ES1385.1 Resistor Cascade Board

User's Guide

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Contents

1 Introduction

This User's Guide contains a description of the ES1385.1 Resistor Cascade Board.

It consists of the following chapters:

- "Features and Applications" on page 6

  The Introduction (this chapter) contains an overview of the properties and functions of the ES1385.1 Resistor Cascade Board.

- "Hardware Features" on page 9

  This is where the properties of the ES1385.1 Resistor Cascade Board are described.

- "Pin Assignments and Indicators" on page 15

  This chapter contains a description of the front-facing connector as well as information on what the LED display means.

- "Technical Data" on page 17

  This section contains the technical data of the ES1385.1 Resistor Cascade Board.

note

Some components of the ES1385.1 Resistor Cascade Board may be damaged or destroyed by electrostatic discharges. Please keep the board in its storage package until it is installed.
The ES1385.1 Resistor Cascade Board should only be taken from its package, configured and installed at a working place that is protected against static discharge.

note

Watch out for protruding components when installing/uninstalling the ES1385.1 Resistor Cascade Board!

1.1 Features and Applications

The ES1385.1 Resistor Cascade Board acts as a resistor cascade with six independent channels in VMEbus systems. Each channel consists of a series connection of 16 resistors – a relay (PhotoMOS) is connected parallel to every resistor.

Four channels have one cascade each with the following resistance values:

- 10 Ω - 20 Ω –20 Ω – 40 Ω - 100 Ω - 200 Ω - 200 Ω - 400 Ω - 1 kΩ - 2 kΩ - 2 kΩ - 4 kΩ - 10 kΩ - 20 kΩ - 40 kΩ - 1 MΩ.

  These channels are particularly used to simulate the internal resistance of oxygen sensors – the 1 MΩ resistor is intended to represent a cold oxygen sensor.

  Resistances of up to 79.99 kΩ (+ 1 MΩ) can be defined with this kind of cascade.

Two channels have one cascade each with the following resistance values:

- 5 Ω - 10 Ω - 20 Ω –20 Ω – 40 Ω - 100 Ω - 200 Ω - 200 Ω - 400 Ω - 1 kΩ - 2 kΩ - 2 kΩ - 4 kΩ - 10 kΩ - 20 kΩ - 40 kΩ

  The additional 5 Ω resistor makes 5 Ω steps up to 79.995 kΩ possible – this makes it possible to simulate temperature sensors, for example.

note

Every channel has a basic resistance of 20 Ω. This is also the smallest resistance that can be set.

The ES1385.1 Resistor Cascade Board has the following properties:

- Six independent resistor cascades (channels)
- The accuracy of the resistances set is 5 Ω for channels 0 and 1 and 10 Ω for channels 2 - 5.
- The real values of the individual resistors of each cascade are stored as calibration data in the board's ROM. The monotony of the resistance values set is ensured by an algorithm implemented in the board's RTIO driver.
- The maximum operating voltage is 36 V.
- The maximum operating current over a cascade is 100 mA – the current is monitored by a protective circuit.
- The overcurrent condition is reset via the RTIO.
- A newly set resistance is stable within 1 ms – there may, however, be states of higher impedance during switching as the PhotoMOSs open within 0.2 ms.

Fig. 1-1 shows the front panel of the ES1385.1 Resistor Cascade Board.

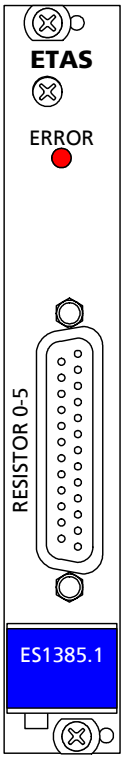


Fig. 1-1 Front View of the ES1385.1 Resistor Cascade Board

For more details on the pin assignment of the "RESISTOR 0-5" connector, please consult section 3.1 on page 15; the meaning of the "ERROR" LED is described in section 3.2 on page 16.

1.2 Block Diagram

Fig. 1-2 shows a block diagram with all important functional units of the ES1385.1 Resistor Cascade Board.

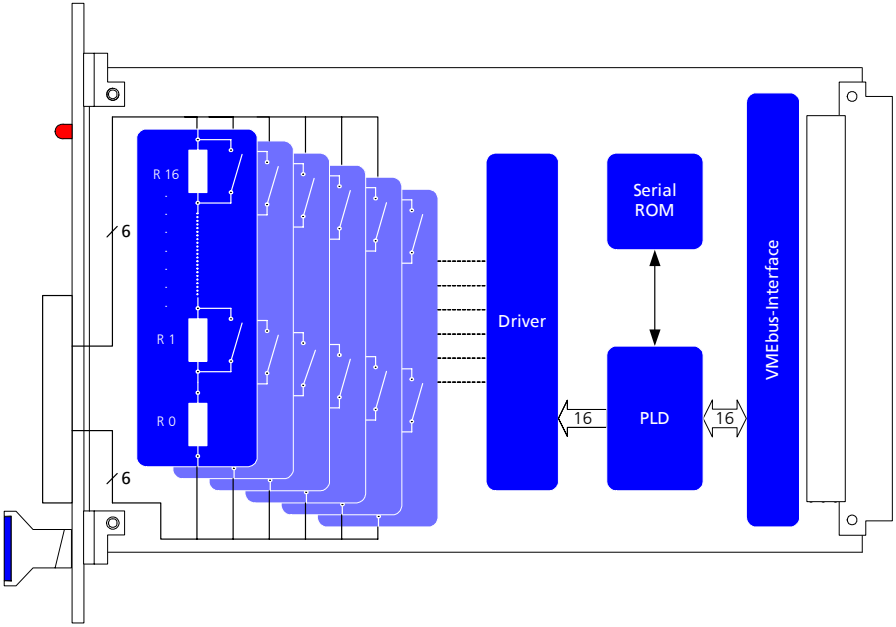


Fig. 1-2 Block Diagram of the ES1385.1 Resistor Cascade Board

2 Hardware Features

This section contains a description of the different hardware features of the ES1385.1 Resistor Cascade Board.

These are:

2.1 Outputs

Four channels of the ES1385.1 Resistor Cascade Board each have a cascade with the following resistance values:

- 10 Ω - 20 Ω –20 Ω – 40 Ω
- 100 Ω - 200 Ω - 200 Ω - 400 Ω
- 1 kΩ - 2 kΩ - 2 kΩ - 4 kΩ
- 10 kΩ - 20 kΩ - 40 kΩ
- 1 MΩ.

These channels are particularly used to simulate the internal resistance of oxygen sensors – the 1 MΩ resistor is intended to represent a cold oxygen sensor.

Resistances of up to 79.99 kΩ can be defined with this kind of cascade.

Two channels of the ES1385.1 Resistor Cascade Board each have a cascade with the following resistance values:

- 5 Ω
- 10 Ω - 20 Ω –20 Ω – 40 Ω
- 100 Ω - 200 Ω - 200 Ω - 400 Ω
- 1 kΩ - 2 kΩ - 2 kΩ - 4 kΩ
- 10 kΩ - 20 kΩ - 40 kΩ

The additional 5 Ω resistor makes 5 Ω steps to 79.995 kΩ possible. This kind of cascade can be used, for example, to simulate temperature sensors.

There is a relay (PhotoMOS) parallel to each resistor of a cascade which is used to activate the individual resistors.

note

Every channel has a basic resistance of 20 Ω. This is also the smallest resistance that can be set.

2.1.1 Accuracy

The accuracy of the resistances set is 5 Ω for channels 0 and 1 and 10 Ω for channels 2 - 5. The real values of the individual resistors of each cascade are stored as calibration data in the board's ROM. The monotony of the resistance values set is ensured by an algorithm implemented in the board's RTIO driver.

2.1.2 Switching Times

The various switching times when enabling and disabling the individual resistors of a cascade (t_{R_on} = 1 ms, t_{R_off} = 0.2 ms) can result in interim states with a high impedance (1 MΩ max.) – the value is stable, however, after just one millisecond.

2.1.3 Overcurrent Protection

The ES1385.1 Resistor Cascade Board has overcurrent monitoring for every individual cascade. If a cascade's current exceeds 100 mA, the connection of the particular resistor cascade is interrupted. An overcurrent condition is shown by the red LED on the front panel (see "LED" on page 16).

The connection is not reestablished automatically after an interrupt caused by an overcurrent condition, but manually via the RTIO. The corresponding channel has to be "reenabled" for this purpose.

2.1.4 Overvoltage

The ES1385.1 Resistor Cascade Board has no special overvoltage protection – please observe the maximum permissible voltage of 36 V.

2.2 VMEbus Interface

2.2.1 Backplane Connector J1

The assignment of the backplane connector J1 adheres to the VMEbus specification. For a detailed description, please refer to the ES4100 VME64x Signal Box User's Guide.

2.2.2 Address Switches SW1 and SW2

The ES1385.1 Resistor Cascade Board can be operated in both VMEbus and in VME64x systems with geographical addressing. If the SW1 and SW2 HEX switches are in position "0x00", the board is addressed in "geographical addressing mode" and otherwise in the relevant address spaces

The ES1385.1 maps 256 bytes into the A24 address space in the setting "0x00" depending on the slot position. Depending on the memory space available, the 64 kB address space is then defined dynamically by the system controller.

Slot Position	Address	VME Interface (Control Registers)
1	E0E000 - E0E0FF	256 bytes
2	E0E100 - E0E1FF	256 bytes
3	E0E200 - E0E2FF	256 bytes
4	E0E300 - E0E3FF	256 bytes
5	E0E400 - E0E4FF	256 bytes
6	E0E500 - E0E5FF	256 bytes
7	E0E600 - E0E6FF	256 bytes
8	E0E700 - E0E7FF	256 bytes
9	E0E800 - E0E8FF	256 bytes
10	E0E900 - E0E9FF	256 bytes
11	E0EA00 - E0EAFF	256 bytes
12	E0EB00 - E0EBFF	256 bytes
13	E0EC00 - E0ECFF	256 bytes
14	E0ED00 - E0EDFF	256 bytes
15	E0EF00 - E0EFFF	256 bytes
16	E0F000 - E0F0FF	256 bytes
17	E0F100 - E0F1FF	256 bytes
18	E0F200 - E0F2FF	256 bytes
19	E0F300 - E0F3FF	256 bytes
20	E0F400 - E0F4FF	256 bytes
21	E0F500 - E0F5FF	256 bytes

Tab. 2-1 Slot Position and Address

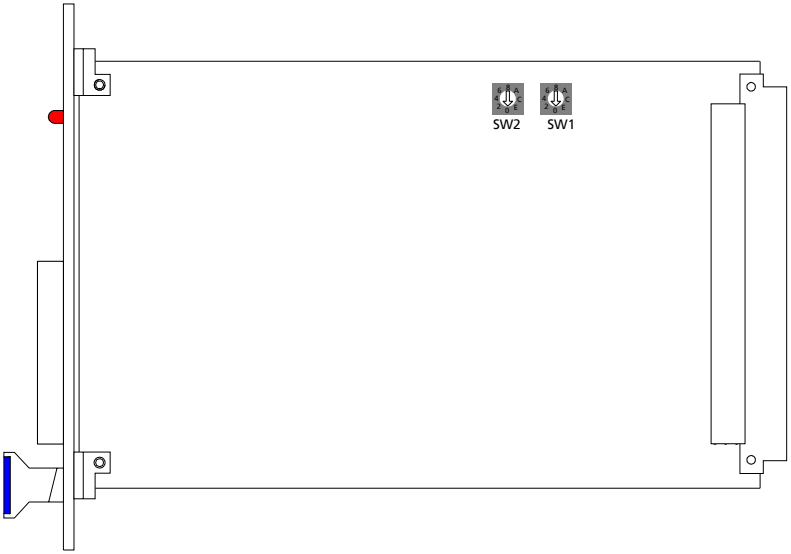


Fig. 2-1 Position of Switches SW1 and SW2 on the Board

In every other setting of the HEX switch (≠ 0x00), the 64 kB address space is assigned statically.

Switch Position	Address Space
0x01	010000 - 01FFFF
0x02	020000 - 02FFFF
0x03	030000 - 03FFFF
..	..
..	..
..	..
0xFF	FF0000 - FFFFFF

Tab. 2-2 Setting of the Address Spaces

SW1	SW2
0x0**n**	0x**n**0
Address A16 - A19	Address A23 - A20

Tab. 2-3 HEX Switches for Setting the Address

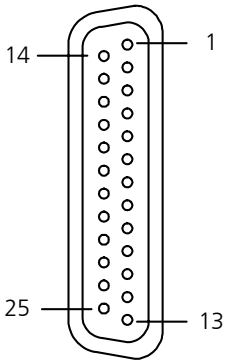
3 Pin Assignments and Indicators

This section contains a description of the pin assignments of the connector on the front panel and the meaning of the indicators on the front panel.

These are:

3.1 "RESISTOR 0-5" Outputs

Sub-D 25-pin, male.



Tab. 3-1 "RESISTOR 0-5" Connector (View from the Plug-In Side)

Pin	Signal	Pin	Signal
1	Res0.1	14	PE (housing)
2	Res0.2	15	n.c.
3	Res1.1	16	n.c.
4	Res1.2	17	n.c.
5	Res2.1	18	n.c.
6	Res2.2	19	n.c.
7	Res3.1	20	n.c.
8	Res3.2	21	n.c.
9	Res4.1	22	n.c.
10	Res4.2	23	n.c.
11	Res5.1	24	n.c.
12	Res5.2	25	n.c.
13	PE (housing)		

Tab. 3-2 "RESISTOR 0-5" Pin Assignment

3.2 LED

There is 1 LED on the front panel of the ES1385.1 Resistor Cascade Board, the meaning of which is described in Tab. 3-3.

LED	Color	Meaning
ERROR	Red	The overcurrent condition is active for at least one channel or SYSFAIL active

Tab. 3-3 Significance of the LED

4 Technical Data

This chapter contains the technical data of the ES1385.1 Resistor Cascade Board.

Outputs

No. of channels	6
Resistance values	Four channels: 10 Ω - 20 Ω –20 Ω – 40 Ω - 100 Ω - 200 Ω - 200 Ω - 400 Ω - 1 kΩ - 2 kΩ - 2 kΩ - 4 kΩ - 10 kΩ - 20 kΩ - 40 kΩ - 1 MΩ. Two channels: 5 Ω - 10 Ω - 20 Ω –20 Ω – 40 Ω - 100 Ω - 200 Ω - 200 Ω - 400 Ω - 1 kΩ - 2 kΩ - 2 kΩ - 4 kΩ - 10 kΩ - 20 kΩ - 40 kΩ
Accuracy	Channels 0 - 1: 5 Ω Channels 2 - 5: 10 Ω
Switching time	Resistance value stable within 1 ms
Maximum permissible voltage	36 V
Overcurrent fuses	Per channel: 100 mA

VME Conformity

VME specification	Revision C.1, October 1985 and IEC 821-1987
Type	Slave
Data bus	A24:D16
Address modifier	39 (hex): A24 non-privileged data access
Base address	$000000-FF0000 jumper-programmable or by VME64x backplane slot detection automatically
Memory map	Short I/O space, occupying 64 kB
Interrupts	Single level, IRQ 1 – 7 By software: – IRQ level – interrupt vector source

Power Supply

Current consumption	0.5 A @ +5 V DC

Environmental Conditions

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

Physical Dimensions

Printed circuit board (L x W)	160 mm x 100 mm
Front panel	Height: 3 U Width: 4 HP

5 ETAS Contact Addresses

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