ETAS

ES5352.1 Signal Conditioning Board

User's Guide

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Contents

1 Introduction

This User's Guide describes the ES5352.1 Signal Conditioning Board.

CAUTION!

Some components of the ES5352.1 Signal Conditioning Board can be damaged or destroyed by electrostatic discharges. Leave the plug-in board in its transport packaging until it is installed.
Only remove, configure and install the ES5352.1 at a workplace that is protected against electrostatic discharges.

This chapter contains information on the following topics:

1.1 Features

The ES5352.1 Signal Conditioning Board is used to accommodate two modules for signal conditioning (example: PB1652LAMBDA.1-B Signal Conditioning for Lambda Sensor Simulation).

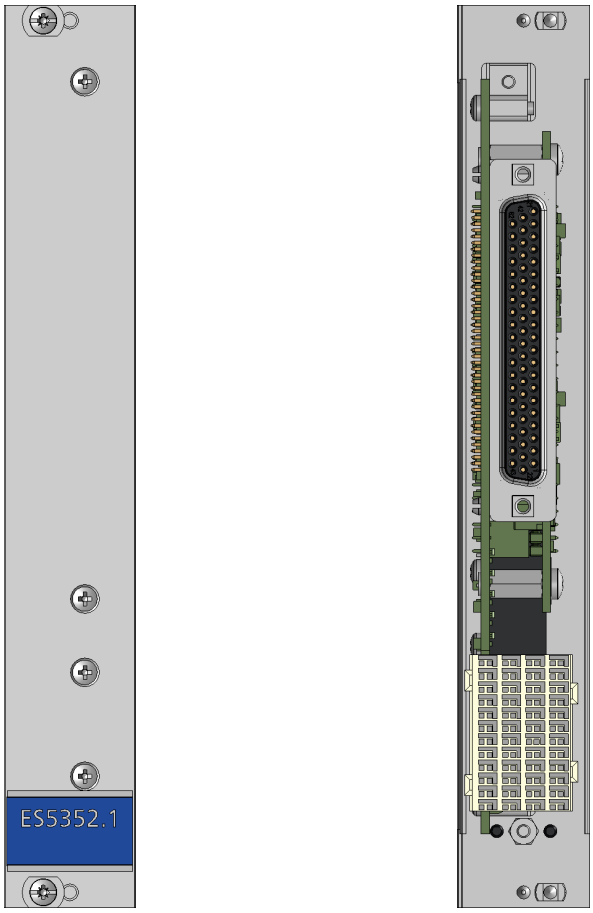


Fig. 1-1 Front Panel and Plug-In Side of the ES5352.1 Signal Conditioning Board

The function units of the ES5352.1 Signal Conditioning Board are shown in the following block diagram:

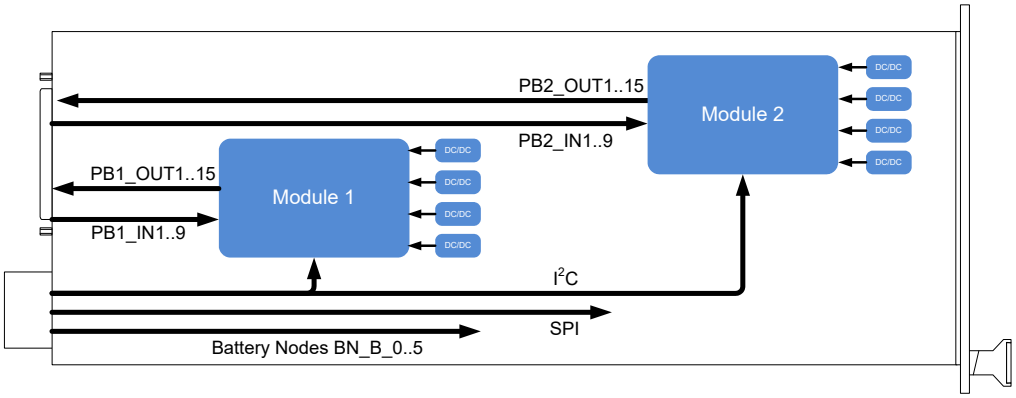


Fig. 1-2 Block Diagram

The 9 input and 15 output signals of each of the piggybacks are routed over the 62-pin D-Sub connector.

CAUTION!

There is no protective circuitry for the inputs and outputs on the ES5352.1 Signal Conditioning Board! If required, the customer must provide this on the relevant piggyback.

To supply power to the piggybacks, up to four DC/DC converters can be installed per module on the ES5352.1 Signal Conditioning Board. These are either supplied with +5 V or +12 V from the backplane.

There are fuses on the ES5352.1 to protect the backplane voltages.

1.2 Basic Safety Instructions

Please adhere to the safety instructions in this manual to avoid injury to yourself and others as well as damage to the device.

1.2.1 Labeling of Safety Instructions

The safety instructions contained in this manual are shown with the standard danger symbol shown below:

The following safety instructions are used. They provide extremely important information. Please read this information carefully.

CAUTION!

indicates a low-risk danger which could result in minor or less serious injury or damage if not avoided.

WARNING!

indicates a possible medium-risk danger which could lead to serious or even fatal injuries if not avoided.

DANGER!

indicates a high-risk, immediate danger which could lead to serious or even fatal injuries if not avoided.

1.2.2 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

The User's Guide must be read 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 qualifications and experience for this product. Improper use or use by a user without sufficient qualification can put life at risk or cause damage to health or 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

Application Area of the Product

The ES5352.1 Signal Conditioning Board is a plug-in board for the ES5300.1-A Housing and the ES5300.1-B Housing for accommodating two modules for signal conditioning.

The ES5352.1 Signal Conditioning Board consists of:

- Two slots for signal conditioning modules,
- One SPI interface to the ES5300.1-A Housing or to the ES5300.1-B Housing for configuring modules,
- One I^2C interface for reading board data,
- One output interface to the ECU,
- One digital interface for signals to battery node control,
- Piggyback power supply - up to four DC/DC converters per module are required for this purpose.

The ES5321.2 must only ever be used in the ETAS ES5300 system housing intended for this purpose and must not be operated as a stand-alone unit.

The intended use of the ES5321.2 in an ES5300.1-A Housing or ES5300.1-B Housing is:

- Use as a component in industrial lab facilities or at industrial workplaces.
- Use as a hardware interface for ECUs in a hardware-in-the-loop test system.
- Use in conjunction with ETAS software that supports the ES5300.1-A Housing and the ES5300.1-B Housing.
- Use as an interface in conjunction with software programs that operate the standardized, documented and open APIs from ETAS software products.

The ES5352.1 Signal Conditioning Board is **not** intended to be used:

- Within a vehicle on the road.
- As part of a life support system.
- As part of a medical application.
- 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 39),
- With signal conditioning that falls outside the specified ranges (see "Voltages, Currents and Power Consumption" on page 39).

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 must only be operated in a technically flawless state, in accordance with its intended purpose and in a safety-conscious and hazard-aware manner under consideration of the documentation regarding the product. If the product is not used in accordance with its intended purpose, its product safety 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. If the product is used in any other way, 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!
Only use fuses that comply with the specification in the User's Guide for the product. Never bridge defective fuses!
Failure to observe the fuse specification can lead to excess currents, short circuits and fires.

CAUTION!

There is no protective circuitry for the inputs and outputs on the ES5352.1 Signal Conditioning Board! If required, the customer must provide this on the relevant piggyback.

Power Supply

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

The electrical connection is made via the backplane connector CO200.

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)). Lab power supplies that comply with IEC/EN 60950 or IEC/EN 61010 meet this requirement.
- 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 the 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, in particular, be suitable for the currents, voltages and temperatures which occur and must be flameretardant in accordance with one of the following standards
IEC60332-1-2, IEC60332-2-2, UL2556/UL1581VW-1!

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 ES5352.1 can be damaged or destroyed by electrostatic discharges. Leave the plug-in board in its transport packaging until it is installed.
Only remove, configure and install the ES5352.1 at a workplace that is protected against electrostatic discharges.

CAUTION!

In order to prevent damage to the plug-in board 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 Guide.

CAUTION!

If cards (e.g. for startup or calibration) are unlocked but not completely removed from the housing, they have to 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.

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 ES5352.1 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 connected 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, then unplug the power plug.
- When plugging in connectors, ensure that they are inserted straight and no pins are bent.

Maintenance

The device 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 identifying the product:

Symbol	Description
	Before using the product, carefully read the User's Guide!
	Identification for CE conformity, see "CE Marking" on page 13
	Identification for China RoHS, see "RoHS Conformity" on page 13
	Identification for conformity with WEEE directive, see "Product Return and Recycling" on page 14
	Marking for KCC Conformity, see "KC Marking" on page 14

Observe the information in the chapter "Technical Data and Norms" on page 39.

1.3.1 CE Marking

ETAS confirms that the product meets the product-specific applicable European Directives with the CE marking affixed to the product or its packaging. The CE Declaration of Conformity for the product is available upon request.

1.3.2 RoHS Conformity

European Union

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

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

China

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

1.3.3 KC Marking

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.

1.4 Product Return and Recycling

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

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

Fig. 1-3 WEEE Symbol

The WEEE symbol on the product or its packaging shows that the product must not be disposed of as residual garbage.

The user is obliged to collect the old devices separately and return them to the WEEE take-back system for recycling.

The WEEE Directive concerns all ETAS devices but not external cables or batteries.

For more information on the ETAS GmbH Recycling Program, contact the ETAS sales and service locations (see "ETAS Contact Addresses" on page 43).

1.5 Declarable Substances

European Union

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 (EU) no.1907/2006.

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

1.6 About this Manual

This manual consists of the following chapters:

- "Introduction" on page 5

  This chapter
- "Features and Functions" on page 17

  This chapter describes the features and functions of the components of the ES5352.1 Signal Conditioning Board.
- "Pin Assignment and Connections" on page 21

  This section describes the various connectors of the ES5352.1 Signal Conditioning Board.

- "Installation of the Piggybacks" on page 31

  This chapter describes the installation of the PB1652LAMBDA.1-B/C-Modules on the ESES5352.1 and the signal assignment for the connections.
- "Technical Data and Norms" on page 39

  This chapter contains the technical data on the ES5352.1 Signal Conditioning Board. In addition, fulfilled standards and norms are listed.
- "Ordering Information and Scope of Supply" on page 41

1.6.1 Using this Manual

Representation of Information

All activities to be carried out by the user are shown in what we call a "Use-Case" format, i.e. the target to be achieved is defined briefly in the title and the individual steps necessary to achieve this target are then listed. The information is displayed as follows:

Target definition

Any introductory information...

1. Step 1

   Possibly an explanation of step 1...
2. Step 2

   Possibly an explanation of step 2...

Any concluding remarks...

Concrete example:

To create a new file

If you want to create a new file, no other file may be open.

1. Select **File** → **New**.

   The "Create file" dialog box appears.
2. Enter a name for the file in the "File name" field.

   The file name must not exceed 8 characters.
3. Click **OK**.

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

Typographic Conventions

The following typographic conventions are used:

Select **File** → **Open**.	Menu commands are shown in boldface/blue.
Click **OK**.	Buttons are shown in boldface/blue.
Press <ENTER>.	Keyboard commands are shown in angled brackets in block capitals.

The "Open File" dialog box appears.	Names of program windows, dialog boxes, fields etc. are shown in quotation marks.
Select the file `setup.exe`.	Text in drop-down lists, program code, as well as path and file names are shown in the `Courier` font.
A conversion between the file types logical and arithmetic is *not* possible.	Content markings and newly introduced terms are shown in *italics*.

Important notes for the user are shown as follows:

Note

Important note for the user.

2 Features and Functions

This chapter describes the features and functions of the components of the ES5352.1 Signal Conditioning Board.

2.1 Power Supply

To supply the piggybacks with power, up to four DC/DC converters per module can be accommodated on the ES5352.1 Signal Conditioning Board. Their primary function is voltage stabilization and galvanic isolation.

The output voltages DC1 - DC4 of the converters are connected with the connector strip CO301 or C307 (see ""CO301" Connector (Piggyback 1)" on page 25 and ""CO307" Connector (Piggyback 2)" on page 27) and can thus be used to supply power to a piggyback.

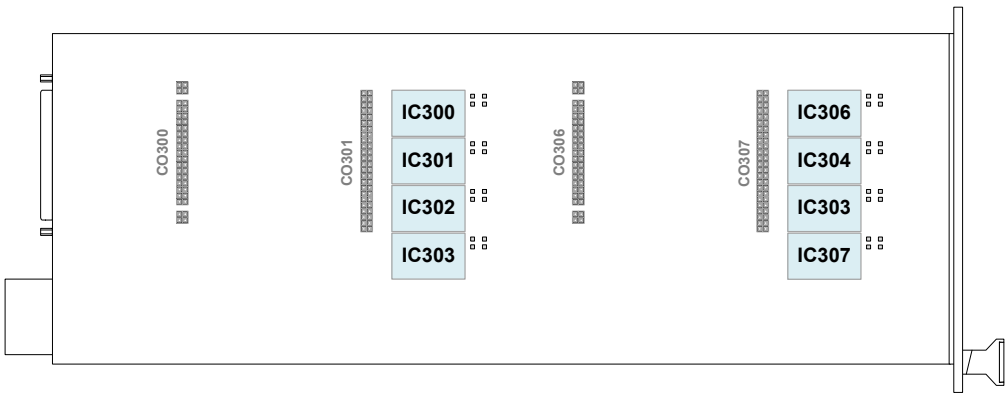


Fig. 2-1 Position of the DC/DC Converters on the ES5352.1 Signal Conditioning Board

Refer to the following table for the assignment of the DC/DC converters to the signals at the connectors.

CO301 Connector		CO307 Connector	
Slot	**Signal**	**Slot**	**Signal**
IC300	PB1_DC1_xxx	IC306	PB2_DC1_xxx
IC301	PB1_DC2_xxx	IC304	PB2_DC2_xxx
IC302	PB1_DC3_xxx	IC305	PB2_DC3_xxx
IC303	PB1_DC4_xxx	IC307	PB2_DC4_xxx

Tab. 2-1 Assignment of the DC/DC Converters to Signals at Connectors

The converters are fed with the +12 V voltage from the backplane (see "Configuring the Input Voltage of the DC/DC Converters" on page 32).
For voltage supply of the piggybacks, the TEN 3-1222N DC/DC converter is used.

2.2 Fuses

There are four fuses on the ES5352.1 Signal Conditioning Board to protect the backplane voltages.

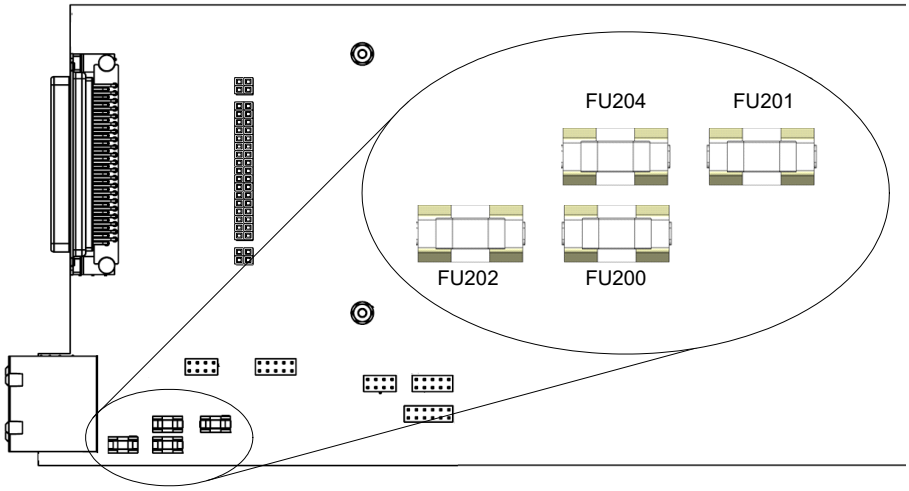


Fig. 2-2 Position of the Fuses on the ES5352.1

The specification of the fuses is as follows:

Fuse	Type	Specification	Protection of (voltage)
FU200	NANO2® Slo-Blo® Fuse 452/454 Series	T 3 A	VCC12 (+12 V)
FU201	NANO2® Slo-Blo® Fuse 452/454 Series	T 3 A	VCC3_3 (+3.3 V)
FU202	NANO2® Slo-Blo® Fuse 452/454 Series	T 1 A	VCC5 (+5 V)
FU204	NANO2® Slo-Blo® Fuse 452/454 Series	T 0.5 A	VSS12 (-12 V)

Tab. 2-2 Fuses

WARNING!

Fire Hazard!
Only use fuses that comply with the specification in the User's Guide for the product. Never bridge defective fuses!
Failure to observe the fuse specification can lead to excess currents, short circuits and fires.

2.3 ES5352.1 with Piggybacks

The ES5352.1 can be fitted with two piggybacks.

For an installation instruction for the PB1652LANBDA.1-B/C modules, see "Installation of the Piggybacks" on page 31

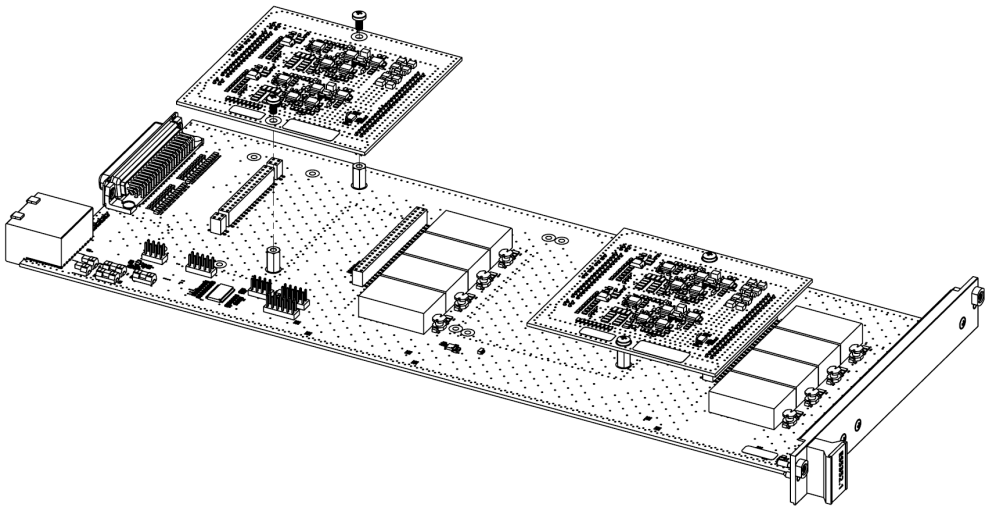


Fig. 2-3 ES5352.1 with Piggybacks

The connectors are designed for 100 cycles of operation

2.4 Assembly

In case you purchased the ES5352.1 and the PB1652LAMBDA.1-B/C-Modules separately, first read the chapter "Installation of the Piggybacks" on page 31.

In case you purchased the ES5352.1 with the PB1652LAMBDA.1-B/C-Modules already fitted, you may skip the chapter "Installation of the Piggybacks".

- "Installation of the Piggybacks" on page 31
  - "Configuring the Input Voltage of the DC/DC Converters" on page 32
  - "Installing the PB1652LAMBDA.1-B/C-Modules" on page 33
- "Assembling the ES5352.1 Signal Conditioning Board in the ES5300.1-A Housing and in the ES5300.1-B Housing" on page 19
- "Inserting the ES5352.1 Signal Conditioning Board into a Slot" on page 20

2.4.1 Assembling the ES5352.1 Signal Conditioning Board in the ES5300.1-A Housing and in the ES5300.1-B Housing

Before you start, ensure you have ESD-compliant conditions at your workplace.

CAUTION!

Some components of the ES5352.1 Signal Conditioning Board can be damaged or destroyed by electrostatic discharges. Leave the plug-in board in its transport packaging until it is installed.
Only remove, configure and install the ES5352.1 at a workplace that is protected against electrostatic discharges.

CAUTION!

Do not install any boards while the ES5100.1 Desktop Housing is powered on!

1. Shut down the Real-Time PC and disconnect the power supply to the ES5300.1-A Housing or the ES5300.1-B Housing by switching it off on the back of the device.
2. Wait at least three minutes until the components (capacitors etc.) have discharged.

2.4.2 Inserting the ES5352.1 Signal Conditioning Board into a Slot

CAUTION!

When sliding in boards that are wider than slot width (5 HP), there may be a collision with an adjacent board or front panels of adjacent slots. This can cause damage to or even destroy the boards to be installed.
Make sure that the ES5352.1 with its piggybacks either adheres to the maximum width of 5 HP or that the neighboring slot is empty and that there are no assembled cover plates stopping the board from being inserted!

1. Position the ES5352.1 (gripping plate on the front panel must be pointing down!) into the top and bottom rail of the slot and insert it slightly.
2. Open the front door of the ES5300.1-A or the ES5300.1-B after first loosening the three upper Phillips screws (see "ES5300.1-A Housing - User's Guide" or "ES5300.1-B Housing - User´s Guide").
3. Carefully slide in the carrier board until the back-plane connector of the ES5352.1 is completely plugged in to the backplane socket.

Note

When sliding in the board, please make sure there are no cables in the way – if necessary, pull the cords into the front door area.

4. Secure the carrier board by tightly screwing on the slot bracket.

CAUTION!

The air circulation inside the ES5300.1-A Housing or 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 over-temperature protection of the ES5300.1-A or ES5300.1-B.
For this reason, install front plates in all free slots!

3 Pin Assignment and Connections

This section describes the various connectors of the ES5352.1 Signal Conditioning Board.

3.1 Backplane Connector (CO200)

Type: ERNI ERMet ZD Right Angle Female Connector 4 Pair (4-12)
(Part Number 973099)

Mating connector (in ES5300): ERNI ERMet ZD Vertical Male Connector 4 Pair (4-12) (Part No. 973096)

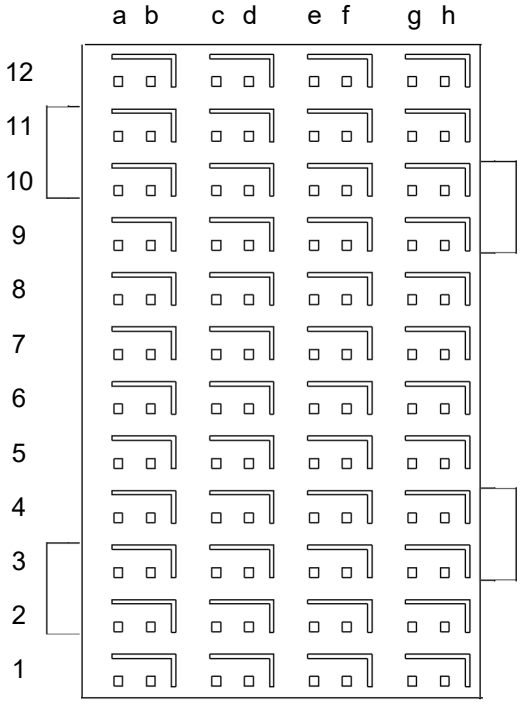


Fig. 3-1 Connector to the Backplane (Plug-In Side)

The pin assignment is as follows:

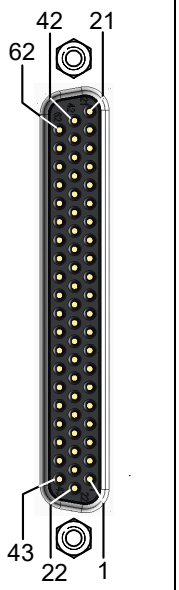
	a	b	c	d	e	f	g	h
12	BN_4	BN_5	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
12-Shield	GND		GND		GND		GND	
11	SPI_CS_A_n	SPI_CS_B_n	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
11-Shield	GND		GND		GND		GND	
10	SPI_CLK	SPI_MOSI	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
10-Shield	GND		GND		GND		GND	
9	SPI_MISO	PCIE_WAKEn	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
9-Shield	GND		GND		GND		GND	
8	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
8-Shield	GND		GND		GND		GND	
7	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
7-Shield	GND		GND		GND		GND	
6	PCIE_JTAG_TDI	PCIE_JTAG_TCK	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
6-Shield	GND		GND		GND		GND	
5	PCIE_JTAG_TMS	PCIE_JTAG_TDO	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
5-Shield	GND		GND		GND		GND	
4	BN_2	BN_3	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
4-Shield	GND		GND		GND		GND	
3	BN_0	BN_1	PCIE_SMBCLK	PCIE_SMBDAT	n.c.	n.c.	VCC24	VCC24
3-Shield	VCC3_3		VCC3_3		VCC3_3		VCC3_3	
2	n.c.	n.c.	n.c.	PCIE_PERSTn	VCC5	VCC3_3	VSS12	VSS12
2-Shield	VCC12		VCC12		VCC12		VCC12	
1	VCC12	VCC12	VCC12	VCC12	VCC5	VCC5	VCC3_3	VCC3_3
1-Shield	VCC12		VCC12		VCC12		VCC12	

3.2 D-Sub62 (CO100)

Note

For details of the permissible voltages and currents, please refer to the specifications in "Voltages, Currents and Power Consumption" on page 39.

Pin	Signal	Pin	Signal	Pin	Signal
1	PB1_IN1	22	PB1_IN2	43	PB1_IN3
2	PB1_IN4	23	PB1_IN5	44	PB1_IN6
3	PB1_IN7	24	PB1_IN8	45	PB1_IN9
4	n.c.	25	n.c.	46	PB1_OUT1
5	PB1_OUT2	26	PB1_OUT3	47	PB1_OUT4
6	PB1_OUT5	27	PB1_OUT6	48	PB1_OUT7
7	PB1_OUT8	28	PB1_OUT9	49	PB1_OUT10
8	PB1_OUT11	29	PB1_OUT12	50	PB1_OUT13
9	PB1_OUT14	30	PB1_OUT15	51	n.c.
10	n.c.	31	n.c.	52	n.c.
11	n.c.	32	n.c.	53	n.c.
12	n.c.	33	n.c.	54	n.c.
13	PB2_IN1	34	PB2_IN2	55	PB2_IN3
14	PB2_IN4	35	PB2_IN5	56	PB2_IN6
15	PB2_IN7	36	PB2_IN8	57	PB2_IN9
16	n.c.	37	n.c.	58	PB2_OUT1
17	PB2_OUT2	38	PB2_OUT3	59	PB2_OUT4
18	PB2_OUT5	39	PB2_OUT6	60	PB2_OUT7
19	PB2_OUT8	40	PB2_OUT9	61	PB2_OUT10
20	PB2_OUT11	41	PB2_OUT12	62	PB2_OUT13
21	PB2_OUT14	42	PB2_OUT15	Housing at protective earth	



Tab. 3-1 "CO100" Pin Assignment

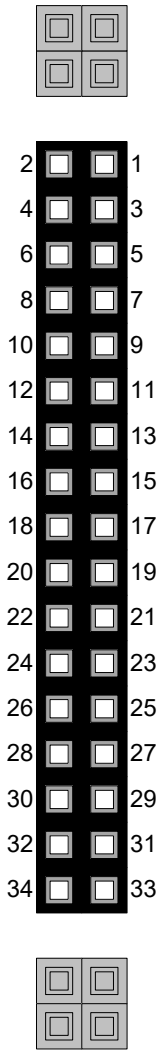
The signal assignment for an ES5352.1 populated with two PB1652LANBDA.1-B/C Modules is described in the chapter "D-Sub62 Connector CO100 (PB1652LAMBDA.1-B/C Signals)" on page 34

Recommended Connectors

The "Conec 163A16629X" connector with "Conec 165X10939X" housing is recommended for the connection with the D-Sub connector.

3.3 Piggyback Connectors

3.3.1 "CO300" Connector (Piggyback 1)



CO300	Signal	D-SUB62 (CO100)
1	n.c.	
2	n.c.	
3	n.c.	
4	n.c.	
5	n.c.	
6	n.c.	
7	n.c.	
8	n.c.	
9	n.c.	
10	PB1_IN9	45
11	PB1_IN8	24
12	PB1_IN7	3
13	PB1_IN6	44
14	PB1_IN5	23
15	PB1_IN4	2
16	PB1_IN3	43
17	PB1_IN2	22
18	PB1_IN1	1
19	n.c.	
20	PB1_OUT15	30
21	PB1_OUT14	9
22	PB1_OUT13	50
23	PB1_OUT12	29
24	PB1_OUT11	8
25	PB1_OUT10	49
26	PB1_OUT9	28
27	PB1_OUT8	7
28	PB1_OUT7	48
29	PB1_OUT6	27
30	PB1_OUT5	6
31	PB1_OUT4	47
32	PB1_OUT3	26
33	PB1_OUT2	5
34	PB1_OUT1	46

Tab. 3-2 Connections from "CO300" to SUB-D62 (CO100)

Signal assignment for PB1652LAMBDA.1-B/C: see "Connector „CO300" (PB1652LAMBDA.1-B/C-Modul 1)" on page 36

3.3.2 "CO301" Connector (Piggyback 1)

Signal		CO301		Signal
PB1_DC1 VDD	2	2	1	PB1_DC1 GND
PB1_DC1 VSS	4	4	3	PB1_DC1 GND
PB1_DC2 VDD	6	6	5	PB1_DC2 GND
PB1_DC2 VSS	8	8	7	PB1_DC2 GND
PB1_DC3 VDD	10	10	9	PB1_DC3 GND
PB1_DC3 VSS	12	12	11	PB1_DC3 GND
PB1_DC4 VDD	14	14	13	PB1_DC4 GND
PB1_DC4 VSS	16	16	15	PB1_DC4 GND
Reserved	18	18	17	n.c.
Reserved	20	20	19	Reserved
/SYSRESET *	22	22	21	Reserved
VSS12 *	24	24	23	GND *
VCC12 *	26	26	25	GND *
VCC12 *	28	28	27	GND *
VCC5 *	30	30	29	GND *
VCC5 *	32	32	31	GND *
VCC5 *	34	34	33	GND *
I^2C CLK *	36	36	35	I^2C DAT
I^2C A0 *	38	38	37	GND *
I^2C A2 *	40	40	39	I^2C A1 *
n.c.	42	42	41	n.c.
n.c.	44	44	43	n.c.
VCC 3_3 *	46	46	45	n.c.
GND *	48	48	47	GND *

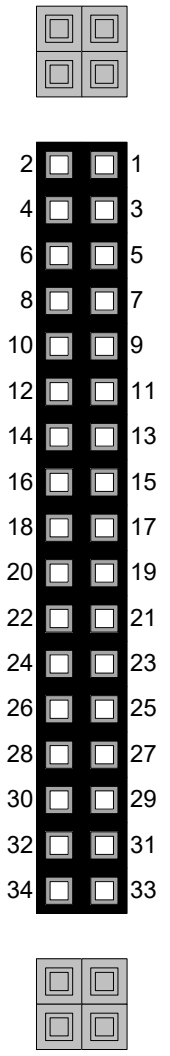
* From the backplane

Tab. 3-3 Pin Assignment of the "CO301" Connector

Note

To avoid interference in the system, the backplane ground (GND) and the galvanically isolated piggyback grounds (PBx_DCn GND, x = slot 1 or 2, n = 1,2,3,4) should not be connected!

3.3.3 "CO306" Connector (Piggyback 2)



CO306	Signal	D-SUB62 (CO100)
1	n.c.	
2	n.c.	
3	n.c.	
4	n.c.	
5	n.c.	
6	n.c.	
7	n.c.	
8	n.c.	
9	n.c.	
10	PB2_IN9	57
11	PB2_IN8	36
12	PB2_IN7	15
13	PB2_IN6	56
14	PB2_IN5	35
15	PB2_IN4	14
16	PB2_IN3	55
17	PB2_IN2	34
18	PB2_IN1	13
19	n.c.	
20	PB2_OUT15	42
21	PB2_OUT14	21
22	PB2_OUT13	62
23	PB2_OUT12	41
24	PB2_OUT11	20
25	PB2_OUT10	61
26	PB2_OUT9	40
27	PB2_OUT8	19
28	PB2_OUT7	60
29	PB2_OUT6	39
30	PB2_OUT5	18
31	PB2_OUT4	59
32	PB2_OUT3	38
33	PB2_OUT2	17
34	PB2_OUT1	58

Tab. 3-4 Connections from "CO306" to SUB-D62 (CO100)

Signal assignment for PB1652LAMBDA.1-B/C: see "Connector „CO306“ (PB1652LAMBDA.1-B/C-Modul 2)" on page 37

3.3.4 "CO307" Connector (Piggyback 2)

Signal		CO307		Signal
PB2_DC1 VDD	2	2 ▢▢ 1	1	PB2_DC1 GND
PB2_DC1 VSS	4	4 ▢▢ 3	3	PB2_DC1 GND
PB2_DC2 VDD	6	6 ▢▢ 5	5	PB2_DC2 GND
PB2_DC2 VSS	8	8 ▢▢ 7	7	PB2_DC2 GND
PB2_DC3 VDD	10	10 ▢▢ 9	9	PB2_DC3 GND
PB2_DC3 VSS	12	12 ▢▢ 11	11	PB2_DC3 GND
PB2_DC4 VDD	14	14 ▢▢ 13	13	PB2_DC4 GND
PB2_DC4 VSS	16	16 ▢▢ 15	15	PB2_DC4 GND
Reserved	18	18 ▢▢ 17	17	n.c.
Reserved	20	20 ▢▢ 19	19	Reserved
/SYSRESET	22	22 ▢▢ 21	21	Reserved
VSS12 *	24	24 ▢▢ 23	23	GND *
VCC12 *	26	26 ▢▢ 25	25	GND *
VCC12 *	28	28 ▢▢ 27	27	GND *
VCC5 *	30	30 ▢▢ 29	29	GND *
VCC5 *	32	32 ▢▢ 31	31	GND *
VCC5 *	34	34 ▢▢ 33	33	GND *
I^2C CLK	36	36 ▢▢ 35	35	I^2C DAT
I^2C A0	38	38 ▢▢ 37	37	GND *
I^2C A2	40	40 ▢▢ 39	39	I^2C A1
n.c.	42	42 ▢▢ 41	41	n.c.
n.c.	44	44 ▢▢ 43	43	n.c.
VCC 3_3	46	46 ▢▢ 45	45	n.c.
GND *	48	48 ▢▢ 47	47	GND *

* From the backplane

Tab. 3-5 Pin Assignment of the "CO307" Connector

Note

To avoid interference in the system, the backplane ground (GND) and the galvanically isolated piggyback grounds (PBx_DCn GND, x = slot 1 or 2, n = 1,2,3,4) should not be connected!

3.4 Connectors on the Board

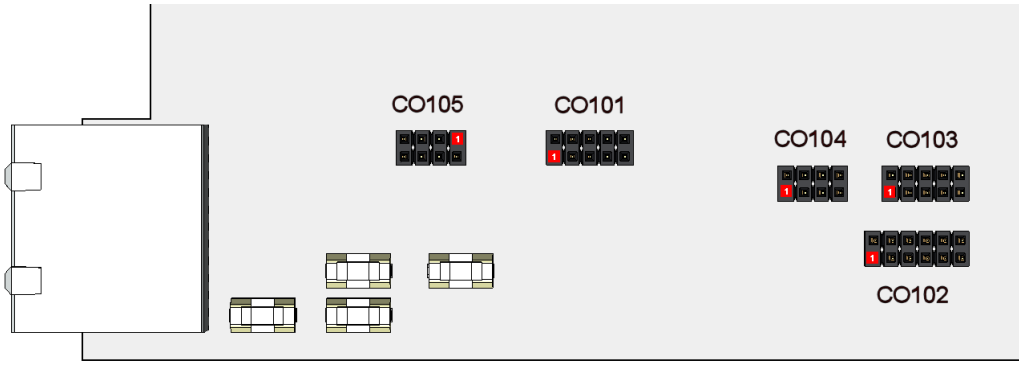


Fig. 3-2 Connectors on the Board (Red = Pin 1)

The connectors are designed for 50 cycles of operation.

3.4.1 C0101

This is where the backplane voltages are available.

Pin	Signal	Pin	Signal
1	VCC24 *	2	GND
3	VCC12	4	GND
5	VCC5	6	GND
7	VCC3_3	8	GND
9	VSS12	10	GND
* If available on the ES5300 backplane			

Tab. 3-6 "CO101" Pin Assignment

3.4.2 C0102

This is where the battery node control signals from the backplane are available.

Pin	Signal	Pin	Signal
1	BN_B_0	2	GND
3	BN_B_1	4	GND
5	BN_B_2	6	GND
7	BN_B_3	8	GND
9	BN_B_4	10	GND
11	BN_B_5	12	GND

Tab. 3-7 "CO102" Pin Assignment

The "BN_B_*n*" signals are buffered by the driver modules TI 74LVTH16245. Each signal has a series resistance of 43.2 Ohm.

3.4.3 C0103

This is where the SPI signals from the backplane are available.

Pin	Signal	Pin	Signal
1	SPI_CLK_B	2	GND
3	SPI_MOSI_B	4	GND
5	SPI_MISO_B	6	GND
7	/SPI_CS_A_B	8	GND
9	/SPI_CS_B_B	10	GND

Tab. 3-8 "CO103" Pin Assignment

The SPI signals are buffered by driver modules – coming from the backplane, the TI 74LVTH16245 is used, driving toward the backplane the TI 74AVC2T245. For more information, refer to the data sheets of the relevant driver modules.

The signals "SPI_CLK_B" and "SPI_MISO_B" both have a series resistance of 43.2 Ohm.

3.4.4 C0104

For internal use only.

3.4.5 C0105

This is where the I^2C signals from the backplane are available.

Pin	Signal	Pin	Signal
1	/PCIE_PERST	2	GND
3	/PCIE_WAKE	4	GND
5	PCIE_SMBCLK	6	GND
7	PCIE_SMBDAT	8	GND

Tab. 3-9 "CO105" Pin Assignment

The I^2C signals "PCIE_SMBCLK" and "PCIE_SMBDAT" available at the CO105, CO301 and CO307 connectors go directly to the backplane and to the bus users on the boards.

4 Installation of the Piggybacks

This chapter describes the installation of the PB1652LAMBDA.1-B/C-Modules on the ESES5352.1 and the signal assignment for the connections.

To install the PB1652LAMBDA.1-B/C-Modules on the ES5352.1, the DC/DC converters have to be installed first.
The DC/DC converters stabilize the voltage supply for the PB1652LAMBDA.1-B/C-Modules and provide galvanic isolation.
Subsequently, the PB1652LAMBDA.1-B/C Modules may be installed.

The mapping between DC/DC converter signals and socket is shown in the following table:.

CO301 Connector		CO307 Connector	
Slot	**Signal**	**Slot**	**Signal**
IC300	PB1_DC1_xxx	IC306	PB2_DC1_xxx
IC301	PB1_DC2_xxx	IC304	PB2_DC2_xxx
IC302	PB1_DC3_xxx	IC305	PB2_DC3_xxx
IC303	PB1_DC4_xxx	IC307	PB2_DC4_xxx

Tab. 4-1 Assignment of the DC/DC Converters to Signals at Connectors

The steps for installing the PB1652LAMBDA.1-B/C Modules are described in the following chapters:

- "Configuring the Input Voltage of the DC/DC Converters" on page 32
- "Installing the PB1652LAMBDA.1-B/C-Modules" on page 33

The signal assignment for the PB1652LAMBDA.1-B/C-Module connectors and for the CO100 connector of the ES5352.1 is in the following chapters:

- "D-Sub62 Connector CO100 (PB1652LAMBDA.1-B/C Signals)" on page 34
- "Connector „CO300“ (PB1652LAMBDA.1-B/C-Modul 1)" on page 36
- "Connector „CO306“ (PB1652LAMBDA.1-B/C-Modul 2)" on page 37

4.1 Configuring the Input Voltage of the DC/DC Converters

To supply the PB1652LAMBDA.1-B/C-Modules with voltage, DC/DC converters of the type Traco TEN 3-1222N are used. Therefore, two DC/DC converters per PB1652LAMBDA.1-B/C-Module must be installed on the ES5352.1.

For the PB1652LAMBDA.1-B/C-Module in socket 1, IC300 and IC301 must be populated.
For the PB1652LAMBDA.1-B/C-Module in socket 2, IC306 and IC304 must be populated, see Fig. 4-1.

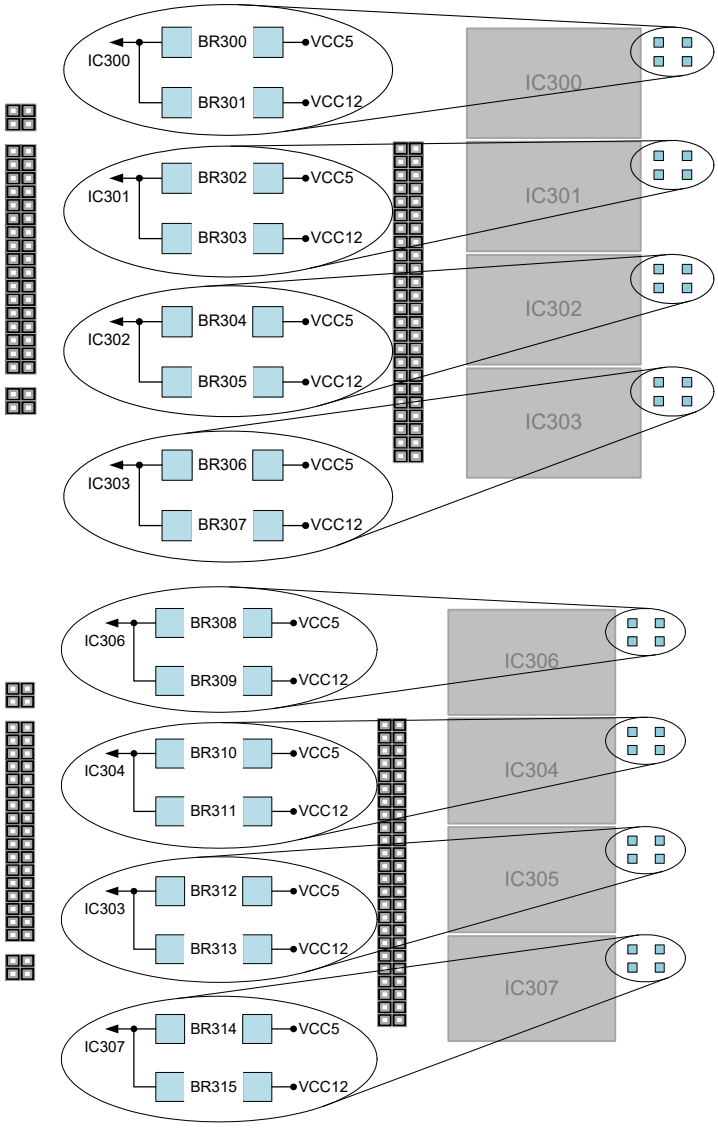


Fig. 4-1 Position of the DC/DC Converters and Solder Bridges at Slots 1 (Top) and 2 (Bottom)

Note

Only one solder bridge can be installed because otherwise the +5 V and +12 V voltages are connected with each other and thus the fuses of the ES5352.1 break the circuit.

Note

Use lead-free solder! Ensure that there is not too much heat at the contacts – too much heat can damage the converters and the board!

The DC/DC converters are supplied with voltage by the +12 V connection of the backplane. Therefore the following solder bridges must be closed:

- For the PB1652LAMBDA.1-B/C-Module 1, close the solder bridges BR301 and BR303.
- For the PB1652LAMBDA.1-B/C-Module 2, close the solder bridges BR309 and BR311, see Fig. 4-1.

4.2 Installing the PB1652LAMBDA.1-B/C-Modules

Place the pin strips of the module onto the contact strips of the ES5352.1 Signal Conditioning Board so they correspond to each other, i.e. interrupted pin strip to interrupted contact strip and continuous pin strip to continuous contact strip.

CAUTION!

If the contact pins of the PB1652LAMBDA.1-B/C piggyback are not positioned exactly over the contact strip, these could be bent and the piggyback thus damaged.
Before pushing the module into the contact strips, check that the position is absolutely right!

The PB1652LAMBDA.1-B/C piggybacks are secured on the spacers with two M3 x 6 screws (see Fig. 4-2).

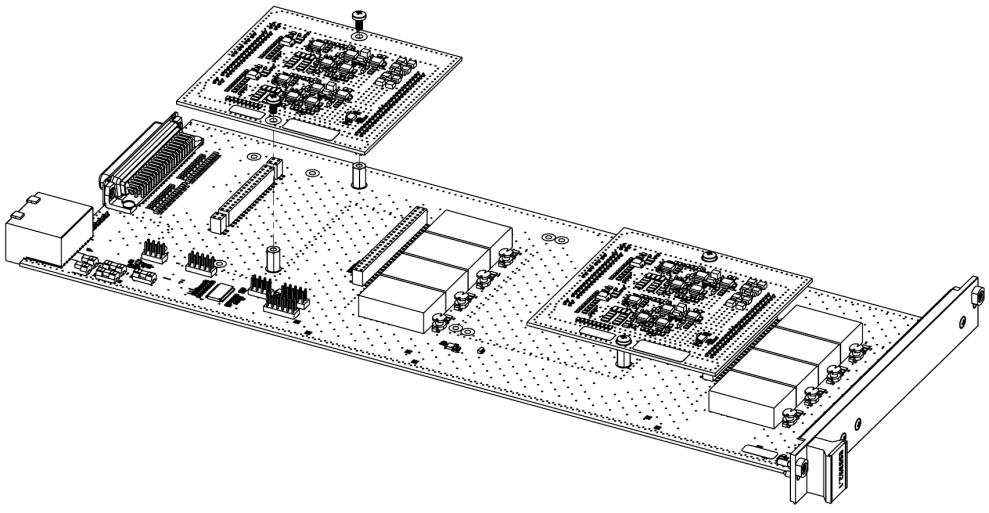


Fig. 4-2 Assembling the Piggybacks

The connectors are designed for 100 cycles of operation.

4.3 D-Sub62 Connector CO100 (PB1652LAMBDA.1-B/C Signals)

CO100 is the interface to an ECU.

Note

For details of the permissible voltages and currents, please refer to the specifications in "Voltages, Currents and Power Consumption" on page 39.

Recommended Connectors

The "Conec 163A16629X" connector with "Conec 165X10939X" housing is recommended for the connection with the D-Sub connector.

Pin assignment for CO100

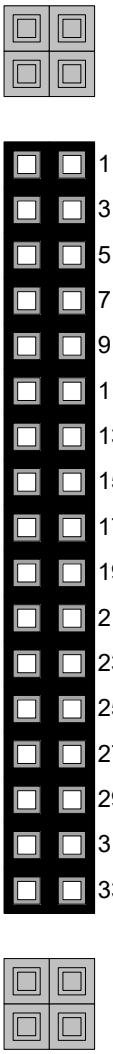
The pin assignment for CO100 for the ES5352.1 populated with two PB1652LAMBDA.1-B/C Modules is given on the next page.

Pin Assignment for CO100: ES5352.1 Populated with two PB1652LAMBDA.1-B/C Modules

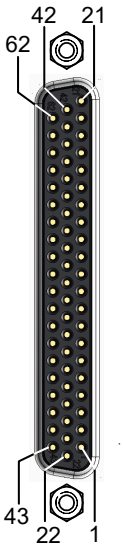
Pin	Signal	Pin	Signal	Pin	Signal
1	PB1_UP_SOLL_P_A	**22**	PB1_UP_SOLL_P_B	**43**	PB1_U_DAC_SPRUNG_A
2	PB1_U_DAC_SPRUNG_B	**23**	PB1_–Vbat	**44**	PB1_UP_SOLL_N_A
3	PB1_UP_SOLL_N_B	**24**	PB1_DAC_SPRUNG_GND_A	**45**	PB1_DAC_SPRUNG_GND_B
4	n. c.	**25**	n. c.	**46**	PB1_IP_A (pump current sensor A)
5	PB1_IA_A (compensating current sensor A)	**26**	PB1_UN_A (Nernst voltage sensor A)	**47**	PB1_IP_B (pump current sensor B)
6	PB1_IA_B (compensating current sensor B)	**27**	PB1_UN_B (Nernst voltage sensor B)	**48**	PB1_SPRUNGSONDE_A
7	n. c.	**28**	n. c.	**49**	PB1_SPRUNGSONDE_B
8	PB1_RELAY_LSW_B	**29**	PB1_RELAY_LSW_A	**50**	PB1_VM_A (virtual ground sensor A)
9	PB1_VM_B (virtual ground sensor B)	**30**	PB1_RELAY_VCC	**51**	n. c.
10	n. c.	**31**	n. c.	**52**	n. c.
11	n. c.	**32**	n. c.	**53**	n. c.
12	n. c.	**33**	n. c.	**54**	n. c.
13	PB2_UP_SOLL_P_A	**34**	PB2_UP_SOLL_P_B	**55**	PB2_U_DAC_SPRUNG_A
14	PB2_U_DAC_SPRUNG_B	**35**	PB2_–Vbat	**56**	PB2_UP_SOLL_N_A
15	PB2_UP_SOLL_N_B	**36**	PB2_DAC_SPRUNG_GND_A	**57**	PB2_DAC_SPRUNG_GND_B
16	n. c.	**37**	n. c.	**58**	PB2_IP_A (pump current sensor A)
17	PB2_IA_A (compensating current sensor A)	**38**	PB2_UN_A (Nernst voltage sensor A)	**59**	PB2_IP_B (pump current sensor B)
18	PB2_IA_B (compensating current sensor B)	**39**	PB2_UN_B (Nernst voltage sensor B)	**60**	PB2_SPRUNGSONDE_A
19	n. c.	**40**	n. c.	**61**	PB2_SPRUNGSONDE_B
20	PB2_RELAY_LSW_B	**41**	PB2_RELAY_LSW_A	**62**	PB2_VM_A (virtual ground sensor A)
21	PB2_VM_B (virtual ground sensor B)	**42**	PB2_RELAY_VCC		Housing at protective earth

Tab. 4-2 Pin Assignment of CO100 for Connection to an ECU, Signal Assignment for two PB1652LAMBDA.1-B/C Modules

4.4 Connector „CO300“ (PB1652LAMBDA.1-B/C-Modul 1)



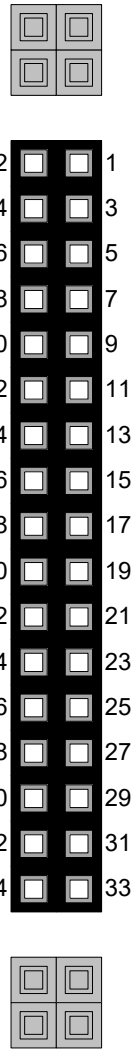
CO300	Signal	D-SUB62 (CO100)
1	n.c.	
2	n.c.	
3	n.c.	
4	n.c.	
5	n.c.	
6	n.c.	
7	n.c.	
8	n.c.	
9	n.c.	
10	PB1_DAC_SPRUNG_GND_B	**45**
11	PB1_DAC_SPRUNG_GND_A	**24**
12	PB1_UP_SOLL_N_B	**3**
13	PB1_UP_SOLL_N_A	**44**
14	PB1_–Vbat	**23**
15	PB1_U_DAC_SPRUNG_B	**2**
16	PB1_U_DAC_SPRUNG_A	**43**
17	PB1_UP_SOLL_P_B	**22**
18	PB1_UP_SOLL_P_A	**1**
19	n.c.	
20	PB1_RELAY_VCC	**30**
21	PB1_VM_B (virtual ground sensor B)	**9**
22	PB1_VM_A (virtual ground sensor A)	**50**
23	PB1_RELAY_LSW_A	**29**
24	PB1_RELAY_LSW_B	**8**
25	PB1_SPRUNGSONDE_B	**49**
26	n.c.	**28**
27	n.c.	**7**
28	PB1_SPRUNGSONDE_A	**48**
29	PB1_UN_B (Nernst voltage sensor B)	**27**
30	PB1_IA_B (compensating current sensor B)	**6**
31	PB1_IP_B (pump current sensor B)	**47**
32	PB1_UN_A (Nernst voltage sensor A)	**26**
33	PB1_IA_A (compensating current sensor A)	**5**
34	PB1_IP_A (pump current sensor A)	**46**

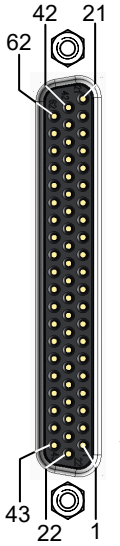


Tab. 4-3 Connections Between „CO300“ and SUB-D62 (CO100)

4.5 Connector „CO306“ (PB1652LAMBDA.1-B/C-Modul 2)

CO306	Signal	D-SUB62 (CO100)
1	n.c.	
2	n.c.	
3	n.c.	
4	n.c.	
5	n.c.	
6	n.c.	
7	n.c.	
8	n.c.	
9	n.c.	
10	PB2_DAC_SPRUNG_GND_B	57
11	PB2_DAC_SPRUNG_GND_A	36
12	PB2_UP_SOLL_N_B	15
13	PB2_UP_SOLL_N_A	56
14	PB2_–Vbat	35
15	PB2_U_DAC_SPRUNG_B	14
16	PB2_U_DAC_SPRUNG_A	55
17	PB2_UP_SOLL_P_B	34
18	PB2_UP_SOLL_P_A	13
19	n.c.	
20	PB2_RELAY_VCC	42
21	PB2_VM_B (virtual ground sensor B)	21
22	PB2_VM_A (virtual ground sensor A)	62
23	PB2_RELAY_LSW_A	41
24	PB2_RELAY_LSW_B	20
25	PB2_SPRUNGSONDE_B	61
26	n.c.	40
27	n.c.	19
28	PB2_SPRUNGSONDE_A	60
29	PB2_UN_B (Nernst voltage sensor B)	39
30	PB2_IA_B (compensating current sensor B)	18
31	PB2_IP_B (pump current sensor B)	59
32	PB2_UN_A (Nernst voltage sensor A)	38
33	PB2_IA_A (compensating current sensor A)	17
34	PB2_IP_A (pump current sensor A)	58





Tab. 4-4 Connections Between „CO306“ and SUB-D62 (CO100)

5 Technical Data and Norms

This chapter contains the technical data on the ES5352.1 Signal Conditioning Board. In addition, fulfilled standards and norms are listed.

5.1 Technical Data

Voltages, Currents and Power Consumption

Maximum voltage at inputs and outputs (CO100)		60 V DC
Maximum current per individual contact of the input/output connector (CO100)		1 A
Maximum total current over the input/output connector (CO100)		5 A
Maximum permissible power consumption per DC/DC converter		3 W
Maximum permissible power consumption from backplane		
	12 V DC	25 W
	5 V DC	4 W
	3.3 V DC	8 W

Storage Conditions

Ambient 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
Temperature during operation	+5 °C to +40 °C (+41 °F to +104 °F)
Relative humidity	0 to 95% (non-condensing)
Max. contamination level	2
Operating altitude	max. 2000 m / 6500 ft above sea level

Physical Dimensions

Height	4 U
Width	5 HP
Weight	0,5 kg

5.2 Fulfilled Standards and Norms

The ES5352.1 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 board is only intended for use in industrial settings in accordance with EN 61326-1. Avoid potential radio interference when using the board 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 Information and Scope of Supply

This chapter features the ordering information for the ES5352.1 Signal Conditioning Board as follows:

Order Name	Short Name	Order Number
Carrier Board for Signal Conditioning Circuits	ES5352.1	F-00K-109-679
Scope of Supply		
Carrier Board for Signal Conditioning Circuits		

Accesories	Short Name	Order Number
PB1652LAMBDA.1-B Signal Conditioning for Lambda Sensor Simulation	PB1652LAMBDA.1-B	F-00K-109-034
PB1652LAMBDA.1-C Signal Conditioning for Lambda Sensor Simulation	PB1652LAMBDA.1-C	F-00K-109-934
Scope of Supply	**Pieces**	
PB1652LAMBDA.1-B Signal Conditioning for Lambda Sensor Simulation	1	
PB1652LAMBDA.1-C Signal Conditioning for Lambda Sensor Simulation	1	

Note

ETAS recommends ordering the ES5352.1 already fitted with PB1652LAMBDA-Modules.

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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