ROHDE&SCHWARZ

USER MANUAL

Matrix Module B

TS-PMB

User Manual

for ROHDE & SCHWARZ Matrix Module B TS-PMB

3rd Issue / 11.05 / GB 1153.5233.12

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Safety Instructions

Attention!
Electrostatic sensitive devices require special care

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Deutsche Gesellschaft zur Zertifizierung von Managementsystemen

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Rohde & Schwarz GmbH & Co. KG

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with the production sites as listed in the annex

for the scope
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DIN EN ISO 9001 : 2000

December 2000 edition

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Frankfurt am Main	2005-01-24

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Appendix to Certificate Registration No.: 001954 QM/ST

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The international and German Road Traffic Law
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Annex to Certificate Registration No.: 001954 QM ST

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Rohde & Schwarz FTK GmbH Wendenschloßstrasse 168 D-12557 Berlin	Design and Development, Production and Sale of Communication Equipment, Installations and systems
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If you have any technical queries about this Rohde & Schwarz equipment, our Hotline at the Support Center of Rohde & Schwarz Sales-GmbH will be glad to help.

Our team will discuss your queries and look for solutions to your problems.

The Hotline is open Mondays to Fridays from 08.00 to 17.00 hrs.

For queries outside office hours, you can leave a message or send a note via fax or email. We will then get back to you as soon as possible.

ROHDE & SCHWARZ

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1 Usage

1.1 General

The ROHDE & SCHWARZ Matrix Module B TS-PMB allows the universal interconnection of test points and measuring instruments. This can be done locally or using the analog bus. The TS-PMB can be used in the CompactTSVP and the PowerTSVP (TSVP = Test System Versatile Platform). Typical product test applications are in the fields of communications, automotive electronics and general industrial electronics, especially for analog In-Circuit Testing with a large number of channels.

The TS-PMB is plugged into the front part of the TSVP chassis.

The **front connector** ends flush with the front panel of the TSVP chassis and is used for contacting the UUTs. An adapter frame can also be used if necessary.

At the rear, the TS-PMB is connected with connector X20 to the cPCI backplane when used in the CompactTSVP or to the control backplane when used in the PowerTSVP. Connector X30 is used to connect the TS-PMB to the analog bus backplane. This connector can be used to make connections with other plug-in modules (e.g. measuring modules) or external instruments.

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1.2 Characteristics

Characteristics TS-PMB
Access to the analog bus (8-wire)
Full matrix with 4 buses with 90 pins
Full matrix with 8 buses with 45 pins
3 Instrument ports
Parallel test with two 4-wire systems
In-Circuit Test wiring for 6-wire measurements
Connection of control signals in the Powertest together with the TS-PSM1 plug-in module.
Switchgear panel in adapters with no TSVP
Self-test capability

Table 1-1 Characteristics TS-PMB

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2 View

Figure 2-1 shows a view of the TS-PMB .

Figure 2-1 View of the TS-PMB

The cPCI connector X1 is also fitted starting with Version V3.x.

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3 Block Diagram

Figure 3-1 shows the block diagram of the TS-PMB. A simplified view of the functional blocks can be seen in Figure 3-2 .

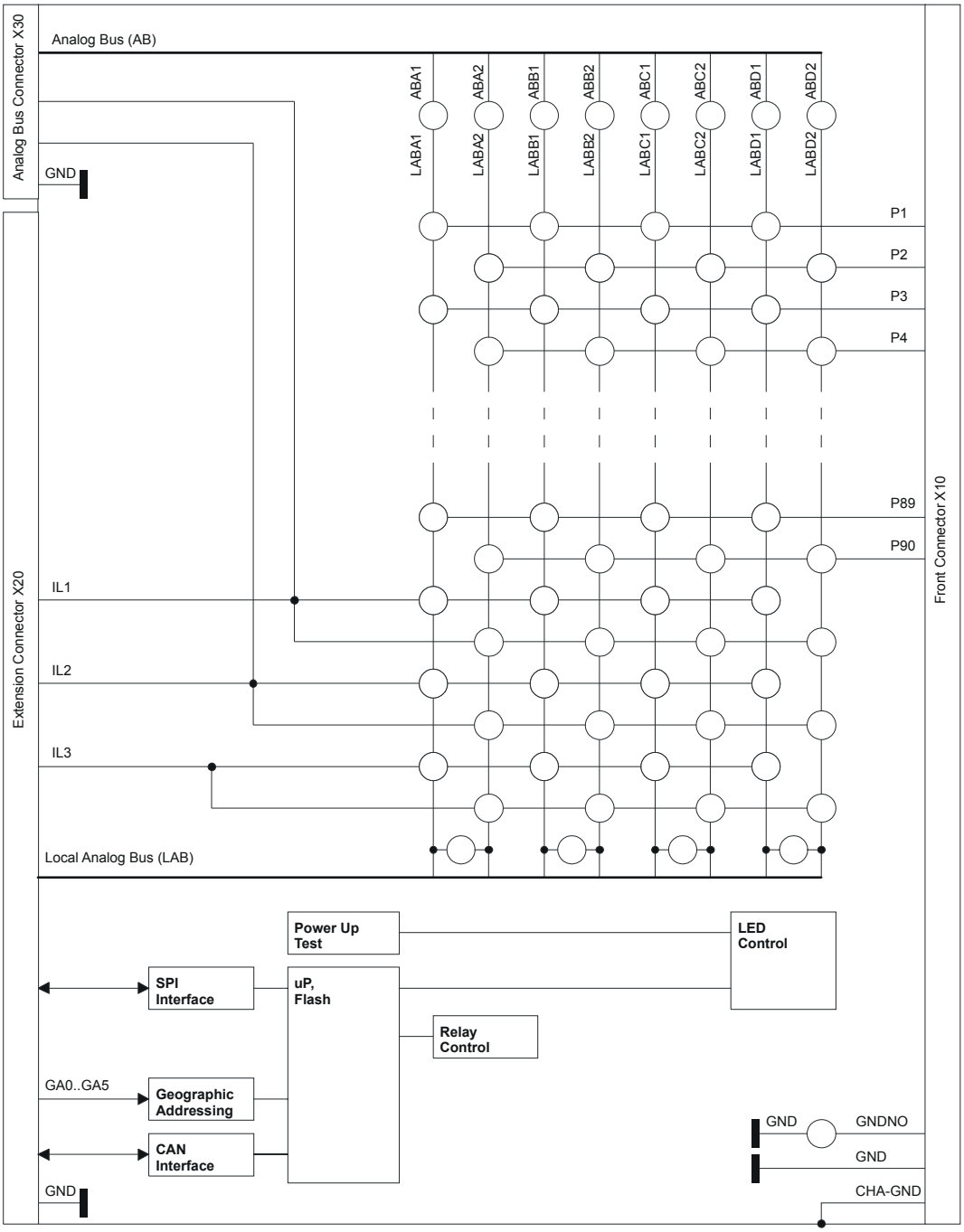

Figure 3-1 Block Diagram TS-PMB

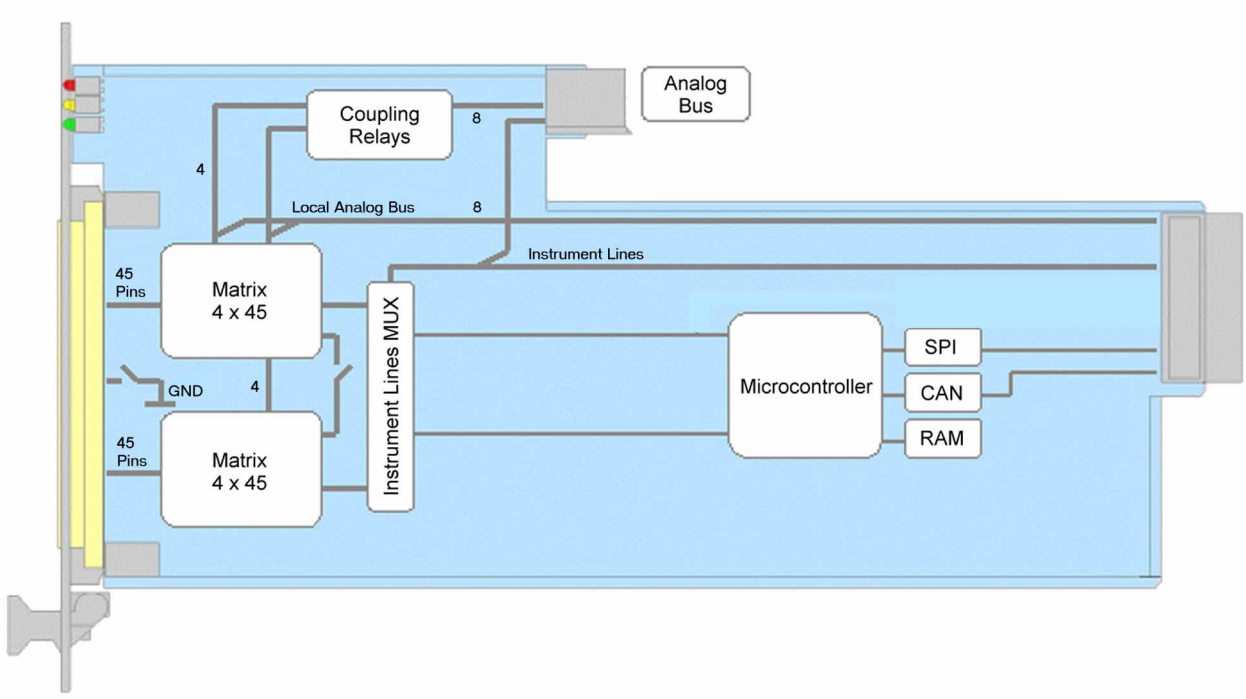

Figure 3-2 Functional Block Diagram TS-PMB

4 Layout

4.1 Mechanical Layout

The TS-PMB is designed as a **long plug-in board** for front mounting in the TSVP chassis. The mounting depth is 300 mm, and the front panel is 4U in height.

Connector X20 is used to make the connections with the cPCI backplane/control backplane of the TSVP. Connector X30 connects the TS-PMB with the analog bus backplane in the TSVP chassis. UUTs and peripherals are connected using front connector **X10**.

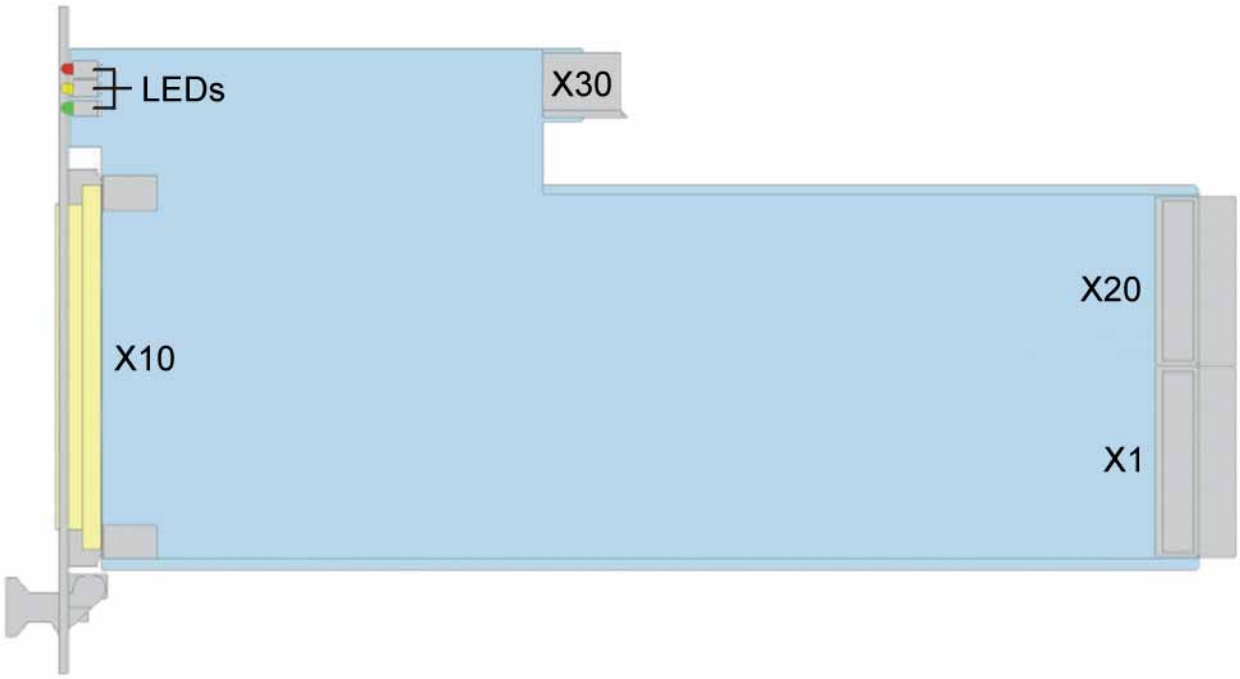

Figure 4-1 Layout of Connectors and LED's

Symbol	Use
X1	cPCI Connector (only Version V3.x)
X10	Front Connector
X20	Extension Connector
X30	Analog Bus Connector

Table 4-1 Connectors on the TS-PMB

4.2 Display Elements

(see Figure 4-1)

The front panel of the TS-PMB contains three LEDs with the following functions:

LED	Description
ERR (red)	Error: Lights up when a fault is detected on the TS-PMB in the power-on test after the supply voltage is switched on.
COM (yellow)	Communication: Lights up briefly when the TS-PMB is accessed via the interface.
Power (green)	Power: Lights up when all supply voltages are present.

Table 4-2 Display Elements on the TS-PMB

LED Test:

When voltage is powered up all three LED's light up for around 1 second. This ensures that the 5 V supply is present and that the LED's and power-on test are functioning.

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5 Function Description

5.1 Signal Concept

The TS-PMB allows the optional connection of measuring instruments to pins on test products. Connections can be made locally within the module or with other modules using the R&S analog bus. This means that no constraints need to be allowed for when wiring test product adapters because the measurement paths are created by software.

The ability to connect measuring instruments to the back of the TSVP avoids cross-connections at the adapter interface. The unit's extreme compactness makes it possible to accommodate measuring systems with a number of PXI instruments and a switch panel with a large number of pins in a single device (one-box solution), making is particularly suitable for in-circuit testing.

The ground can be connected to the front connector via the ground relay (GND - GNDNO).

5.2 Scalability

The TS-PMB has two switching matrices (4 x 45). These can also be configured as 8 buses x 45 pins with external connection or 4 buses x 90 pins, e.g. using plug-in module TS-PSAM via the analog bus (see Figure 3-2).

Three additional instrument inputs (IL1 ... IL3) can be used to connect measuring instruments at the rear. Up to12 modules can be used in the CompactTSVP.

The switch panel can be divided into two 4-wire part buses for the parallel test. The number of pins can be increased to 16 modules with the PowerTSVP.

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5.3 Noise Immunity

The signal concept with the analog bus remote from the Compact PCI bus and the triggering via the CAN bus guarantee good signal quality. Despite the unit's compact size, DC and AC voltages up 125 V (rms) can be connected and passed to other modules.

5.4 Relay Matrix

The matrix is designed as a part matrix, i.e. each even I/O channel (e.g. P2) can be switched to an even part bus (e.g. LABA2) and each odd I/O channel (e.g. P1) can be switched to an off part bus (e.g. LABA1) (see Section 3, Block Diagram). This does not apply to channels IL1 ... IL3, which can be switched to all lines of the local analog bus.

Coupling relays separate the local analog bus lines (LAB) on the TS-PMB from the bus lines on the analog bus backplane. The firmware automatically switches these relays selectively when at least one I/O channel is switched to the corresponding local analog bus. When an I/O channel is no longer switched to a bus, the corresponding coupling relay is automatically opened. This function can be turned on or off at any time. The coupling relays can also be switched manually.

5.5 Interfaces

(see Figure 3-2)

The SPI interface (Serial Peripheral Interface) is used for communication with rear I/O modules. The TS-PMB is controlled via CAN interface (Controller Area Network).

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5.6 Power supply

The TS-PMB is operated with a voltage of 5 V. The power supply is provided through connector X20 for Versions V1.x and V2.x. In Version V3.x the power supply is provided via connector X20 or connector X1. All versions of the TS-PMB can be operated in the CompactTSVP TS-PCA3 and in the PowerTSVP TS-PWA3.

Since the CompactTSVP TS-PCA3 no longer makes a 5-V power supply available on connector X20 starting with backplane Version V4.x , only TS-PMB modules of Version V3.x can be operated with this backplane version. TS-PMB modules of Version V2.x require a change to TAZ 2.14 and a rear IO module TS-PRIO.

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6 Commissioning

6.1 Installing the Plug-In Module

To install the plug-in module, proceed as follows:

- Run down and power off the TSVP
- Select a suitable front slot
- Remove the front panel from the TSVP chassis by slackening off the screws

WARNING!

Check the backplane connectors for bent pins! Any bent pins must be straightened!
Failure to do this may permanently damage the backplane!

- Insert the plug-in module using moderate pressure
- The top snap pin on the module must locate in the right-hand and the bottom pin in the left-hand hole on the TSVP chassis

WARNING!

Use both hands to guide the module and carefully plug it into the backplane connectors

- The module is correctly located when a distinct 'stop' can be felt
- Tighten the top and bottom screws on the front panel of the plug-in module

6.2 Initializing the Plug-In Module

Once the system has been powered up, the TS-PMB is initialized. Signals GA0 ... GA5 on the cPCI bus are used for slot detection.

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6.3 Operation in the CompactTSVP TS-PCA3

(starting with CompactTSVP TS-PCA3 with backplane version V4.x)

Matrix modules B TS-PMB with change status V2.x (recognisable from the lack of connector X1) require a hardware change to TAZ 2.14 and a Rear IO Module TS-PRIO plugged in to operated in the CompactTSVP TS-PCA3 with backplane version V4.x (starting with serial number 100109). The 5-V power supply and CAN bus are supplied via the TS-PRIO.

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7 Software

7.1 Driver Software

A LabWindows CVI driver is provided for the TS-PMB . This driver satisfies the IVI Switch specification. The driver is part of the ROHDE & SCHWARZ GTSL software. All the functions of the driver are described fully in the on-line help.

The following software modules are installed during driver installation:

Module	Path	Remarks
rspmb.dll	<GTSL Directory>\Bin	Driver
rspmb.hlp	<GTSL Directory>\Bin	Help file
rspmb.fp	<GTSL Directory>\Bin	LabWindows CVI Function Panel file, Function Panels for CVI development environment
rspmb.sub	<GTSL Directory>\Bin	LabWindows CVI attribute file This files is needed by some „Function Panels“.
rspmb.lib	<GTSL Directory>\Lib	Import library
rspmb.h	<GTSL Directory>\Include	Header file for the driver

Table 7-1 Driver Installation TS-PMB

NOTE:

The IVI and VISA libraries of National Instruments are needed to run the driver.

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7.2 Softpanel

The software package of the TS-PMB includes a softpanel (see example in Figure 7-1). The softpanel enables the user to execute the functions of the TS-PMB listed in the menu with on-screen mouse clicks.

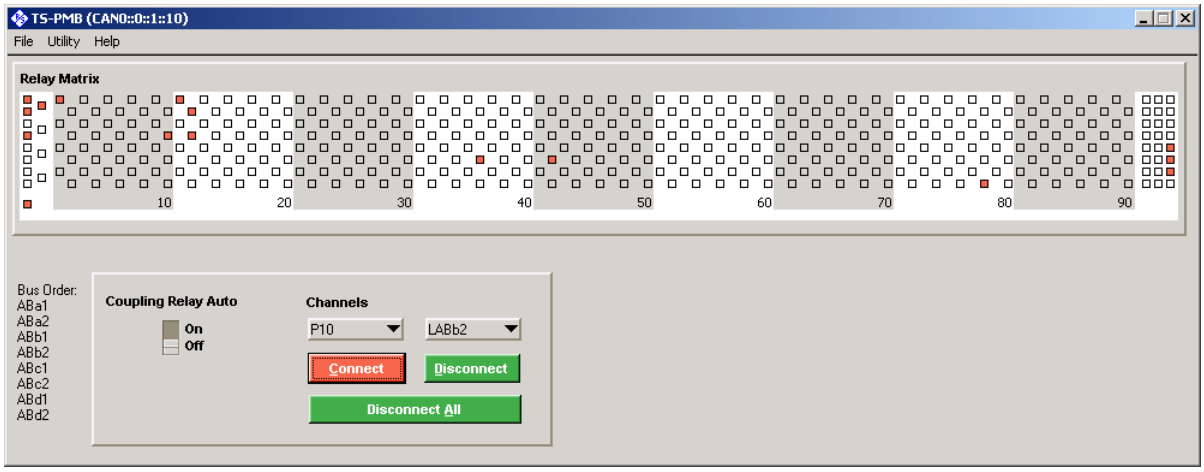

Figure 7-1 Softpanel TS-PMB (example)

7.3 TS-PMB Program Example

```
/*
    Connection between ABa1 and ABb1 with TS-PMB in Slot 12

    The coding rules of a GTSL software like
    allocating and locking the resource, or error handling
    are not considered in this example.
    It´s just to show the function calls to get the connection.
*/

/*
    rspmb ivi-driver header file
*/

#include "rspmb.h"

static ViStatus  s_status;

main()
{

    /*
      Creates a new IVI instrument driver and optionally sets the initial
       state of the session attributes

      "CAN0::0::1::12": CAN board 0, Bus Controller 0, Frame 1, Slot 12
    */

   s_status = rspmb_InitWithOptions ("CAN0::0::1::12", VI_TRUE, VI_TRUE,
"", & handle);


    /*
       This function sets/opens automatically the bus coupling relays
       (local analog bus to analog bus) if a path is created/closed.
    */

    s_status = rspmb_SetAttributeViBoolean (handle, "",
RSPMB_ATTR_CR_AUTO, VI_TRUE);
    /*
       This function creates a path between channel ABa1 and P1.
      The driver calculates the shortest path between the two channels.
    */
    s_status = rspmb_Connect (handle, "ABa1", "P1");
    s_status = rspmb_Connect (handle, "ABb1", "P1");

    /*
       Connection between ABa1 and ABb1 exists.
    */
    /*
       Opens the path between Channel ABa1 and LABa1.
```

```
        */

        s_status = rspmb_Disconnect (handle, "ABa1", "P1");
        s_status = rspmb_Disconnect (handle, "ABb1", "P1");

        s_status = rspmb_close (handle);
    }
```

8 Self-Test

The TS-PMB has a built-in self-test capability. The following tests are possible:

- LED Test:
- Power-on test
- TSVP Self-Test

8.1 LED Test:

After power-on, all three LED's light up for around one second to indicate that the 5 V supply is present, all LED's are working and the power-on test was successful. The following statements can be made about the different LED statuses:

LED	Description
One LED does not light up	Hardware problem on the module
No LED's light up	No +5V supply

Table 8-1 Statements about the LED Test

8.2 Power-On Test

The power-on test runs at the same time as the LED test. The red LED lights up if a fault is found on the module. This is just a test of the cPCI interface and the firmware of the TS-PMB .

8.3 TSVP Self-Test

The TSVP self-test runs an in-depth test on the module and generates a detailed log.

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The TS-PSAM modules is used as a measuring unit of R&S modules in the TSVP. The correct operation of the modules is ensured by measurements on the analog bus.

NOTE:

You will find information about starting the self-test and on the sequence of necessary steps in the Service Manual.

9 Interface description

9.1 Connector X10

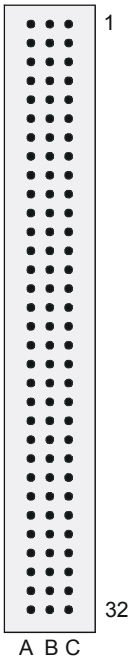

Figure 9-1 Connector X10 (mating side)

Pin	A	B	C
1	P1	P33	P65
2	P2	P34	P66
3	P3	P35	P67
4	P4	P36	P68
5	P5	P37	P69
6	P6	P38	P70
7	P7	P39	P71
8	P8	P40	P72
9	P9	P41	P73
10	P10	P42	P74
11	P11	P43	P75
12	P12	P44	P76
13	P13	P45	P77
14	P14	P46	P78
15	P15	P47	P79
16	P16	P48	P80
17	P17	P49	P81
18	P18	P50	P82
19	P19	P51	P83
20	P20	P52	P84
21	P21	p53	P85
22	P22	P54	P86
23	P23	P55	P87
24	P24	P56	P88
25	P25	P57	P89
26	P26	P58	P90
27	P27	P59	GNDNO
28	P28	P60	GNDNO
29	P29	P61	GNDNO
30	P30	P62	GND
31	P31	P63	GND
32	P32	P64	**CHA-GND**

Table 9-1 X10 Pinning Schedule

Note:
Signal CHA-GND (chassis GND) is connected to the front panel of theTS-PMB .

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9.2 Connector X20

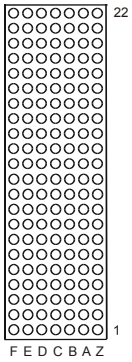

Figure 9-2 Connector X20 (mating side)

NC = not connected, NP = not populated

Pin	F	E	D	C	B	A	Z	
22		GA0	GA1	GA2	GA3	GA4		
21		PXI_LBR3	PXI_LBR2	PXI_LBR1	GA5	PXI_LBR0		
20		PXI_LBL1	GND	PXI_LBL0	AUX1	AUX2		
19		AUX1	AUX2	PXI_LBL3	GND	PXI_LBL2		
18		PXI_TRIG6	GND/NC *1)	PXI_TRIG5	PXI_TRIG4	PXI_TRIG3		X20
17		PXI_CLK10	AUX4	AUX3	GND	PXI_TRIG2		
16		PXI_TRIG7	GND	AUX5	PXI_TRIG0	PXI_TRIG1		
15		+5V	+5V	AUX6	GND			
14	NC						NC	C
13	NC						NC	O
12	NP	LABA1				LABC1	NP	N
11	NP			IL1			NP	N
10	NC	LABB1				LABD1	NC	E
9	NC			IL3			NC	C
8	NC	LABA2				LABC2	NC	T
7	NC			IL2			NC	O
6	NC	LABB2				LABD2	NC	R
5	NC						NC	
4	NC						NC	
3		RSA0	RRST#	+12V	GND	RSDO		
2		+12V	RSDI	RSA1	+5V	RSCLK		
1		+5V	CAN_L	CAN_H	GND	RCS#		
Pin	F	E	D	C	B	A	Z	

Rear IO
Rear IO incompatible PXI
PXI signals
R&S Rear IO control (SPI)
GA3..0 at GND or N.C.
GA5..4 at jumper field, GA5 only TS-PWA3
High Voltage, incompatible PXI

*1) N.C. only in V2.14 (special requirement for use in TS-PCA3 backplane V4.x, additionally rear-IO-module TS-PRIO required)

Table 9-2 X20 Pinning Schedule (Version 2.X)

Pin	F	E	D	C	B	A	Z	
22		GA0	GA1	GA2	GA3	GA4		
21					GA5			
20			GND		AUX1	AUX2		
19		AUX1	AUX2		GND	-12V		
18		PXI_TRIG6	GND / CAN_EN in V3.0	PXI_TRIG5	PXI_TRIG4	PXI_TRIG3		X20
17		PXI_CLK10			GND	PXI_TRIG2		
16		PXI_TRIG7	GND		PXI_TRIG0	PXI_TRIG1		
15			+5V		GND			
14	NC						NC	C
13	NC						NC	O
12	NP	LABA1				LABC1	NP	N
11	NP			IL1			NP	N
10	NC	LABB1				LABD1	NC	E
9	NC			IL3			NC	C
8	NC	LABA2				LABC2	NC	T
7	NC			IL2			NC	O
6	NC	LABB2				LABD2	NC	R
5	NC						NC	
4	NC						NC	
3		RSA0	RRST#		GND	RSDO		
2		+12V	RSDI	RSA1		RSCLK		
1		+5V	CAN_L	CAN_H	GND	RCS#		
Pin	F	E	D	C	B	A	Z	

Table 9-3 X20 Pinning Schedule (Version 3.X)

9.3 Connector X1 (only Version 3.x)

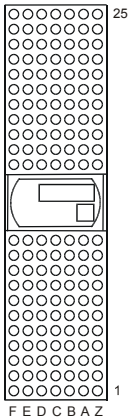

Figure 9-3 Connector X1 (mating side)

Pin	F	E	D	C	B	A	Z	
25	GND	+5V_IN2				+5V_IN2		
24	GND				+5V_IN2			
23	GND		+5V_IN2					
22	GND				GND			
21	GND							
20	GND				GND			X1
19	GND		GND					
18	GND				GND			
17	GND		GND					
16	GND				GND			C
15	GND		GND					O
12..14								N
11	GND		GND					N
10	GND				GND			E
9	GND		GND					C
8	GND				GND			T
7	GND		GND					O
6	GND				GND			R
5	GND		GND					
4	GND				GND			
3	GND		+5V_IN1					
2	GND				+5V_IN1			
1	GND	+5V_IN1	+12V		-12V	+5V_IN1		
Pin	F	E	D	C	B	A	Z	

Table 9-4 X1 Pinning Schedule

9.4 Connector X30

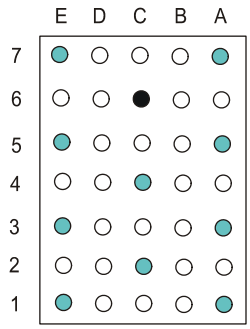

Figure 9-4 Connector X30 (mating side)

Pin	E	D	C	B	A
7	IL2_x				IL1_x
6			GND		
5	ABC1				ABA1
4			ABB1		
3	ABC2				ABB2
2			ABA2		
1	ABD2				ABD1

Table 9-5 X30 Pinning Schedule

Note:
IL1_x = IL1 of the slot

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10 Specifications

NOTE:

In the event of any discrepancies between data in this manual and the technical data in the data sheet, the data sheet takes precedence.

Interfaces

Control Bus	CAN 2.0b (1 Mbit/s)
UUT connector (front panel)	DIN 41612, 96 pins
Rear I/O connector	cPCI, 110 pins

Input Characteristics

Max. voltage DC/AC	125 V / 125 V rms
Max. current DC/AC	1 A / 1 A rms
Max. switching capacity	10 W / 10 VA
Switching time (incl. bounce) (all data carry and switched, resistive load)	0.5 ms typ.
Path resistance (typ.)	<1 Ohm

GND Relay

Max. voltage DC/AC	125 V / 125 V rms
Max. current (switched)	2 A / 2 A rms
Max. switching capacity (resistive load)	60 W / 60 VA

Switching Configurations

Analog buses	8
Pins	90
Measurement lines	3

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configurable as	
Dual Matrix	4 buses with 45 pins
Single Matrix	4 buses with 90 pins
Single Matrix	8 buses with 45 pins
Modes	local or global
Instrument inputs	to all 8 buses
GND switching relay	1

Transmission Characteristics

Max. Frequency	>3 MHz
(3 dB bandwidth, 50 Ohm)	≥10 MHz
Crosstalk	
(channel-to-channel, 50 Ohm, typ.)	
at 100 kHz	≤ -50 dB
at 1 MHz	≤ -23 dB
at 10 MHz	≤ -15 dB

Environmental conditions

EMC	according to EMC Directive 89/336/EEC and Standard EN61326
Safety	CE, EN61010 Part 1
Shock	40 g, MIL-STD-810, MIL-T-28800D, class 3 and class 5
Sinusoidal Vibration	
5 Hz to 55 Hz	2 g, MIL-T-28800D, class 5
55 Hz to 150 Hz	0.5 g, MIL-T-28800D, class 5
Noise	
10 Hz to 300 Hz	1.2 g
Humidity	+25°C/+40°C, 95% humidity

General Data

Dimensions	316 x 174 x 20 mm
Weight	740 g
Nominal temperature range	+5°C to +40°C
Operating temperature range	0 to +50°C

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Storage temperature range	-40°C to +70°C
Current consumption	21 W max.

Order number

Matrix Module B TS-PMB	1143.0039.02

Software

GTSL basic software, CVI driver