

# ES4435.1 Current Source Load Board

## User's Guide



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## 1 Introduction

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This User's Guide describes the ES4435.1 Current Source Load Board.

It consists of the following chapters:

- "Introduction" on page 5  
This chapter – here you will find general information on the ES4435.1 Current Source Load Board.
- "Hardware" on page 11  
This chapter describes the individual function units of the ES4435.1 Current Source Load Board in more detail.
- "Technical Data" on page 15  
This section contains the technical data of the ES4435.1 Current Source Load Board



### **CAUTION!**

*Some components of the ES4435.1 Current Source Load Board may be damaged or even destroyed by static discharge. Leave the board in its transport package until you want to install it.  
The ES4435.1 Current Source Load Board should only be taken from its package, configured and installed at a working place that is protected against static discharge.*



### **WARNING!**

*The components, connectors and conductors of the ES4435.1 Current Source Load Board may carry dangerous voltages. These voltages may even exist if the ES4435.1 is not installed in the ES4408.1 Load Chassis or the ES4408.1 Load Chassis is powered off.  
Make sure the ES4435.1 is protected against contact during operation.*



### **CAUTION!**

*If cards are unlocked (e.g. during setup or calibration) but not completely removed from the housing, they nevertheless have to be pulled out of the housing so that the distance between the card and the backplane of the housing is at least 1 cm! Otherwise there could be contacts between the cards which could then be destroyed as a result.*

## 1.1 Features

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The ES4435.1 Current Source Load Board is a 3 U plug-in board for the ES4408.1 Load Chassis and is used to simulate low current loads up to 150 mA.

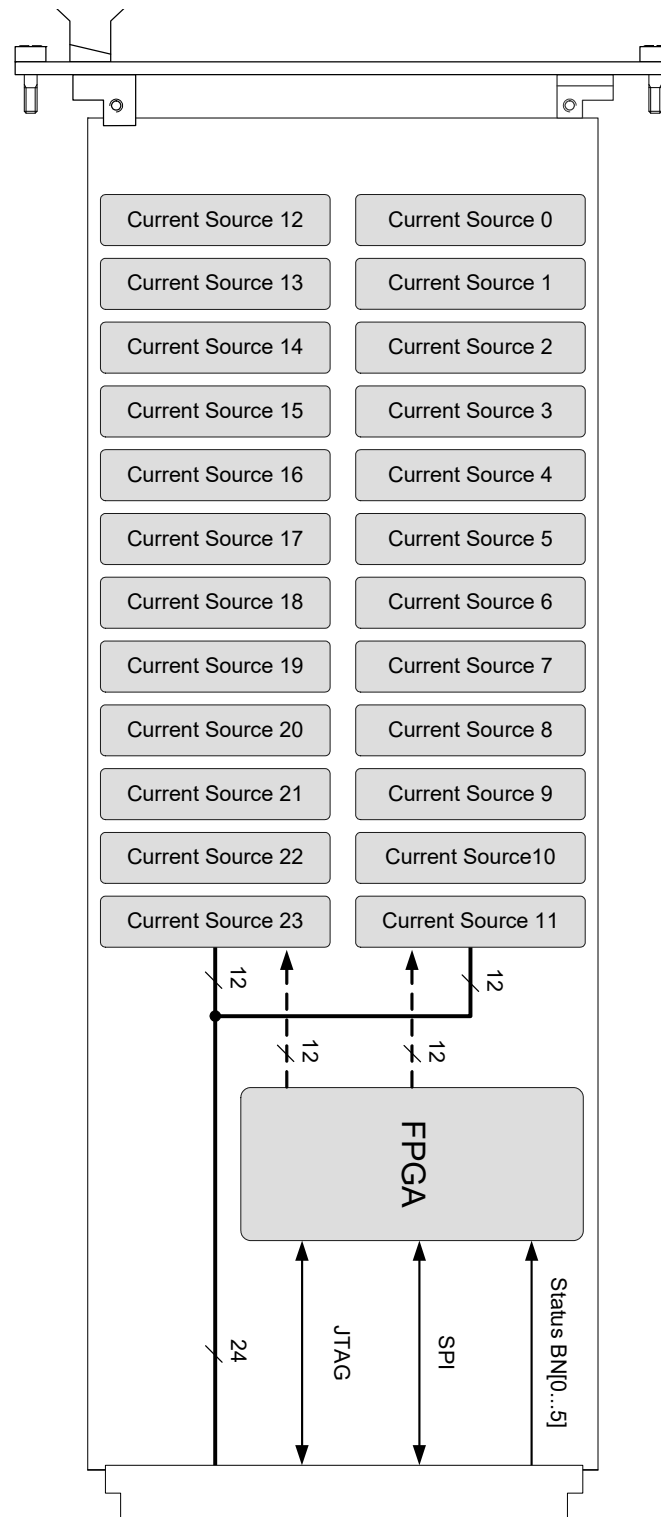
A total of seven boards of the type ES4434.1 Configurable Load Board and ES4435.1 Current Source Load Board can be installed in the ES4408.1 Load Chassis.

The ES4435.1 Current Source Load Board has the following features:

- 24 current sources
- Current direction can be set for every current source in LABCAR-RTC
- Every current source can drive currents of 5...150 mA (at 6 V...20 V battery voltage)
- Power limitation 3 W/current source – with higher battery voltages (up to 60 V max.) the maximum permissible current will be limited accordingly
- Current sources are enabled/disabled depending on the status of a specific battery node – sources are also assigned to battery nodes in LABCAR-RTC.

This makes the ES4435.1 Current Source Load Board suitable for projects in which frequent reconfigurations are necessary – for rare changes, we would recommend the ES4434.1 Configurable Load Board which can accommodate 24 manually configurable loads.

Fig. 1-1 shows the block diagram of the ES4435.1 Current Source Load Board.



**Fig. 1-1** Block Diagram of the ES4435.1 Current Source Load Board



## 1.2 Basic Safety Instructions

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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 Correct Use

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ETAS GmbH cannot be made liable for damage which is caused by incorrect use and not adhering to the safety instructions.

### 1.2.2 Labeling of Safety Instructions

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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.*





### 1.3 Identifications on the Product

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*The following Symbols are Used for Product Labeling:*

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Symbol	Description
	Marking for KCC conformity (see "KC Mark" on page 9)
	Marking for conformity with WEEE directive (see "Taking the Product Back and Recycling" on page 10)

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#### 1.3.1 KC Mark

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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 Taking the Product Back and Recycling

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

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



**Fig. 1-2** 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 17).

## 2 Hardware

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This chapter describes the individual function units of the ES4435.1 Current Source Load Board in more detail.

These are:

- "Current Sources" on page 11
- "Configuration in LABCAR-RTC" on page 12
- "Assigning "Load in Slot x" to Connector "Load n" " on page 13
- "The Load Signals at the Backplane Connectors" on page 14

### 2.1 Current Sources

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The current sources of the ES4435.1 Current Source Load Board are controlled MOSFET current sources for regulating current – the input operational amplifier is addressed via a 10-bit D/A converter with a serial input.

Mechanical relays control the pull functionality.

#### **Note**

*The ES4435.1 Current Source Load Board can only be operated in connection with LABCAR-RTC! Otherwise, leakage currents of the MOSFETs can lead to signal problems as the relevant source is disabled but configured as pull-down. If the ES4435.1 is disabled in LABCAR-RTC, these problems do not occur.*

#### *Operation Modes "Pull-Up" and "Pull-Down"*

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In the operation mode "pull-up", the current source is switched internally against the positive potential of the selected battery node. A current flows from the source when the load is connected to an ECU pin with lower potential (e.g. -UBatt).

In the operation mode "pull-down", the current source is switched internally against the negative potential (-UBatt). A current flows into the source when the load is connected to an ECU pin with higher potential.

#### 2.1.1 Currents

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The maximum power of the current sources is 3 W. For the maximum current rating of the current sources, this means:

- 150 mA (pull-up/pull-down) with a battery voltage of 6..20 V
- 70 mA with a battery voltage of 20..42 V
- 50 mA with a battery voltage of 42..60 V

with an accuracy of 3 mA.

#### 2.1.2 Switched Battery Voltages

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All current sources must refer to switched battery voltages in their pull-up function, i.e. the corresponding current source only becomes active when the corresponding battery node is activated.

The battery node control signals are TTL signals which are applied from the ES4408CON.1 Communication Interface to the backplane of the ES4408.1 Load Chassis.

### 2.1.3 Calibrating the Circuit

The current sources can be calibrated by ETAS. The order data is shown below:

Order Name	Short Name	Order Number
Calibration Service for ES4435	K_ES4435	F-00K-106-387

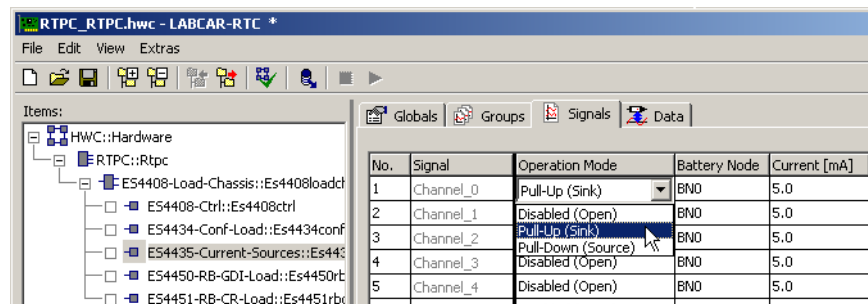
## 2.2 Configuration in LABCAR-RTC

To configure the individual current sources of the ES4435.1 Current Source Load Boards used:

- Open your hardware configuration in LABCAR-RTC.
- Select the “ES4435-Current-Sources” device.
- Select the “Signals” tab.

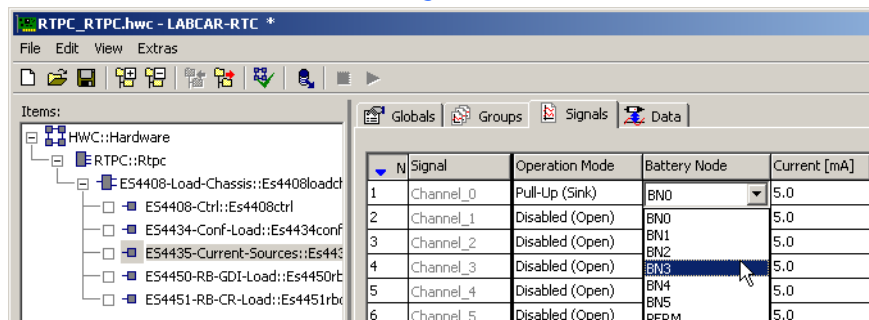
### To see the operation mode

- Select the channel to be configured (the relevant current source 0...23)
- Select the operation mode in the “Operation Mode” column



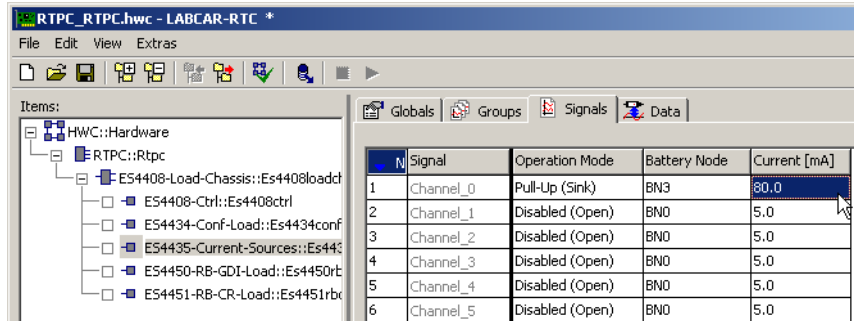
### To select the battery node

- Select the relevant battery node (from the “Battery Node” column) against which the current source is to be configured.



**To set the current**

- Enter the required current in the “Current” column.



The LABCAR-RTC User’s Guide contains more details on the configuration of LABCAR-RTC.

**2.3 Assigning “Load in Slot x” to Connector “Load n”**

The loads in the various slots are routed to the connectors “Load n” as follows.

Slot:Load	Connector:Pin	Slot:Load	Connector:Pin
Slot x:load 1	Load n:1	Slot x:load 13	Load n:13
Slot x:load 2	Load n:2	Slot x:load 14	Load n:14
Slot x:load 3	Load n:3	Slot x:load 15	Load n:15
Slot x:load 4	Load n:4	Slot x:load 16	Load n:16
Slot x:load 5	Load n:5	Slot x:load 17	Load n:17
Slot x:load 6	Load n:6	Slot x:load 18	Load n:18
Slot x:load 7	Load n:7	Slot x:load 19	Load n:19
Slot x:load 8	Load n:8	Slot x:load 20	Load n:20
Slot x:load 9	Load n:9	Slot x:load 21	Load n:21
Slot x:load 10	Load n:10	Slot x:load 22	Load n:22
Slot x:load 11	Load n:11	Slot x:load 23	Load n:23
Slot x:load 12	Load n:12	Slot x:load 24	Load n:24

**Tab. 2-1** Slot:Load → Connector:Pin

**Note**

Please note that the connector numbering does not correspond to the slot numbering (see the following table)!

Slot	6	7	8	9	10	11	12
Connector	Load 15	Load 14	Load 13	Load 12	Load 11	Load 10	Load 9

**Tab. 2-2** Assignment: Slot x → Connector “Load n”

## 2.4 The Load Signals at the Backplane Connectors

The following table shows how the load signals are routed from the connector on the rear of the ES4408.1 Load Chassis to the backplane connectors.

Slot: Signal	Slot: Backplane Connector	Slot: Signal	Slot: Backplane Connector
Slot n:load 1	Slot n:a11	Slot n:load 14	Slot n:b15
Slot n:load 2	Slot n:b11	Slot n:load 15	Slot n:c15
Slot n:load 3	Slot n:c11	Slot n:load 16	Slot n:a16
Slot n:load 4	Slot n:a12	Slot n:load 17	Slot n:b16
Slot n:load 5	Slot n:b12	Slot n:load 18	Slot n:c16
Slot n:load 6	Slot n:c12	Slot n:load 19	Slot n:c17
Slot n:load 7	Slot n:a13	Slot n:load 20	Slot n:c17
Slot n:load 8	Slot n:b13	Slot n:load 21	Slot n:c17
Slot n:load 9	Slot n:c13	Slot n:load 22	Slot n:a18
Slot n:load 10	Slot n:a14	Slot n:load 23	Slot n:b18
Slot n:load 11	Slot n:b14	Slot n:load 24	Slot n:c18
Slot n:load 12	Slot n:c14	GND board	Slot n:c10
Slot n:load 13	Slot n:a15		

**Tab. 2-3** Load Signals and Backplane Connectors

### 3 Technical Data

This section contains the technical data of the ES4435.1 Current Source Load Board

#### *Current Sources*

No. of channels	24
Maximum output current	150 mA $\pm$ 3 mA
Overvoltage protection	to 60 V

#### *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: 100 mA + 5 V: 700 mA +12 V: 20 mA -12 V: 20 mA
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#### *Dimensions*

Height	3 U
Width	4 HP
Length	340 mm





## 4 **ETAS Contact Addresses**

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### *ETAS HQ*

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70469 Stuttgart

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Fax: +49 711 3423-2106

WWW: [www.etas.com](http://www.etas.com)

### *ETAS Subsidiaries and Technical Support*

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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](http://www.etas.com/en/contact.php)

ETAS technical support WWW: [www.etas.com/en/hotlines.php](http://www.etas.com/en/hotlines.php)



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