

ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors

User's Guide



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1 Introduction

This User's Guide describes the ES4456.2 Load Board for 8 RB CR13-x Piezo Injectors. It consists of the following chapters:

1.1 Applications and Features

Applications

The ES4456.2 Load Board for 8 RB CR13-x Piezo Injectors is a load simulation for eight Piezo Injectors.

The ES4456.2 can be directly built into the ES4408.1 Load Chassis. If the ES4456.2 is built into the ES5372.1-B Carrier Board, it can also be used in the ES5300.1-A Housing or in the ES5300.1-B Housing.

For fast project change, an ES4408.1 Load Chassis is usually equipped with two ES4450.2 Load Boards for 4 RB CRS Injectors (or two ES4451.3 Load Boards for 4 RB GDI Injectors) for simulating eight injectors with solenoid valves for Common Rail systems or gasoline direct injection and one ES4456.2 Load Board for 8 RB CR13-x Piezo Injectors for simulating eight Piezo Injectors.

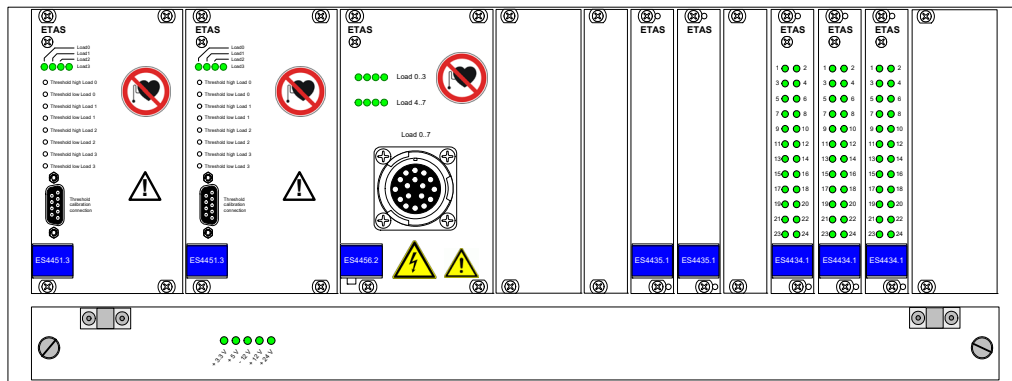


Fig. 1-1 ES4408.1 Load Chassis with ES4456.2 Load Board for 8 RB CR13-x Piezo Injectors (Slot 3)

Features

The ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors has the following features:

- 3 U plug-in board (14 HP, 340 mm x 100 mm)
- Eight channels for load simulations to 16 A/250 V
- Eight galvanically isolated analog channels for voltage measuring

Fig. 1-2 shows the block diagram of the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors.

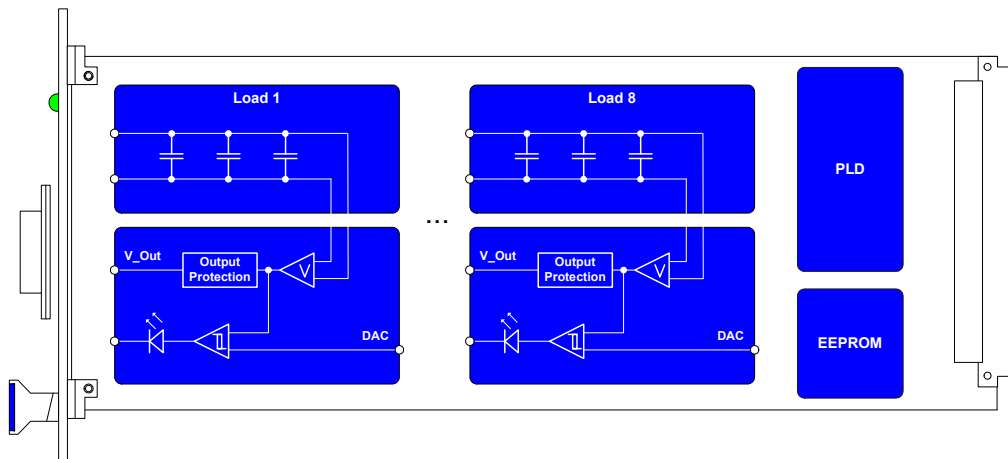


Fig. 1-2 Block Diagram of the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors

The following figure shows the front panel of the ES4456.2 Load Board for 8 RB CR13-x Piezo Injectors.

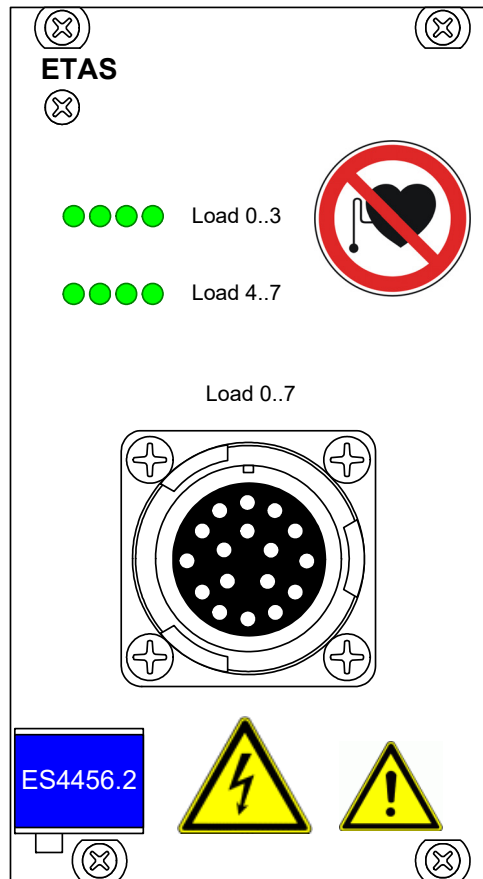


Fig. 1-3 Front Panel of the ES4456.2 Load Board for 8 RB CR13-x Piezo Injectors

The elements of the front panel are:

- The LEDs "Load n" that light up when the currents exceed the thresholds set in the software
- The "Load 0..7" port to which the eight loads of the board can be connected (e.g. to a LABCAR).

1.2 Basic Safety Instructions

Please adhere to the safety instructions in this manual to avoid injury to yourself.

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

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 ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors is for load emulation of eight piezo injectors.

The ES4456.2 is a plug-in board for the ES4408.1 Load Chassis. When built into the ES5372.1-B, it can also be used in the ES5300.1-A Housing and the ES5300.1-B Housing.

The ES4456.2 consists of the following:

- Load emulation for 8 RB CRI3-x piezo injectors with connections to ECU output stages
- Digital and analog output interfaces for the ES4408.1 or ES5300.1-A-based hardware-in-the-loop system or for connecting oscilloscopes or other measurement devices
- SPI interface to the ES4408.1 Load Chassis, the ES5300.1-A Housing or ES5300.1-B Housing

The ES4456.2 may be installed and operated only in the ES4408.1 Load Chassis, the ES5300.1-A Housing or in the ES5300.1-B Housing.

The intended use of the ES4456.2 in an ES4408.1 Load Chassis, 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 hardware interface for ECUs in a hardware-in-the-loop test system
- Use in conjunction with ETAS software that supports the ES4408.1 Load Chassis, the ES5300.1-A Housing and the ES5300.1-B Housing
- Use as interface in cooperation with software programs that operate the standardized, documented and open APIs of ETAS software products

The ES4456.2 is **not** intended for the following:

- Use within a vehicle on the road.
- Use as part of a life support system.
- Use as part of a medical application
- In applications where misuse can lead to injuries or damages.
- Use in environments in which conditions prevail that fall outside the specified ranges (see "Environmental Conditions" on page 29).
- Use with signal conditioning that falls outside the specified ranges (see voltages, currents and power consumption in the chapter "Technical Data" on page 29)

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!



DANGER!

Risk of electric shock!

At the plug Load 0...7 high voltages may still be present even after disconnecting the counter plug.

After disconnecting the cable, wait one minute before touching the connections or the circuit board. Parallel to the capacitors are resistors that allow a safe discharging.

Nonobservance may lead to fatal injury or death.



WARNING!

Danger of high voltages!

The components, plug connectors, conductor paths of the ES4456.2 may have dangerous voltages. These voltages can also be present when the ES4456.2 is not installed in the ES4408.1 Load Chassis, the ES5300.1-A Housing or in the ES5300.1-B Housing or if the ES4408.1 Load Chassis, the ES5300.1-A Housing and the ES5300.1-B Housing are switched off.

Ensure that the ES4456.2 is protected against touching it during operation. Switch off the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing and pull the power plug. Wait at least three minutes before removing the ES4456.2.

Nonobservance may lead to fatal injury or death.



WARNING!

Danger through electromagnetic radiation!

The ES4456.2 and loads connected to it, can emit electromagnetic radiation during operation which can cause interference with the operation or damage pacemakers or implanted defibrillators.

The ES4456.2 may be operated only in areas where persons with pacemakers are prohibited from entering. At the entrances to these areas, the P007 identification, "No access for persons with pacemakers or implanted defibrillators" in accordance with ISO 7010:2011 "Registered Safety Signs", must be attached and clearly legible.

Failure to observe it can lead to health hazards and even death for persons with pacemakers and implanted defibrillators.

**WARNING!**

Fire hazard!

Use only fuses that meet the specification in the User's Guide of the product! 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 ES4408.1 Load Chassis. If the ES4456.2 is built into the ES5300.1-A Housing or the ES5300.1-B Housing, the ES4456.2 is powered via the PCIe Backplane Connector of the ES5300.1-A Housing or ES5300.1-B Housing.

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 ES4408.1 Load Chassis, 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!

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 ES4408.1 Load Chassis, 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 ES4456.2 can be damaged or destroyed by electrostatic discharges. Leave the plug-in cards in their transport packaging until their installation. Remove, configure and install the ES4456.2 only at a workplace secured against static 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.

**WARNING!**

*Risk of electric shock, fire hazard!
For safety reasons, the assembly of the ES5372.1-B and ES4456.2 may be performed only at ETAS. If you purchased the two products individually, please contact your ETAS contact person so that the ES5372.1-B and the ES4456.2 can be returned to ETAS for assembly. Failure to observe it can lead to an incorrect pin assignment, damage to the board of the ES4456.2 or short circuits. This causes a risk of electric shock from high voltages and of fires.*

**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.

Connecting/Disconnecting Devices

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

- Do not apply any voltages to the connections of the ES4456.2 that do not correspond to the specifications of the respective connection.
- Do not connect or disconnect any devices while the ES4408.1 Load Chassis, the ES5300.1-A Housing or ES5300.1-B Housing or external devices are switched on. First, switch off the ES4408.1 Load Chassis, the ES5300.1-A Housing and 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.
- When crimping the plug contacts of Positronic, use only the crimping tool intended for this purpose.

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
	W012 identification in accordance with DIN EN ISO 7010: "Warning about electrical voltage"
	Marking for CE conformity (see "CE Mark" on page 15)
	Marking for China RoHS (see "RoHS Conformity" on page 15)
	Marking for conformity with WEEE directive (see "Product Return and Recycling" on page 16)
	P007 identification in accordance with ISO 7010:2011: "No access for persons with pacemakers and implanted defibrillators". "Operational malfunction or damage to pacemakers and implanted defibrillators".

Observe the information in the chapter "Technical Data" on page 29.

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 RoHS Conformity

European Union

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

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

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.

1.3.3 P007 Identification in Accordance with ISO 7010:2011

Under consideration of the standard ISO 7010:2011, the product is labeled with the symbol "No access for persons with pacemakers or implanted defibrillators".

The ES4456.2 may be operated only in areas where persons with pacemakers are prohibited from entering. The user is obligated to attach a clearly legible P007 identification, "No access for persons with pacemakers or implanted defibrillators" in accordance with ISO 7010:2011 "Registered Safety Signs", at the entrances to these areas.

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. 1-4 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 43).

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
- "Hardware" on page 19
- "Pin Assignment, Cables and Display Elements" on page 23
- "Technical Data" on page 29
- "Ordering Data and Scope of Delivery" on page 31

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>.	Key commands are printed in small capitals enclosed in angle brackets.
The "Open file" dialog window appears.	Names of program windows, dialog windows, fields and similar are given 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 using the <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 Hardware

This chapter describes the individual function units of the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors in more detail.

These are:

- "Connecting Loads and Measuring the Signals" on page 19
- "Overcurrent Protection of the Measure Outputs" on page 19
- "LED Display" on page 19
- "Acoustic Signals" on page 20
- "Calibration" on page 20
- "Settings in LABCAR-RTC" on page 20

2.1 Connecting Loads and Measuring the Signals

The ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors can be used in slot 1, 2 or 3 in an ES4408.1 Load Chassis. The loads are connected at the front panel connector "Load 0...7" of the ES4456.2 - the measure signals are available at connectors on the back of the ES4408.1 Load Chassis.

Board in Slot	Measure Signals to
1	Meas 8-2
2	Meas 8-1
3	Meas 7

For details of the pin assignment of the front panel connector "Load 0...7" refer to section " "Load 0..7" Connector" on page 23 – the pin assignment of the measure connectors is described in the ES4408.1 Load Chassis manual.

Special cables are available for connecting loads and measure signals with a PT-LABCAR (see " "CBAV344.1-1" Cable" on page 24 and " "CBAV345.1-1" Cable" on page 25).

Note

The "CBAV345.1-1" cable must be used if the measure signals are from an ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors. It is not possible to use one of the three DSUB9 connectors of the CBAV343.1-1 cable which are intended for slots with an ES4450.2 Load Board for 4 RB CRS Injectors or an ES4451.3 Load Board for 4 RB GDI Injectors.

2.2 Overcurrent Protection of the Measure Outputs

The outputs of the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors are protected against shorts to +UBatt and against ± 60 V.

2.3 LED Display

The LED display on the front panel (see "LEDs for Status Display" on page 27) shows when a specific voltage value between 0 and 250 V has been reached – if the voltage at a load is over this value, the relevant LED lights up.

The thresholds are set in the software; this is described in the section "To set thresholds for LEDs" on page 20.

2.4 Acoustic Signals

An acoustic signal can be emitted when the above-mentioned thresholds have been attained. The section "To set the beeper" on page 21 describes how to enable/disable this function.

2.5 Calibration

ETAS provides a calibration service for correcting any voltage converter offsets. The order data is as follows:

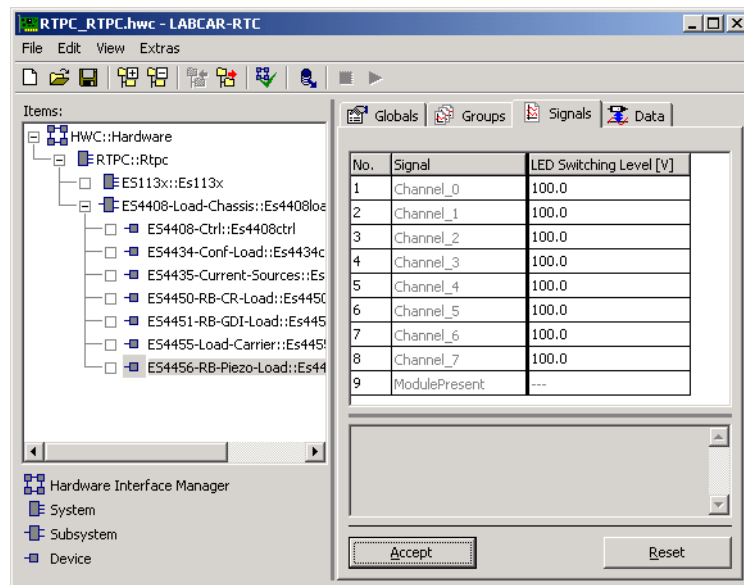
Order Name	Short Name	Order Number
Calibration Service for ES4456	K_ES4456	F-00K-106-542

2.6 Settings in LABCAR-RTC

The software settings for the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors are described below.

To set thresholds for LEDs

1. To configure the thresholds for the optical (via LEDs) and acoustic signals, select the "Signals" tab.
2. Enter a value (for the relevant channel) for "LED Switching Level [V]".



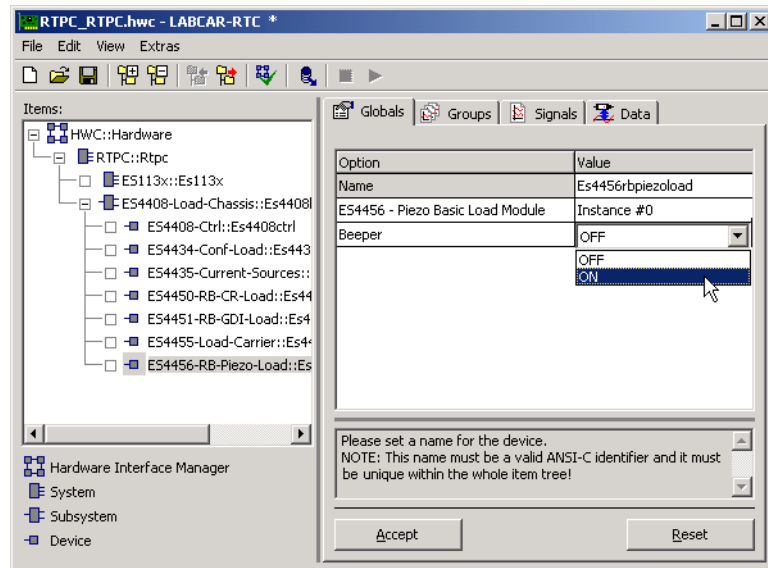
3. Click **Accept**.

The settings are accepted.

For more detailed information on LABCAR-RTC, refer to the LABCAR-RTC User's Guide.

To set the beeper

1. To enable/disable the acoustic signal to indicate when a threshold has been exceeded (see "To set thresholds for LEDs" on page 20), select the option "Beeper" "ON" or "OFF".



2. Click **Accept**.
The settings are accepted.

3 Pin Assignment, Cables and Display Elements

This chapter contains a description of the pins and LEDs on the front panel of the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors.

3.1 "Load 0..7" Connector

The "Load 0..7" connector is used to connect the loads.

Type: ITT Cannon CA02COM-E20-29P-B (male)

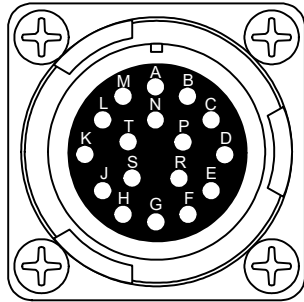


Fig. 3-1 "Load 0..7" Connector The pin assignment is as follows:



DANGER!

Risk of electric shock!

At the plug Load 0...7 high voltages may still be present even after disconnecting the counter plug.

After disconnecting the cable, wait one minute before touching the connections or the circuit board. Parallel to the capacitors are resistors that allow a safe discharging.

Nonobservance may lead to fatal injury or death.

The pin assignment is as follows:

Pin	Signal	Pin	Signal
A	Load 1_High	K	Load 3_High
B	Load 2_High	L	Load 5_Low
C	Load 1_Low	M	Load 6_Low
D	Load 2_Low	N	Load 7_Low
E	Load 3_Low	P	Load 8_Low
F	Load 4_Low	R	Load 7_High
G	Load 5_High	S	Load 8_High
H	Load 6_High	T	n.c.
J	Load 4_High	Housing	Protective earth

Tab. 3-1 Pin Assignment: "Load 0..7"

3.2 Cables

This section contains the specification of the cables available from ETAS for connecting the ES4456.2 with a PT-LABCAR and their order data.

3.2.1 "CBAV344.1-1" Cable

This cable is used to connect "Load 0...7" to the corresponding "Load8" port of the PT-LABCAR.

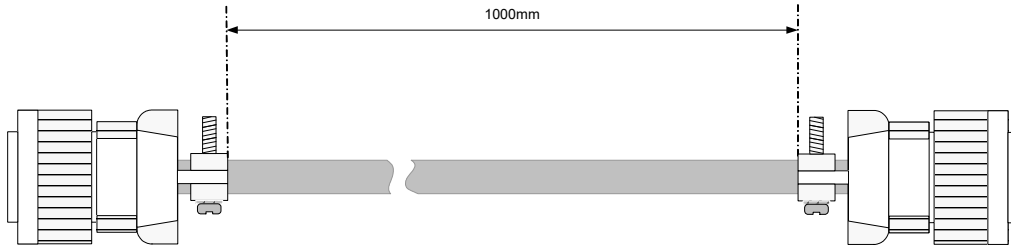


Fig. 3-2 "CBAV344.1-1" Cable

Connectors and Wiring

ES4456.2 side: ITT Cannon CA06COM-E20-29P-B (male)

PT-LABCAR side: ITT Cannon CA06COM-E20-29S-B (female)

The cables have a cross section of 1.5 mm² and are twisted pair cables.

For details of the assignment of the signals between these two ports, refer to Tab. 3-2 on page 24.

ES4456 ("Load 0...7")		PT-LABCAR ("Load8")		
Signal Name	Pin	Pin	Signal Name	Signal (LED)
Load 1_High	A	A	Inj_Ch0	Inj 1
Load 1_Low	C	C	Inj_Ch2	Inj 1
Load 2_High	B	G	Inj_Ch6	Inj 2
Load 2_Low	D	E	Inj_Ch4	Inj 2
Load 3_High	K	B	Inj_Ch1	Inj 3
Load 3_Low	E	D	Inj_Ch3	Inj 3
Load 4_High	J	H	Inj_Ch7	Inj 4
Load 4_Low	F	F	Inj_Ch5	Inj 4
Load 5_High	G	J	Inj_Ch8	Inj 5
Load 5_Low	L	L	Inj_Ch10	Inj 5
Load 6_High	H	R	Inj_Ch14	Inj 6
Load 6_Low	M	N	Inj_Ch12	Inj 6
Load 7_High	R	K	Inj_Ch9	Inj 7
Load 7_Low	N	M	Inj_Ch11	Inj 7
Load 8_High	S	S	Inj_Ch15	Inj 8
Load 8_Low	P	P	Inj_Ch13	Inj 8
n.c.	T	T	Inj_Ch16	-

Tab. 3-2 Pin Assignment of the "CBAV344.1-1" Cable (Gray) and the Extended Environment of the Signals

Order Data

Order Name	Short Name	Order Number
High current connection cable (ES4408/ES4640), Round Connector - Round Connector (17fc-17mc), 1 m	CBAV344.1-1	F-00K-106-618

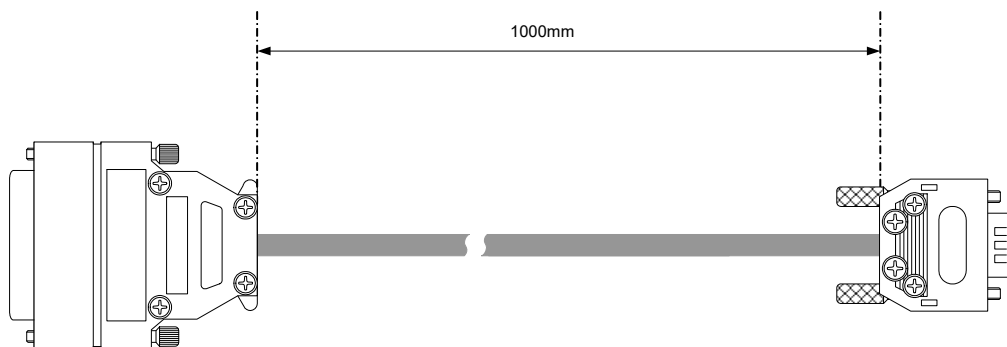
Tab. 3-3 Order Data for the "CBAV344.1-1" Cable

3.2.2 "CBAV345.1-1" Cable

This cable connects the measure signals ("Meas 8-1", "Meas 8-2" or "Meas 7" connector (on the back of the ES4408.1 Load Chassis)) with the "Measure" port of a PT-LABCAR.

Note

The "CBAV345.1-1" cable must be used if the measure signals are from an ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors. It is not possible to use one of the three DSUB9 connectors of the CBAV343.1-1 cable which are intended for slots with an ES4450.2 Load Board for 4 RB CRS Injectors or an ES4451.3 Load Board for 4 RB GDI Injectors.

**Fig. 3-3** "CBAV345.1-1" Cable*Connectors and Wiring*

ES4408.1 side: DSUB9 (male)

PT-LABCAR side: DSUB25 (female)

For details of the assignment of the signals between these two ports, refer to Tab. 3-4 on page 26.

ES4408 (DSUB9)		PT-LABCAR (DSUB25)	
Slot*:Signal Name	Pin	Pin	ES1336:Signal Name
Slot n:voltage 0	1	1	In_CH0
Slot n:voltage 1	2	2	In_CH1
Slot n:voltage 2	3	3	In_CH2
Slot n:voltage 3	4	4	In_CH3
Slot n:voltage 4	5	5	In_CH4
Slot n:voltage 5	6	6	In_CH5
Slot n:voltage 6	7	7	In_CH6
Slot n:voltage 7	8	8	In_CH7
		9	n.c.
	
		24	n.c.
GND	9	25	n.c.

* n = 1,2 or 3

Tab. 3-4 Pin Assignment of the "CBAV345.1-1" Cable (Gray) and the Extended Environment of the Signals

Order Data

Order Name	Short Name	Order Number
Connection Cable, DSUB - DSUB, (25fc-9mc), 1 m	CBAV345.1-1	F-00K-106-619

Tab. 3-5 Order Data for the "CBAV345.1-1" Cable

3.3 LEDs for Status Display

There are eight LEDs on the front panel of the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors which light up when the thresholds set in the software are exceeded.

●●●● Load 0..3

●●●● Load 4..7

Fig. 3-4 LEDs on the Front Panel

The LEDs have the following meaning:

LED	Display	Meaning
Load n	Showing green	Current over load n is greater than the threshold value set (see "LED Display" on page 19)

Tab. 3-6 Meaning of the LEDs

4 Technical Data

This chapter contains the technical data of the ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors.

Load Channels

Number	8
Capacity	4.7 μ F
Max. load current	16 A for max. 1 ms
Max. load voltage	250 V DC for max. 1 ms

Measurement channels

Accuracy of voltage measuring - level	$\pm 3\%$
Electrical strength of the outputs	± 60 V DC
Max. current	1 A

Environmental Conditions

Operating temperature	5 °C to 35 °C (41 °F to 95 °F)
Relative humidity	0 to 95% (non-condensing)

Power Supply

Current consumption	+ 3.3 V DC: 100 mA + 5 V DC: 20 mA +12 V DC: 30 mA -12 V DC: 30 mA +24 V DC: 200 mA
---------------------	-------------------------------------------------------------------------------------------------

Dimensions

Height	3 U
Width	14 HP
Depth	340 mm
Weight	1.5 kg

4.1 Standards Met

The ES4456.2 meets the following 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 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!

5 **Ordering Data and Scope of Delivery**

Ordering Name	Short Name	Order Number
ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors	ES4456.2	F-00K-109-951
Calibration Service for ES4456	K_ES4456	F-00K-106-542
Scope of Delivery	Pieces	
ES4456.2 Load Board for 8 RB CRI3-x Piezo Injectors	1	

Accessories	Short Name	Order Number
High current connection cable (ES4408/ES4640), Round Connector - Round Connector (17fc-17mc), 1 m	CBAV344.1-1	F-00K-106-618
Connection Cable, DSUB - DSUB, (25fc-9mc), 1 m	CBAV345.1-1	F-00K-106-619

6 **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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