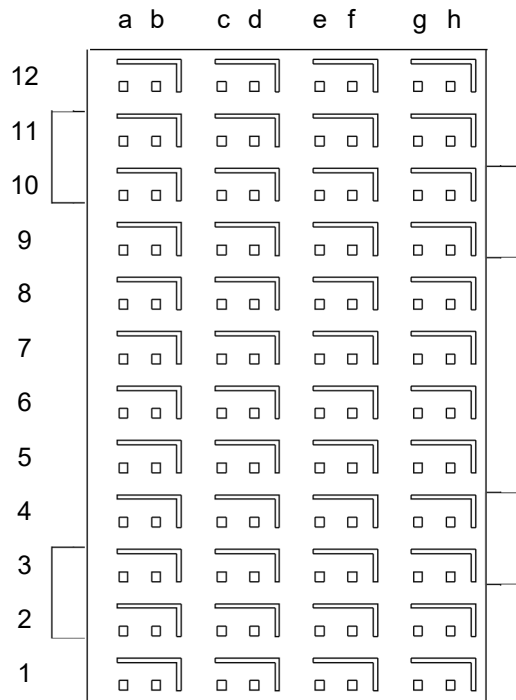


Fig. 4-1 Connector to backplane (top view)

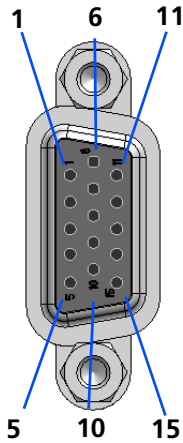
- The assignment of the pins is as follows (the maximum possible pin assignment for the ES5300.1-A Housing and the ES5300.1-B Housing is given):

	h	g	f	e	d	c	e	a
12	GBLI_TX_n_0	GBLI_TX_p_0	GBLI_RX_n_0	GBLI_RX_p_0	M_LVDS_n_7	M_LVDS_p_7	BN_5	BN_4
12-shield	GND		GND		GND		GND	
11	GBLI_TX_n_1	GBLI_TX_p_1	GBLI_RX_n_1	GBLI_RX_p_1	M_LVDS_n_6	M_LVDS_p_6	SPI_CS_B_n	SPI_CS_A_n
11-shield	GND		GND		GND		GND	
10	GBLI_TX_n_2	GBLI_TX_p_2	GBLI_RX_n_2	GBLI_RX_p_2	M_LVDS_n_5	M_LVDS_p_5	SPI_MOSI	SPI_CLK
10-shield	GND		GND		GND		GND	
9	GBLI_TX_n_3	GBLI_TX_p_3	GBLI_RX_n_3	GBLI_RX_p_3	M_LVDS_n_4	M_LVDS_p_4	PCIE_WAKE_n	SPI_MISO
9-shield	GND		GND		GND		GND	
8	GBLI_PRESENT_n	GEO_ADDR_4	PCIE_REFCLK_n	PCIE_REFCLK_p	M_LVDS_n_3	M_LVDS_p_3	n.c.	n.c.
8-shield	GND		GND		GND		GND	
7	PCIE_RX_n_0	PCIE_RX_p_0	PCIE_TX_n_0	PCIE_TX_p_0	M_LVDS_n_2	M_LVDS_p_2	n.c.	n.c.
7-shield	GND		GND		GND		GND	
6	Ass. internally	Ass. internally	Ass. internally	Ass. internally	M_LVDS_n_1	M_LVDS_p_1	PCIE_JTAG_TCK	PCIE_JTAG_TDI
6-shield	GND		GND		GND		GND	
5	Ass. internally	Ass. internally	Ass. internally	Ass. internally	M_LVDS_n_0	M_LVDS_p_0	PCIE_JTAG_TDO	PCIE_JTAG_TMS
5-shield	GND		GND		GND		GND	
4	Ass. internally	Ass. internally	IAss. internally	Ass. internally	GEO_ADDR_1	GEO_ADDR_0	BN_3	BN_2
4-shield	GND		GND		GND		GND	
3	VCC24	VCC24	GEO_ADDR_3	GEO_ADDR_2	PCIE_SMBDAT	PCIE_SMBCLK	BN_1	BN_0
3-shield	VCC3_3		VCC3_3		VCC3_3		VCC3_3	
2	VSS12	VSS12	VCC3_3	VCC5	PCIE_PERSTn	PCIE_PRSTn	PCIE_PRSTn_X 1	PCIE_PRSTn_X 4
2-shield	VCC12		VCC12		VCC12		VCC12	
1	VCC3_3	VCC3_3	VCC5	VCC5	VCC12	VCC12	VCC12	VCC12
1-shield	VCC12		VCC12		VCC12		VCC12	

4.2 Connector X1 PwrCtrl

The X1 PwrCtrl connector can be used to control an external power supply for battery simulation.

Counterplug: Manufacturer: FCI
 Type: D-Sub HD 15 Pole, Male
 Order number: 10090769-P154ALF



The pin assignment is as follows:

Shortname	Type	#	PIN (signal)	PIN (reference)	Shortname
DIG_IN_0	Digital input	0	8	12	GND_DIG_IN*
DIG_IN_1	Digital input	1	2	12	GND_DIG_IN*
DIG_IN_2	Digital input	2	7	12	GND_DIG_IN*
DIG_OUT_0	Digital output	0	6	11	GND_DIG_OUT*
DIG_OUT_1	Digital output	1	1	11	GND_DIG_OUT*
ANA_IN_0	Analog input	0	4	3	GND_ANA_IN_0**
ANA_IN_1	Analog input	1	9	14	GND_ANA_IN_1**
ANA_OUT_0	Analog output	0	5	13	GND_ANA_OUT_0**
ANA_OUT_1	Analog output	1	10	15	GND_ANA_OUT_1**
				Housing	GND_EARTH

* Reference of digital inputs and outputs, internally connected
 ** Reference of analog inputs and outputs, internally connected

Tab. 4-1 Connector X1 PwrCtrl

4.3 Connector X2 SwCtrl

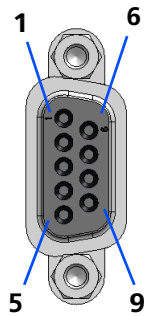
The connector X2 SwCtrl has 6 generic digital TTL outputs

Counterplug:

Manufacturer: Tyco

Type: D-Sub 9 Pole, Male

Order number: 5-747904-2



The pin assignment is as follows:

Shortname	Type	#	PIN (signal)	PIN (reference)	Shortname
DIG_OUT_0	Digital output	0	5	1, 2	GND_DIG_OUT_0*
DIG_OUT_1	Digital output	1	9	6	GND_DIG_OUT_1*
DIG_OUT_2	Digital output	2	4	1, 2	GND_DIG_OUT_0*
DIG_OUT_3	Digital output	3	8	6	GND_DIG_OUT_1*
DIG_OUT_4	Digital output	4	3	1, 2	GND_DIG_OUT_0*
DIG_OUT_5	Digital output	5	7	6	GND_DIG_OUT_1*
Housing					GND_EARTH

* Reference of digital outputs, internally connected

Tab. 4-2 Connector X2 SwCtrl

4.4 Connector X3 Battery Input

The connector X3 Battery Input is used to connect the voltage of the external power supply.

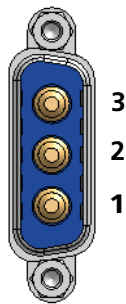
Counterplug:

Manufacturer: Positronic

Type: D-Sub 3W3, Female

Order number: CBD3W3F0000X/AA (connector)

1xFC4008D/AA (crimp contact)



The pin assignment is as follows:

Shortname	Type	#	PIN (signal)	PIN (reference)	Shortname
+VBAT_IN_0*	High current input	0	3	1	-VBAT_IN
+VBAT_IN_1*	High current input	1	2	1	-VBAT_IN
Housing					GND_EARTH

* internally connected

Tab. 4-3 Connector X3 Battery Input



WARNING!

The sum of absolute current values must not exceed 40 A and must be limited by the upstream element (power supply). In case of non-observance, overheating can lead to damages to the ES5392.1, the ES5300 housing and personal injuries.

4.5 Connector X4 Power I/O

The connector X4 Power I/O contains high-current connections, an input for the MRC signal and generic digital outputs. The numbering of the pins is shown in Fig. 4-2 on page 45.

Ordering information for X4 Power I/O, counterplug and crimp contacts is as follows:

X4 Power I/O:

Type: PCIM30W15RM400A1, male

Manufacturer: Positronic

Order number: PCIM30W15M300A1/AA

Counter plug:

The counter plug with the matching crimp contacts can be ordered as accessory (see "Ordering Data" on page 50).

Type: PCIM30W15F8000, female

Manufacturer: Positronic

Order number: PCIM30W15F8000/AA

Crimp Contacts (15 parts for each type):

Type: FC422N8

Manufacturer: Positronic

Order number: FC422N8/AA-1565.0

Type: FC114N2

Manufacturer: Positronic

Order number: FC114N2/AA

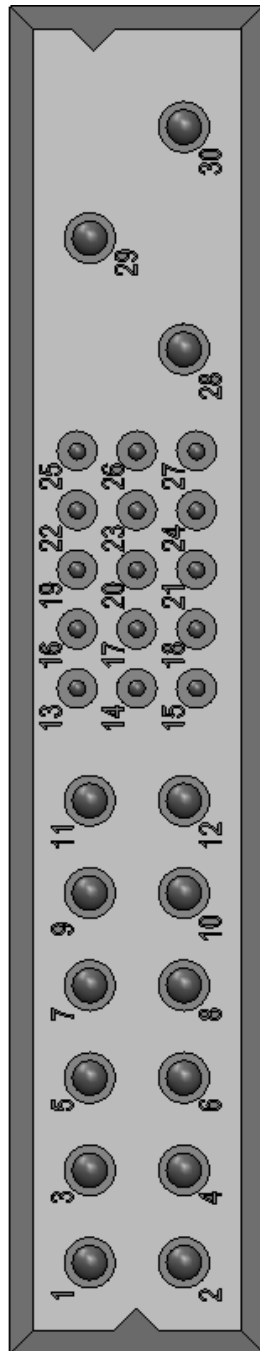


Fig. 4-2 X4 Power I/O connector

The pin assignment is as follows:

Shortname	Type	#	PIN (signal)	PIN (reference)	Shortname
HC_IN_0*	High current input	0	3		
HC_IN_1*	High current input	1	7		
HC_IN_2*	High current input	2	6		
HC_IN_3*	High current input	3	2		
HC_IN_4*	High current input	4	10		
HC_IN_5*	High current input	5	11		
HC_OUT_0	High current output	0	5	28, 29, 30	-VBAT**
HC_OUT_1	High current output	1	9	28, 29, 30	-VBAT**
HC_OUT_2	High current output	2	4	28, 29, 30	-VBAT**
HC_OUT_3	High current output	3	1	28, 29, 30	-VBAT**
HC_OUT_4	High current output	4	8	28, 29, 30	-VBAT**
HC_OUT_5	High current output	5	12	28, 29, 30	-VBAT**
DIG_OUT_0	Digital output	0	20	24	GND_DIG_OUT
DIG_OUT_1	Digital output	1	19	24	GND_DIG_OUT
DIG_OUT_2	Digital output	2	23	24	GND_DIG_OUT
DIG_OUT_3	Digital output	3	22	24	GND_DIG_OUT
LED_ANODE	LED	0	15	26	LED_CATHODE
MRC_IN	MRC	0	13		+ -VBAT***
HC_OUT_5_CHASSIS	High current output	5	16,17,18	25, 27	-VBAT
	not connected		14, 21		

* Input with high current switch configuration

** Reference for battery node configuration

*** Dependent on PULL-Up/Down configuration and derived from X3 input

Tab. 4-4 Connector X4 Power I/O

4.6 Connecting Cable

Use only approved cables for creating cable assemblies (e.g. for connecting the ECU and external loads). The cable length must not exceed 3 m.

Special connecting cables for an external power supply are listed in the chapter "Connecting Cable" on page 29.



WARNING!

Fire hazard!

The cables used must be suitable particularly for occurring currents, voltages and temperatures and flame-retardant in accordance with one of the following standards IEC60332-1-2, IEC60332-2-2, UL2556/UL1581VW-1!

Note

The signal lines may not exceed a maximum length of 3 m!

5 Technical Data and Standards

This chapter contains the technical data of the ES5392.1. It also contains the norms and standards met.

- "Technical Data" on page 47
- "Norms and Standards Met" on page 49
- "Ordering Data" on page 50

5.1 Technical Data

Technical Data for X3 Battery Input

Input quantity	Data
Max. voltage	+/- 60 V DC
Max. sum of absolute current values (+VBAT / -VBAT)	< 40 A

Technical Data of the High Current Connections of X4 Power I/O

Input quantity	Data
Max. voltage	+/- 60 V
Max. current per channel	+/- 15 A
Current measurement	+/- 15 A
Accuracy of current measurement	1.5 %

Technical Data of the Digital Inputs of X1 PwrCtrl

Input quantity	Data
Input voltage range	TTL
Input current	< 3.5 mA
Overvoltage protection	yes, up to ± 60 V
Galvanic isolation	yes
Sampling rate	1 ms

Technical Data of the Digital Outputs of X1 PwrCtrl

Output	Data
Output voltage	Open drain TTL
Output current	max. 11 mA
Overvoltage protection	yes, up to ± 20 V
Galvanic isolation	yes
Switching frequency	max. 5 kHz

Technical Data of the Analog Inputs of X1 PwrCtrl

Input quantity	Data
Input voltage	0 V to 10 V
Input impedance	>1 MΩ
Accuracy	±10 mV
Resolution	16 bit
Sampling rate	1 ms
Galvanic isolation	yes
Overvoltage protection	up to ±60 V

Technical Data of the Analog Outputs of X1 PwrCtrl

Output	Data
Output voltage	0 V to 10 V
Max. output current	10 mA
Resolution	14 bit
Accuracy	±10 mV
Galvanic isolation	yes
Overvoltage protection	up to ±60 V

Technical Data of TTL Signals at X2 SwCtrl and X4 Power I/O Outputs

Output	Data
Output voltage	Open drain TTL
Output current	max. 11 mA
Overvoltage protection	X2: up to ±20 V X4: up to ±60 V
Galvanic isolation	yes
Switching frequency	max. 5 kHz

Technical Data of MRC Input.

Main relay input	Data
Input voltage	0 V to 60 V
Input current	0 mA -150 mA
Accuracy	3 mA
Galvanic isolation	yes

Current Consumption from Backplane

Current consumption	0.1 A @ +3.3 V DC 1.65 A @ +12 V DC
---------------------	--

Storage Conditions

Temperature	-20 °C to 85 °C (-4 °F to 185 °F)
Relative humidity	0 to 95% (non-condensing)

Ambient Conditions

Environment	Use only inside enclosed and dry rooms
Max. contamination level	2
Temperature during operation	5 °C to 40 °C (41 °F to 104 °F)
Relative humidity	0 to 95% (non-condensing)
Operating altitude	Max. 2000 m above sea level

Physical Dimensions

Height	4 U
Width	5 HP
Weight	1.5 kg

5.2 Norms and Standards Met

The ES5392.1 meets the following norms and standards:

Standard	Test
IEC 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements (industrial setting)
IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

The module is only intended for use in industrial settings in accordance with EN 61326-1. Avoid potential radio interference when using the module outside of the industrial settings with additional shielding measures!

**WARNING!**

This is class A equipment. This equipment can cause radio interference in residential areas. Should that be the case, the operator may be requested to institute reasonable measures.

Note

The signal lines may not exceed a maximum length of 3 m!

6 Ordering Data

Order name	Short name	Order number
ES5392.1 High Current Switch Board (6-CH)	ES5392.1	F-00K-110-001
Calibration Service for ES5392.1	K_ES5392.1	F-00K-110-003
Scope of delivery	Quantity	
ES5392.1 High Current Switch Board (6-CH)	1	

Accessories	Short name	Order number
Counter plug for the ES5392, with crimp contacts: 15x FC422N8_AA and 15x FC114N2_AA	AS_Positronic_ES5392	F-00K-111-995
Power Supply Controller Connection Cable, HD-DSUB15-DSUB25 (14mc-25mc), 3 m	CBAV325.1-3	F-00K-110-004
High Current Switch Board Connection Cable, DSUB3W3-Ring Tongue M8 (3fc-2xmc), 3 m *	CBAV305.1-3 *	F-00K-110-005
Connection Cable, DSUB9-Lemo 1B FG (9mc - 14mc), 2 m	CBV305.1-2	F-00K-110-006

* The cable pair of the wire with ring terminals is imprinted with numbers. The numbers' meaning is as follows:

Cable Imprint	Signal
1	+VBAT
2	-VBAT

Note

The crimp tool for the crimp contacts of the AS_Positronic_ES5392 must be ordered separately.

7 **ETAS Contact Addresses**

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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

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