Test and Measurement
Division

Manual

Vector Network Analyzer

R&S®ZVB4 / ZVB8

1145.1010.06/10

Printed in the Federal
Republic of Germany

Dear Customer,

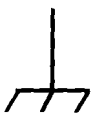
throughout this manual, the Vector Network Analyzer R&S® ZVB is abbreviated as R&S ZVB.

Safety Instructions

This unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards.

To maintain this condition and to ensure safe operation, the user must observe all instructions and warnings given in this operating manual.

Safety-related symbols used on equipment and documentation from R&S:

							
Observe operating instructions	Weight indication for units >18 kg	PE terminal	Ground terminal	Danger! Shock hazard	Warning! Hot surfaces	Ground	Attention! Electrostatic sensitive devices require special care

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:

   IP degree of protection 2X, pollution severity 2 overvoltage category 2, only for indoor use, altitude max. 2000 m.

   The unit may be operated only from supply networks fused with max. 16 A.

   Unless specified otherwise in the data sheet, a tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.

2. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures should be taken to avoid any hazards.

   (using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).

3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made. Installation and cabling of the unit to be performed only by qualified technical personnel.

4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.

5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.

   If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.

6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.

7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.

   Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.

8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.

   If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.

9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

   Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.

   Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.

   Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.

   (visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

continued overleaf

Safety Instructions

10. Ensure that the connections with information technology equipment comply with IEC950 / EN60950.
11. Lithium batteries must not be exposed to high temperatures or fire.

    Keep batteries away from children.

    If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (see spare part list).

    Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only.

    Do not short-circuit the battery.
12. Equipment returned or sent in for repair must be packed in the original packing or in packing with electrostatic and mechanical protection.
13. Electrostatics via the connectors may damage the equipment. For the safe handling and operation of the equipment, appropriate measures against electrostatics should be implemented.
14. The outside of the instrument is suitably cleaned using a soft, lint-free dustcloth. Never use solvents such as thinners, acetone and similar things, as they may damage the front panel labeling or plastic parts.
15. Any additional safety instructions given in this manual are also to be observed.

Qualitätszertifikat

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO 9001 und ISO 14001 zertifiziert.

Certificate of quality

Dear Customer,

You have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards. The Rohde & Schwarz quality management system is certified according to standards such as ISO 9001 and ISO 14001.

Certificat de qualité

Cher client,

Vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde & Schwarz a été homologué, entre autres, conformément aux normes ISO 9001 et ISO 14001.

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E-mail:werner.breidling@rsd.rohde-schwarz.com

In case of urgent spare parts requirements for this Rohde & Schwarz unit, please contact our spare parts express service.

Outside business hours, please leave us a message or send a fax or e-mail. We shall contact you promptly.

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Contents of the Manuals for the ZVB Network Analyzer

Service manual - instrument

This service manual for the instrument contains information on checking specs, instrument alignment, repairs and troubleshooting. The service manual – instrument contains all the information you will need to repair the instrument by means of board replacement.

The service manual has four chapters and an annex (Chapter 5) which contains the instrument documentation:

Chapter 1 Contains all the information you will need to check specs and lists the test equipment required.

Chapter 2 Describes the manual alignment of the frequency and DC measurement accuracy, automatic alignment after board replacement and also system error calibration.

Chapter 3 Describes the instrument design and simple repair and troubleshooting strategies. Board replacement plays a key role.

Chapter 4 Contains information on expansions and modifications achieved by updating instrument software and by retrofitting options.

Chapter 5 Describes how to return the instrument and order spare parts. It also contains spare parts lists and exploded diagrams of the instrument.

Operating manual

The operating manual contains all the information you will need about the technical characteristics of the instrument, putting the instrument into operation, the basic operating procedures, controls and displays, menu operation and remote control.

By way of an introduction, typical measurement tasks are explained using menu screen-shots and program examples.

The operating manual also contains notes on maintenance and explains how to troubleshoot faults using the warnings and error messages output by the instrument.

Service and Repairs

Contact your Rohde & Schwarz Service Center or the Rohde & Schwarz Express Spare-Part Delivery Service to solve your service problems or to order spare parts and boards.

A list of Rohde & Schwarz representatives and the address of our Express Spare-Part Delivery Service can be found at the beginning of this service manual.

To help us process your queries rapidly and effectively, and to determine whether your instrument is still covered by warranty, we need the following information:

- Instrument model
- Serial number
- Firmware version
- If repairs are to be made, the description of the fault should be as accurate as possible
- Contact person to answer any questions that may arise

Rohde & Schwarz offers the following calibration services:

- Calibration on R&S's own test systems. The calibration documentation meets the requirements of the ISO 9000 quality management system.
- Calibration in an R&S-based, accredited DKD calibration laboratory. The calibration documentation comprises the DKD calibration certificate.
  The calibration documentation meets the requirements of the ISO 17025 quality management system.

Chapter 5 describes in detail the procedure for returning your instrument and the procedure for ordering spare parts.

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1 Performance Test

Preliminary Remarks

- The required characteristics of the spectrum analyzer are checked after a warm-up time of at least 60 minutes; this ensures that the guaranteed data is met.
- The values stated in the following sections are not guaranteed data; only the specifications in the data sheet are binding.
- The values in the data sheet are guaranteed limits. Because of the measurement errors that arise, these limits must be increased to encompass the tolerances of the measuring equipment used for the performance test.
- Entries for the measurement are represented in the following way:

  [**<KEY>**] Press a front-panel key, e.g. [**SPAN**]

  [<SOFTKEY>] Press a softkey, e.g. [MARKER -> PEAK]

  [<**nn unit**>] Enter a value + terminate the entry with a unit, e.g. [**12 kHz**]

  Consecutive entries are separated with a [:], e.g. [**BW** : MANUAL RES BW : **3 kHz**]

Test Equipment and Accessories

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
1	Spectrum analyzer	a) Counter mode: Min. resolution: 100 Hz Max. rel. frequency deviation: 10^{-6} b) Linearity Max. departure from linearity (2σ): 0.06 dB c) Frequency response: 50 MHz to 4 GHz: < 1 dB 4 GHz to 8 GHz: < 2 dB	FSU 26	1129.9003.26	Frequency uncertainty Harmonics Output linearity Input linearity
2	Power sensor	N, 50 Ω. 300 kHz to 8 GHz RSS error < 0.1 dB VSWR < 1.2	NRP-Z51	1138.0005.02	Max. output power Accuracy of output power Power measurement uncertainty
2	Power meter	300 kHz to 8 GHz	NRVD + Sensor ZV-Z51	0857.8008.02 0857.9004.02	Max output power Accuracy of output power Power measurement uncertainty
3	Network analyzer	300 kHz to 8 GHz	ZVC	1127.8600.61	Matching port 1 to port 4
4	Calibration kit	N, 50 Ω. 300 kHz to 8 GHz.	ZV-Z21	1085.7099.02	Input linearity Matching port 1 to port 4 Input noise level
5	Signal generator	300 kHz to 8 GHz, Power = -40 dBm to 10 dBm	SMR27 with Option SMR-B15 SML01	1104.0002.27 1104.4989.02 1090.3000.11	Power measurement uncertainty
6	Power splitter	N, 50 Ohm, Γ_{eq} < 0.05 (50 MHz to 8 GHz) Output tracking < 0.15 dB	Weinschel 1870A	-	Power measurement uncertainty
7	Test cable	N(male) – N(male), approx. 1.5 m			Frequency uncertainty Harmonics Matching port 1 to port 4 Power measurement uncertainty Input linearity
8	BNC cable	Male – male, approx. 1.5 m			General: Device synchronisation
9	DC power supply	-12 V to +12 V	NGSM 32/10	0192.0810.31	DC meas inputs
10	Multimeter	MU < 0.2%, DC range 1 V, 10 V	URE3	0350.5315.03	DC meas inputs
11	Conn. Cables for DC inputs		ZV-Z71	1164.1005.02	DC meas inputs

Performance Test

Compare with data sheet

Checking the Frequency Uncertainty

Instrument:	Spectrum analyzer (see Chapter “Test Equipment“, Item1)
	Test cable (see Chapter “Test Equipment“, Item7)
Test setup:	Connect the spectrum analyzer to (port 2 to port 4)
Spectrum analyzer settings:	- [**PRESET**] - [**FREQ** : **1 GHz**] - [**SPAN** : **50 kHz**] - [**BW** : MANUAL RES BW : **10 kHz**] - [**MARKER** : MARKER MODE : FREQ COUNT] - [**AMPT** : REF LEVEL : **10 dBm**]
R&S® ZVB settings	- Select [**System** : Internal Reference]
	- [**Preset**] - [**Meas** :Wave Quantities: a1 Src Port 1] - [**Sweep** : Sweep Type : CW Mode : CW Frequency : **1 GHz**; Power : **0 dBm**] - [**Sweep** : Single : **Restart**]
Measurement:	Read off the frequency indicated by the marker.
	Frequency deviation = marker value – 1 GHz
	Max. frequency deviation ..... see Performance Test Report

Checking the Harmonics

Instrument: Spectrum analyzer (see Chapter "Test Equipment", Item1)

Test cable (see Chapter “Test Equipment", Item7)

Test setup: Connect the spectrum analyzer to port1 (port 2 to port 4)

Spectrum analyzer settings:

Note:
Synchronize the reference oscillators in the spectrum analyzer and in the R&S®ZVB.

- [**PRESET**]
- [**FREQ** : f_{GEN}, 2* f_{GEN}, 3* f_{GEN} *]
- [**SPAN** : ZERO SPAN]
- [**BW** : MANUAL RES BW : **100 Hz**]
- [**MARKER** : DETECTOR : RMS]
- [**AMPT** : REF LEVEL : **10 dBm**]

* For measurement frequencies, see Performance Test Report {fGEN}.

R&S® ZVB settings:

- [**Preset**]
- [**Meas** : Wave Quantities: a1 Src Port 1
  (a2 Src Port 2, a3 Src Port 3, a4 Src Port 4)]
- [**Sweep** : Sweep Type : CW Mode :
  CW Frequency : **{f_{GEN}*}** ; Power : **8 dBm**]
- [**Sweep** : Single : **Restart**]

* For measurement frequencies, see Performance Test Report {fGEN}.

Measurement: Read off the levels L_{n*fgen} (n = 1, 2, 3) indicated by the spectrum analyzer’s markers.

Calculation:

$$\text{Harmonics} = L_{n*f\,gen} - L_{fgen} - \text{cable loss (in dB)}$$

The cable loss corresponds to the S_{21} of the test cable used between the fundamental and the measured harmonic (S_{21} is negative).

Checking the Maximum Output Power

Instrument:	Power sensor or Power meter with power sensor (see Chapter “Test Equipment“, Item2)
Test setup:	Connect power sensor to port1 (port 2 to port 4)
Power sensor settings:	For measurement frequencies, see Performance Test Report {f_{GEN}*}.
R&S®ZVB settings:	- [**Preset**] - [**Meas** : Wave Quantities: a1 Src Port 1 (a2 Src Port 2 to a4 Src Port 4)] - [**Sweep** : Sweep Type : CW Mode : CW Frequency : **{f_{GEN}*}** ; Power : **16 dBm**] - [**Sweep** : Single : **Restart**] * For measurement frequencies see the Performance Test Report {f_{GEN}}.
Measurement:	Read off the level indicated by the power meter. Max. power ..... see Performance Test Report

Checking the Accuracy of Output Power

Instrument:	Power sensor or Power meter with power sensor (see Chapter “Test Equipment“, Item2)
Test setup:	Connect the power sensor to port 1 (port 2 to port 4)
Power sensor settings:	For measurement frequencies, see Performance Test Report {f_{GEN}*}.
R&S®ZVB settings:	- [**Preset**] - [**Meas** :Wave Quantities: a1 Src Port 1 (a2 Src Port 2, a3 Src Port 3, a4 Src Port 4)] - [**Sweep** : Sweep Type : CW Mode : CW Frequency : **{f_{GEN}*}** ; Power : **-10 dBm**] - [**Sweep** : Single : **Restart**] * For measurement frequencies, see Performance Test Report {f_{GEN}}.
Measurement:	Read off the levels indicated by the power sensor Level deviation = L_{SENSOR} – (-10 dBm)

Checking the Output Linearity

Instrument:

Spectrum analyzer (see Chapter “Test Equipment“, Item1)

Test cable (see Chapter “Test Equipment“, Item7)

Test setup:

Connect the spectrum analyzer to port 1(port 2 to port 4)

Spectrum analyzer settings:

Note:
Synchronize the reference oscillators in the spectrum analyzer and in the R&S®ZVB :

- [**PRESET**]
- [**FREQ** : f_{GEN}*]
- [**SPAN** : ZERO SPAN]
- [**BW** : MANUAL RES BW : **100 Hz**]
- [**MARKER** : DETECTOR : RMS]
- [**AMPT** : REF LEVEL : **5 dBm**]

* For measurement frequencies, see Performance Test Report {fGEN}.

R&S®ZVB settings:

- [**Preset**]
- [**Meas** : Wave Quantities: a1 Src Port 1
  (a2 Src Port 2, a3 Src Port 3, a4 Src Port 4)]
- [**Sweep** : Sweep Type : CW Mode :
  CW Frequency : **{f_{GEN}*}** ; Power : **{l_{GEN}*}**]
- [**Sweep** : Single : **Restart**]

* For measurement frequencies {fGEN} and levels {l_{GEN}}, see Performance Test Report

Measurement:

Read the spectrum analyzer’s marker values (level L) .

Calculation:

The measured values are referred to the level at the ZVB setting of -10 dBm.
Calculating the generator level linearity:

Level linearity = L - $L_{@-10dBm}$ – step width (in dB)

Step width = l_{gen} – (-10 dBm) (reference)

Checking the Power Measurement Uncertainty

Instrument:

Power sensor or
Power meter with power sensor
(see Chapter “Test Equipment“, Item2)

Signal generator (see Chapter “Test Equipment“, Item5)

Power splitter (see Chapter “Test Equipment“, Item6)

Calibration kit (see Chapter “Test Equipment“, Item4)

Test cable (see Chapter “Test Equipment“, Item7)

Preparation/
test setup:

Connect the signal generator to the power-splitter input using the test cable.

Connect the power sensor to a power-splitter output

Connect the other power-splitter output to port1 (port2 to port 4) using an adapter from the calibration kit

The reference oscillators in the signal generator and in the ZVB must be synchronized.

R&S®ZVB settings:

- [**Preset**]
- [**Meas** : Wave Quantities: b1 Src Port 1
  (b2 Src Port 2, b3 Src Port 3, b4 Src Port 4)]
- [**Power** : RF Off]
- [**Meas Bandwidth** : 100 Hz]
- [**Marker**]
- [**Sweep** : Sweep Type : CW Mode :
  CW Frequency : **{f_{GEN}*}**]
- [**Sweep** : Single : **Restart**]

* For the measurement frequencies, see Performance Test Report {fGEN}.

Measurement:

Signal generator : CW Mode, Frequency: f_{gen}
Signal-generator level: -5 dBm

Adjust the signal-generator level so that the power meter reads 0 dB +/- 0.2 dB

Determine the signal-generator level that gives –10 dBm at the splitter output. This level is required for the following measurement, “Checking Receiver Linearity”.

Read off the power meter display and the ZVB marker values.

Level error = $L_{ZVB} – L_{PS}$

Checking the Input Linearity

Instrument:	Spectrum analyzer (see Chapter “Test Equipment“, Item1) Test cable (see Chapter “Test Equipment“, Item7) Calibration kit (see Chapter “Test Equipment“, Item4)
R&S®ZVB settings:	- [**Preset**] - [**Meas** : Wave Quantities: a1 Src Port 1] [**Meas** : Wave Quantities: a2 Src Port 2] [**Meas** : Wave Quantities: a3 Src Port 3] [**Meas** : Wave Quantities: a4 Src Port 4] - [**Meas Bandwidth** : 10 Hz] - [**Marker**] - [**Sweep** : Sweep Type : CW Mode : CW Frequency : **{f_{GEN}*}**] - [**Sweep** : Single : **Restart**] * For measurement frequencies, see Performance Test Report {fGEN}
Test setup for reference measurement: Settings for the spectrum analyzer:	Connect the spectrum analyzer to port 1 (port 2 to port 4) - [**PRESET**] - [**AMPT** : REF LEVEL : 15 dBm - [**FREQ** : CENTER : f_{GEN}] - [**SPAN** : ZERO SPAN] - [**BW** : MANUAL RES BW : **10 Hz**] - [**MARKER** : DETECTOR : RMS] * For measurement frequencies, see Performance Test Report {fGEN}.
Reference measurement:	Set the ZVB and the spectrum analyzer to f_{GEN} Set the ZVB output power to -40 dBm and increase the power in 5dB steps up +10 dBm (+8 dBm) Read off the level displayed by the spectrum analyzer and by the ZVB. Reference offset $L_{offset} = L_{ZVB,REF} - L_{SA, REF}$
R&S®ZVB settings:	- [**Meas** : Ratios: b1/a1 Src Port 1] [**Meas** : Ratios: b2/a2 Src Port 2] [**Meas** : Ratios: b3/a3 Src Port 3] [**Meas** : Ratios: b4/a4 Src Port 4]
Test setup:	Connect a short male to port 1 (port 2 to port 4)
Measurement:	Set the ZVB output power to -40 dBm and increase the power in 5dB steps up to +10 dBm (+8 dBm) Read off the ratio displayed by the ZVB (L_{ZVB})
Calculation:	Input linearity error @ xx dB = $L_{ZVB,} - L_{offset}$

Checking the Input Noise Level

Test equipment	Calibration kit (see Chapter “Test Equipment“, Item4)
Test setup:	Connect the Match Male from the calibration kit to port 1 (port 2 to port 4)
R&S®ZVB settings:	- [**Preset**] - [**Meas** : Wave Quantities: b1 Src Port 1 (b2 Src Port 2, b3 Src Port 3, b4 Src Port 4)] - [**Power** : RF Off] - [**Meas Bandwidth** : 10 Hz] - [**Marker]** - [**Sweep** : Sweep Type : CW Mode : CW Frequency : **{f_{GEN}*}**] - Service Function 1.0.0.1.1 (see chapter 3 ‘Service Functions’, Service Level 2) - [**Measure** : Wave Quantities : More Wave Quantities… : Properties : Detector : **RMS**] - [**Sweep** : Single : **Restart**] * For measurement frequencies, see Performance Test Report {fGEN}.
Measurement:	Read off the noise level indicated by the markers on the DUT.

Checking the Matching (raw)

Instrument:	Network analyzer (see Chapter “Test Equipment“, Item3)
	Calibration kit (see Chapter “Test Equipment“, Item4)
	Test cable (see Chapter “Test Equipment“, Item7)
Preparation/ test setup:	Connect the test cable to the network analyzer and perform a 1-port calibration at the end of the cable.
	Connect the test cable to port 1 (port2 to port 4) on the R&S®ZVB.
R&S®ZVB settings:	- [**Preset**] - [**Power** : -40 dBm]
Measurement	Read off the network analyzer’s marker values (for marker frequencies see Performance Test Report)

Checking the Dynamic Range

Test equipment:
Calibration kit N
(see Chapter “Test Equipment“, Item4)

Test setup:
Connect Short Male to port1 and port 2 (port 3 and port 4)
(use Short Female with Through Male as a second Short Male)

R&S®ZVB settings:
- [**Preset**]
- [**Meas** : Ratios : b1/a2 Drive Port 2]
  [**Meas** : Ratios: b2/a1 Drive Port 1]
  [**Meas** : Ratios: b3/a4 Drive Port 4]
  [**Meas** : Ratios: b4/a3 Drive Port 3]
- [**Power** : 10 dBm]
- [**Meas Bandwidth** : 10 Hz]
- [**Marker**]
- [**Sweep** : Sweep Type : CW Mode : CW Frequency : **{f_{GEN}*}**]
- Service Function 1.0.0.1.1 (see chapter 3 "Service Functions", Service Level 2)
- [**Measure** : Wave Quantities : More Wave Quantities… : Properties : Detector : **RMS**]
- [**Sweep** : Single : **Restart**]

* For measurement frequencies, see Performance Test Report {fGEN}.

Measurement:
Read off marker value

Calculation:
Nominal dynamic range: ..... see Performance Test Report

Checking the Dynamic Range reduced due to Spurious

Test equipment:	Calibration kit N (see Chapter “Test Equipment“, Item4)
Test setup:	Connect Short Male to port1 and port 2 (port 3 and port 4) (use Short Female with Through Male as a second Short Male)
R&S®ZVB settings:	- [**Preset**] - [**Meas** : Ratios : b1/a2 Drive Port 2] [**Meas** : Ratios: b2/a1 Drive Port 1] [**Meas** : Ratios: b3/a4 Drive Port 4] [**Meas** : Ratios: b4/a3 Drive Port 3] - [**Start** : 16 MHz] - [**Number of Points** : 500] - [**Power** : 10 dBm] - [**Meas Bandwidth** : 1000 Hz] - [**Marker**] - [**Sweep** : Sweep Type : CW Mode : CW Frequency : **{f_{GEN}*}**] - Service Function 1.0.0.1.1 (see chapter 3 ‘Service Functions’, Service Level 2) - [**Measure** : Wave Quantities : More Wave Quantities… : Properties : Detector : **RMS**] - [**Sweep** : Single : **Restart**] * For measurement frequencies, see Performance Test Report {fGEN}.
Measurement:	Read off marker value
Calculation:	Nominal dynamic range: ..... see Performance Test Report

Checking the DC Measurement Inputs

Test equipment:	DC Power Supply NGSM 32/10 (see Chapter “Test Equipment“, Item9) Multimeter URE3 (see Chapter “Test Equipment“, Item10) DC cable (see Chapter “Test Equipment“, Item11)
Test setup:	Connect the Power Supply to the Input DC MEAS 1V (DC MEAS 10V) of the ZVB using the DC cable
R&S®ZVB settings:	- [**Preset**] For DC Meas 1 V: - [**Meas** : More : DC Inputs : DC Meas ±1 V] - [**Format** : Real] - [**Scale** : Scale/Div : .25 x1] - [**Marker**] For DC Meas 10 V: - [**Meas** : More : DC Inputs : DC Meas ±10 V] - [**Format** : Real] - [**Scale** : Scale/Div : 2.5 x1] - [**Marker**]
Measurement:	Set Power Supply to DC values U_{DC} using Multimeter URE (DC values see Performance Test Report) and connect it to pos. and neg. input Read off the DC level $U_{DC\ ZVB}$ indicated by the marker.
Calculation:	Deviation = U_{DC} - $U_{DC\ ZVB}$

Performance Test Report

Table 1-1: Performance Test Report

ROHDE & SCHWARZ	Performance Test Report	ZVAB	Version 30.09.04
Model (ZVB4/ZVB8) Item number: 1045. Serial number Tested by: Date: Signature:			

General: All Tables apply to port1; values for ports 2 to 4 are identical.

Parameter	**Covered on**	**Min. value**	**Actual value**	**Max. value**	**Unit**	**Measurement tolerance**
Frequency deviation @ 1 GHz **With Option ZVAB-B4**	Page 1.3	- 8000 - 100	_____	+ 8000 + 100	Hz	1 Hz

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Harmonics** **Source power +8dBm** **Freq. Harmonics**	Page 1.4				dBc	1 dB
50 MHz 100 MHz			_____	-20		
150 MHz			_____	-20		
50,001 MHz 100 MHz			_____	-20		
150 MHz			_____	-20		
100 MHz 200 MHz			_____	-20		
300 MHz			_____	-20		
200 MHz 400 MHz			_____	-20		
600 MHz			_____	-20		
500 MHz 1000 MHz			_____	-20		
1500 MHz			_____	-20		
750 MHz 1500 MHz			_____	-20		
2250 MHz			_____	-20		
1 GHz 2 GHz			_____	-20		
3 GHz			_____	-20		
1.5 GHz 3 GHz			_____	-20		
4.5 GHz			_____	-20		
2 GHz 4 GHz			_____	-20		
6 GHz			_____	-20		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Harmonics** **Source power +8 dBm** **Freq. Harmonics**	Page 1.4				dBc	1 dB
2.1 GHz 4.2 GHz			_____	-20		
6.3 GHz			_____	-20		
2.5 GHz 5.0 GHz			_____	-20		
3.0 GHz 6.0 GHz			_____	-20		
3.5 GHz 7 GHz			_____	-20		
ZVB8 only:						
7 GHz 14 GHz			_____	-20		
8 GHz 16 GHz			_____	-20		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Maximum output power**	Page 1.5				dBm	1 dB
Test frequency						
300 kHz		10	_____			
1 MHz		10	_____			
2 MHz		10	_____			
5 MHz		10	_____			
10 MHz		10	_____			
20 MHz		10	_____			
50 MHz		13	_____			
100 MHz		13	_____			
200 MHz		13	_____			
500 MHz		13	_____			
750 MHz		13	_____			
1 GHz		13	_____			
1.5 GHz		13	_____			
2 GHz		13	_____			
2.1 GHz		13	_____			
2.5 GHz		13	_____			
3 GHz		13	_____			
3.5 GHz		13	_____			
4 GHz		13	_____			
ZVB8 only:						
4.1 GHz		10	_____			
4.5 GHz		10	_____			
5 GHz		10	_____			
5.5 GHz		10	_____			
6 GHz		10	_____			
6.5 GHz		10	_____			
7 GHz		10	_____			
7.5 GHz		8	_____			
8 GHz		8	_____			

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Accuracy of output power -10 dBm**	Page 1.6				dB	0. dB
Test frequency						
300 kHz		– 3	_____	3		
1 MHz		– 3	_____	3		
2 MHz		– 3	_____	3		
5 MHz		– 3	_____	3		
10 MHz		– 3	_____	3		
20 MHz		– 3	_____	3		
50 MHz		– 2	_____	2		
100 MHz		– 2	_____	2		
200 MHz		– 2	_____	2		
500 MHz		– 2	_____	2		
750 MHz		– 2	_____	2		
1 GHz		– 2	_____	2		
1.5 GHz		– 2	_____	2		
2 GHz		– 2	_____	2		
2.1 GHz		– 2	_____	2		
2.5 GHz		– 2	_____	2		
3 GHz		– 2	_____	2		
3.5 GHz		– 2	_____	2		
4 GHz		– 2	_____	2		
ZVB8 only:						
4.1 GHz		– 2	_____	2		
4.5 GHz		– 2	_____	2		
5 GHz		– 2	_____	2		
5.5 GHz		– 2	_____	2		
6 GHz		– 2	_____	2		
6.5 GHz		– 2	_____	2		
7 GHz		– 2	_____	2		
7.5 GHz		– 2	_____	2		
8 GHz		– 2	_____	2		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port .	Page 1.7				dB	0.06 dB
Output linearity						
Reference –10 dBm						
Freq. Level						
50 MHz 20 dB		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		
500 MHz 20 dB		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		
1 GHz 20 dB		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		
2 GHz 20 dB		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Output linearity** **Reference –10 dBm**	Page 1.7				dB	0.06 dB
Freq. Level						
2.1 GHz 20 dB		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		
3 GHz 20 dB		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		
4 GHz 20 dB		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
ZVB8 only: ***Port .*** ***Output linearity*** ***Reference –10 dBm***	Page 1.7				dB	0.06 dB
Freq. *Level*						
4.1 GHz *20 dB*		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		
6 GHz *20 dB*		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		
8 GHz *18 dB*		-2	_____	2		
15 dB		-2	_____	2		
10 dB		-2	_____	2		
5 dB		-2	_____	2		
-5 dB		-2	_____	2		
-10 dB		-2	_____	2		
-15 dB		-2	_____	2		
-20 dB		-2	_____	2		
-25 dB		-2	_____	2		
-30 dB		-2	_____	2		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Power measurement uncertainty**	Page 1.8				dB	0.2 dB
Test frequency						
300 kHz		- 1	_____	1		
1 MHz		- 1	_____	1		
2 MHz		- 1	_____	1		
5 MHz		- 1	_____	1		
10 MHz		- 1	_____	1		
20 MHz		- 1	_____	1		
50 MHz		- 1	_____	1		
100 MHz		- 1	_____	1		
200 MHz		- 1	_____	1		
500 MHz		- 1	_____	1		
750 MHz		- 1	_____	1		
1 GHz		- 1	_____	1		
1.5 GHz		- 1	_____	1		
2 GHz		- 1	_____	1		
2.1 GHz		- 1	_____	1		
2.5 GHz		- 1	_____	1		
3 GHz		- 1	_____	1		
3.5 GHz		- 1	_____	1		
4 GHz		- 1	_____	1		
ZVB8 only:						
4.1 GHz		- 1	_____	1		
4.5 GHz		- 1	_____	1		
5 GHz		- 1	_____	1		
5.5 GHz		- 1	_____	1		
6 GHz		- 1	_____	1		
6.5 GHz		- 1	_____	1		
7 GHz		- 1	_____	1		
7.5 GHz		- 1	_____	1		
8 GHz		- 1	_____	1		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Input linearity** **Reference –10 dBm**	Page 1.9				dB	0.06 dB
50 MHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		
500 MHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		
1 GHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		
2 GHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Input linearity** **Reference –10 dBm**	Page 1.9				dB	0.06 dB
4 GHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		
ZVB8 only:						
4.1 GHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		
6 GHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		
8 GHz 20 dB		-0.1	_____	0.1		
15 dB		-0.1	_____	0.1		
10 dB		-0.1	_____	0.1		
5 dB		-0.1	_____	0.1		
-5 dB		-0.1	_____	0.1		
-10 dB		-0.1	_____	0.1		
-15 dB		-0.1	_____	0.1		
-20 dB		-0.1	_____	0.1		
-25 dB		-0.1	_____	0.1		
-30 dB		-0.1	_____	0.1		

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Input noise level**	Page 1.10				dBm	
Test frequency						
423.450 kHz			_____	–70		_
1.12345 MHz			_____	–70		_
2.12345 MHz			_____	–70		_
5.12345 MHz			_____	–70		_
10.12345 MHz			_____	–70		_
20.12345 MHz			_____	–70		_
50.12345 MHz			_____	–70		_
100.12345 MHz			_____	–110		_
200.12345 MHz			_____	–110		_
50012345 MHz			_____	–110		_
75012345 MHz			_____	–110		_
1000.12345 MHz			_____	–110		_
1500.12345 MHz			_____	–110		_
2000.12345 MHz			_____	–110		_
2100.12345 MHz			_____	–110		_
2500.12345 MHz			_____	–110		_
3000.12345 MHz			_____	–110		_
3500.12345 MHz			_____	–110		_
3999.87655 MHz			_____	–110		_
ZVB8 only:						
4100.12345 MHz			_____	–105		_
4500.12345 MHz			_____	–105		_
5000.12345 MHz			_____	–105		_
5050.12345 MHz			_____	–105		_
5700.12345 MHz			_____	–105		_
6000.12345 MHz			_____	–105		_
6350.12345 MHz			_____	–105		_
6360.12345 MHz			_____	–105		_
7000.12345 MHz			_____	–105		_
7500.12345 MHz			_____	–105		_
7999.87655 MHz			_____	–105		_

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . Matching (raw)	Page 1.11				dB	1 dB
Test frequency						
300 kHz		16	_____			
1 MHz		16	_____			
2 MHz		16	_____			
5 MHz		16	_____			
10 MHz		16	_____			
20 MHz		16	_____			
50 MHz		16	_____			
100 MHz		16	_____			
200 MHz		16	_____			
500 MHz		16	_____			
750 MHz		16	_____			
1 GHz		16	_____			
1.5 GHz		16	_____			
2 GHz		16	_____			
2.5 GHz		16	_____			
3 GHz		16	_____			
3.5 GHz		16	_____			
4 GHz		16	_____			
ZVB8 only:						
4.5 GHz		16	_____			
5 GHz		16	_____			
5.5 GHz		16	_____			
6 GHz		16	_____			
6.5 GHz		16	_____			
7 GHz		16	_____			
7.5 GHz		14	_____			
8 GHz		14	_____			

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Dynamic range**	Page 1.12				dB	
Test frequency						
300 kHz		80	_____			_
1 MHz		80	_____			_
2 MHz		80	_____			_
5 MHz		80	_____			_
10 MHz		80	_____			_
20 MHz		80	_____			_
50 MHz		120	_____			_
100 MHz		120	_____			_
200 MHz		120	_____			_
500 MHz		123	_____			_
750 MHz		123	_____			_
1 GHz		123	_____			_
1.5 GHz		123	_____			_
2 GHz		123	_____			_
2.1 GHz		123	_____			_
2.5 GHz		123	_____			_
3 GHz		123	_____			_
3.5 GHz		123	_____			_
4 GHz		123	_____			_
ZVB8 only:						
4.1 GHz		120	_____			_
4.5 GHz		120	_____			_
5 GHz		120	_____			_
5.05 GHz		120	_____			_
5.7 GHz		120	_____			_
6 GHz		120	_____			_
6.35 GHz		120	_____			_
6.36 GHz		120	_____			_
7 GHz		120	_____			_
7.5 GHz		115	_____			_
8 GHz		108	_____			_

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Port . **Dynamic range reduced due to spurious**	Page 1.13				dB	
Test frequency						
16 MHz		50	_____			_
32 MHz		50	_____			_
48 MHz		50	_____			_
96 MHz		90	_____			_
192 MHz		90	_____			_
496 MHz		90	_____			_
752 MHz		93	_____			_
1008 MHz		93	_____			_
1504 MHz		93	_____			_
2000 MHz		93	_____			_
2096 MHz		93	_____			_
2496 MHz		93	_____			_
3008 MHz		93	_____			_
3504 MHz		93	_____			_
4000 MHz		93	_____			_
ZVB8 only:						
4096 MHz		90	_____			_
4496 MHz		90	_____			_
5008 MHz		90	_____			_
5056 MHz		90	_____			_
5696 MHz		90	_____			_
6000 MHz		90	_____			_
6352 MHz		90	_____			_
6368 MHz		90	_____			_
6992 MHz		90	_____			_
7488 MHz		85	_____			_
8000 MHz		78	_____			_

Parameter	Covered on	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Accuracy **DC meas 1 V** **Pos. Input** -1000 m V -300 mV -10 mV 10 mV 300 mV 1000 m V **Neg. Input** -1000 m V -300 mV -10 mV 10 mV 300 mV 1000 m V	Page 1.14	 - 27.5 - 10.0 - 2.75 - 2.75 - 10.0 - 27.5 - 27.5 - 10.0 - 2.75 - 2.75 - 10.0 - 27.5	 _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	 + 27.5 + 10.0 + 2.75 + 2.75 + 10.0 + 27.5 + 27.5 + 10.0 + 2.75 + 2.75 + 10.0 + 27.5	mV	1 mV
Accuracy **DC meas 10 V** **Pos. Input** **-**10.0 V -3.0 V -0.1 V 0.1 V 3.0 V 10.0 V **Neg. Input** **-**10.0 V -3.0 V -0.1 V 0.1 V 3.0 V 10.0 V	Page 1.14	 - 0.275 - 0.10 - 0.0275 - 0.0275 - 0.10 - 0.275 - 0.275 - 0.10 - 0.0275 - 0.0275 - 0.10 - 0.275	 _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	 + 0.275 + 0.10 + 0.0275 + 0.0275 + 0.10 + 0.275 + 0.275 + 0.10 + 0.0275 + 0.0275 + 0.10 + 0.275	V	0.01 V

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2 Alignment

This chapter describes the alignment of the frequency reference and the recording of correction data after a board has been replaced.

The following manual alignments or corrections can be performed on the ZVB:

- Alignment of the 10-MHz reference oscillator which determines the frequency accuracy of the ZVB
- Recording the correction values for the generators and the receivers which determine the measurement accuracy of the ZVB's absolute values.

By performing the alignment and recording the correction values, it is possible to ensure that the ZVB is meeting its specifications by correcting any deviations.

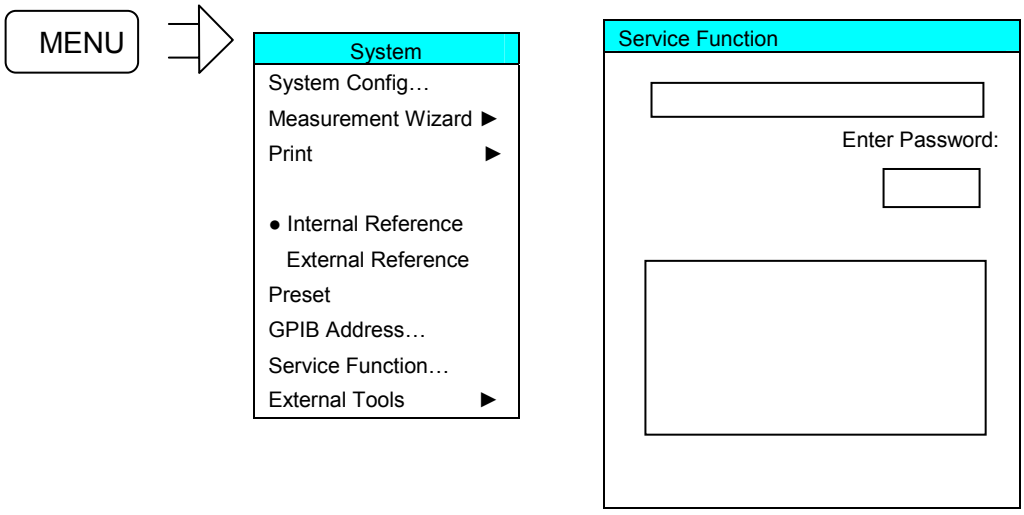
The alignments must be performed within an ambient temperature range of +22 °C to +24 °C after the appropriate warm-up time.

The ZVB meets its specs and is ready for operation when the alignment has been performed and/or correction values have been recorded and a system error calibration carried out.

Service Menu

Access to the board-alignment functions is password-protected to prevent unintentional changes to settings.

Entering the password



- Enter password 30473035.

Caution
The alignment shall be performed only by appropriately trained personnel because any changes made have a profound effect on the measurement accuracy of the instrument

Manual Alignment and Recording Correction Values

In the sequel, the test equipment and the instrument preparations required to manually align the ZVB and each of the alignments are described.

Preliminary remarks

The analyzer must be allowed to warm up for at least 30 minutes before alignment. This is the only way of ensuring that the guaranteed data are met.

Test Equipment

Table 2-1 Test equipment for manually aligning the ZVB

Item	Type of equipment	Recommended specifications	Recommended model	R&S Order No.	Application
1	Frequency counter	Error <1x10^{-9}, frequency range to 10 MHz	Advantest R5361B with Option 23		Frequency accuracy of the reference oscillator
2	Signal generator	300 kHz to 8 GHz	SML01 SMR20	1090.3000.11 1104.0002.20	Recording correction values
3	Power meter	300 kHz to 8 GHz	NRVD	0857.8008.02	Recording correction values
4	Power sensor	300 kHz to 8 GHz	NRV-Z51	0857.9004.02	Recording correction values
5	Power divider	DC to 8 GHz	Weinschel Mod. 5628	1109.0617.00	Recording correction values
6	PC	PC with IEC/IEEE-bus interface and. ZVAB-Service program			Recording correction values
7	Power supply	2x 0 to 10 V			Aligning the DC inputs
8	DC meter		URE	0350.5315.02	Aligning the DC inputs
9	Calibration kit	N calibration kit	ZV-Z21	1085.7099.02	Recording correction values
10	Test cable	Test cable N (m) to N (m).	ZV-Z11	1085.6505.03	Recording correction values
14	Conn. Cables for DC Inputs	4-pin mini-DIN plug	ZV-Z71	1164.1005.02	Aligning the DC inputs

Aligning the Frequency Accuracy

Test equipment	Frequency counter (section "Test Equipment", item 1): Error <$1x10^{-9}$ Frequency range to 10 MHz
Test setup:	Connect the frequency counter to the 10-MHz reference output at the rear of the ZVB.
ZVB settings:	Select internal reference MENU : System: Reference Internal
Frequency counter settings:	Set the necessary resolution: 0.1 Hz
Note:	*Before the following measurement is performed, the ZVB must have been switched on for at least 30 minutes to give the reference oscillator time to warm up.*
Measurement:	Measure the frequency with the frequency counter: Nominal frequency: Model **without** OCXO (Option B4) 10 MHz ± 1 Hz Model **with** OCXO (Option B4) 10 MHz ± 0.3 Hz

Alignment without Option ZVAB-B4:

- Enter Service Function 2.1.1.6.209.0x000**000**
- Read off the frequency-counter display, e.g. 10.000050 MHz.
- Change the **right-hand segment** (corresponding to bit 0 to bit 11) of the data word - e.g. to 000**400** - instead of 000**000**.
- Read off the frequency counter display again, e.g. 10.000010 MHz.
- Change the left-hand segment of the data word, until the counter indicates precisely 10.000000 MHz.

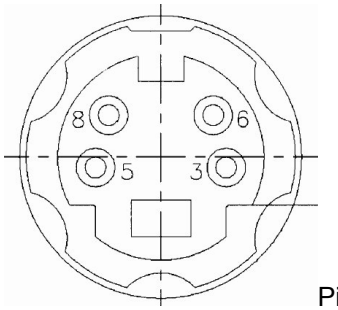
Alignment with Option ZVAB-B4:

- Enter Service Function 2.1.1.6.209.0x**800**000.
- Read off the frequency-counter display, e.g. 10.000005 MHz.
- Change the **left-hand segment** (corresponding to bit 12 to bit 23) of the data word - e.g. to **400**000 - instead of **800**000.
- Read off the frequency-counter display again, e.g. 10.000001 MHz.
- Change the left-hand segment of the data word, until the counter indicates precisely 10.000000 MHz.

Aligning the DC Inputs

At the outset, ensure that the correction parameters "Multiplier" M and "Offset" F have been preset to M=1 and F=0 for both inputs. This can be done using the Service Functions 3.1.2.5 and 3.1.2.2 which are described below under ***Service Functions***.

Test equipment:	Power supply 2 x 0 to 10 V DC meter (URE)	
Test setup:	DC Meas ± 1 V	DC Meas ± 10 V
	Connect DC voltage + 1 V……pin 6, pin 3 (Gnd) - 1 V……pin 8, pin 5 (Gnd)	Connect DC voltage: + 10 V……pin 6, pin 3 (Gnd) - 10 V……pin 8, pin 5 (Gnd)
	Check voltages with the URE and correct if necessary.	
ZVB settings:	**Measure :** DC Inputs : DC Meas ± 1V	**Measure :** DC Inputs: DC Meas ± 10V
Measurement	Read off the voltages displayed by the ZVB: V1 = positive voltage V2 = negative voltage	
Calculating the corrections: M -> scaling factor F -> offset	M = (V1-V2)/2 F = (V1+V2)/(V1-V2)	M = (V1-V2)/20 F = 10x (V1+V2)/(V1-V2)



Pin assignment for DC MEAS connector

The values that have been obtained in this way are now written to the hard disk using the Service Functions described below and then transferred to the EEprom of network controller1.

Example illustrating DC Meas 1 V:

When +1 V is applied, V 1 = 1.023 V is displayed by the ZVB; when -1 V is applied, V2 = -1.011 V is displayed. The results of the calculation are M = 1.017 and F = 0.0059. The following entries are, therefore, made:

- Select Service Level 2 (see Service Functions).
- Set Service Functions (Writing to the hard disk)

  3.1.2.5.dc_meas_1V.DcMeasMultiplier.1.017
  3.1.2.5.dc_meas_1V.DcMeasOffset.0.0059

etc. for the second measurement input.

- Set Service Function (Writing to the EProm)

  3.1.2.2

When correction value programming for the two DC voltage measurement inputs has been completed, end the NWA application and restart.
Check the alignment by applying the four voltages +1 V, -1 V, +10 V and -10 V and, as a further check, 0 V.

Reading the previous DC values:

- Select **Read** in the Service Function Menu
- Set Service Functions:

  3.1.2.5.dc_meas_1V.DcMeasMultiplier
  3.1.2.5.dc_meas_1V.DcMeasOffset

  3.1.2.5.dc_meas_10V.DcMeasMultiplier
  3.1.2.5.dc_meas_10V.DcMeasOffset

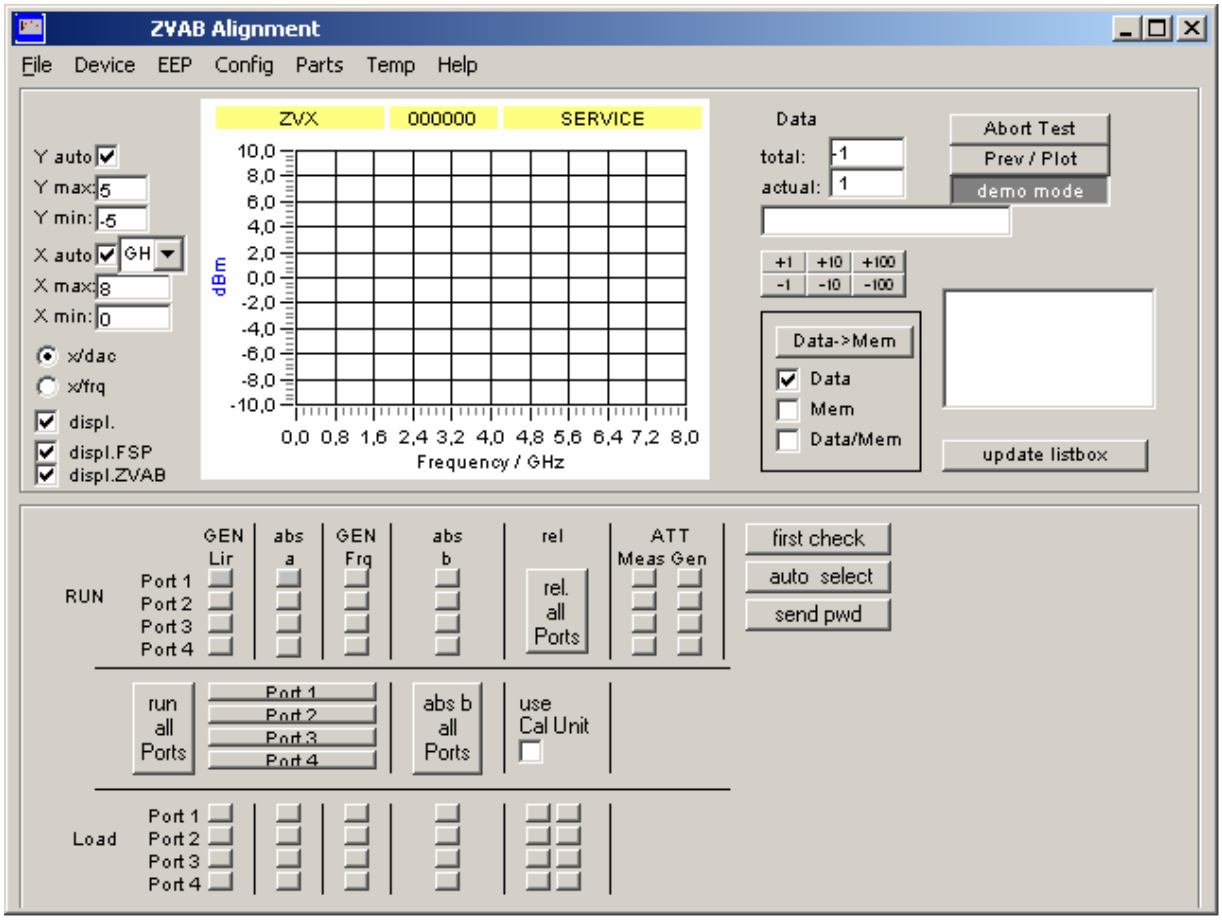
Correction Value Recording

Required test equipment (see Table 2-1):

- PC with ZVAB-Service program
- Power meter with power sensor
- Signal generator

Connect the PC, ZVB, power meter and signal generator via the IEC/IEEE-bus interface.

Start the **ZVAB-Service** program.



Generator and reference-channel absolute measurements

Test setup:	NRV-Z51 power sensor to port1	
		Buttons in the RUN section:
Measurement	Generator linearity	GEN Lin
	Reference channel absolute	abs a
	Generator frequency response	GEN Frq

Measurements are then performed in the same way on the remaining ports.

If all three correction values for the generator side of a port are to be recorded, click on the appropriate bar:

Port 1

If two NRVDs and four NRV-Z51 sensors are used (for 2-port models, one NRVD with two sensors), measurements on all ports can be made simultaneously.

run all Ports

Meas-channel absolute measurements

Test setup:	Connect generator (SMP/SMR) via power splitter to port1. Screw the NRV-Z51 to the second power-splitter output.	
		Buttons in the RUN section:
Measurement:	Wave quantity b1	abs a

Now, perform the measurement in the same way on the remaining ports.

The measurement can be performed simultaneously on all ports using a setup comprising an LO divider, four power splitters, two NRVDs and four NRV-Z51 sensors (for 2-port models: two power splitters and one NRVD with two sensors).

REF and MEAS channel relative measurement (a and b wave)

Test setup:	Follow the instructions on the screen (screw SHORT to portx or connect test cable between two ports)	
Measurement:	Wave ratio b1/ a1	rel all Ports

Specific measurement results can be displayed as a graph by clicking on the appropriate button in the **Load** section. This means that a check can be made at a later date. Spurious measurements (outliers) can then be detected.

The ZVAB-Service program automatically writes the correction data to the Eprom.

Factory System Error Calibration

A complete factory N-port system-error calibration is performed on all the network analyzer's measurement ports. This involves directly connecting the O, S and M calibration standards to each port and then connecting the ports together in pairs using a cable as a T standard. All port pairs must be considered. If the analyzer has four ports, this means that there are six ways of connecting the ports together in pairs, i.e. port pairs 1-2, 1-3, 1-4 then 2-3, 2-4 and finally 3-4. The number of connection pairs for a 3-port instrument goes down to three and there is only one way of pairing off the ports of 2-port analyzer.

The TOSM method is used for calibration. The procedure is illustrated using a 4-port instrument, but the principle is the same for 2-port and 3-port instruments:

PRESET

SWEEP : NUMBER OF POINTS : 1000

POWER BW AVG : MEAS BANDWIDTH : 100 HZ

CAL : START CAL : FOUR PORT P1 P2 P3 P4

The SELECT PORT CONNECTOR(S) dialog, which can be skipped with NEXT, is displayed. The MEASURE STANDARDS dialog then appears. The "Standards to be measured" list then shows the calibration standards. When the calibration standards have been connected, the calibration measurement is started by clicking the appropriate button.
Finally, click the APPLY CAL button.

When you click on the CAL button again, CAL MANAGER appears with a dialog in which the "Channel Cal" calibration must be copied to the CAL POOL under the name "Factory". Then, the Windows Explorer is used to copy the file Factory.cal which is now in the directory C:\Rohde&Schwarz\Nwa\Calibration\Data to the directory C:\Documents and Settings\All Users\Application Data\Rohde&Schwarz\Nwa\Data\Eeprom\Mbt.
Service Function 3.5.0.2 then uses this file to program the MB-EEprom. This can take about a minute.

Restart the network analyzer to check that it is functioning properly.

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3 Repairs

This chapter describes the ZVB's construction, simple procedures for repairs, troubleshooting and board replacement. A selftest which checks the diagnostic voltages of the board and indicates limit violations is provided for troubleshooting and diagnostics.

Chapter 4 of this service manual describes the installation of options and firmware updates.

Instrument Construction and Function Description

The ZVB's construction is shown schematically by the following block diagrams and the exploded drawings (see also Chapter 5).

The block diagram will help clarify the following function description of the instrument.

Block Diagram

See also Chapter 5, Annex and Drawings.

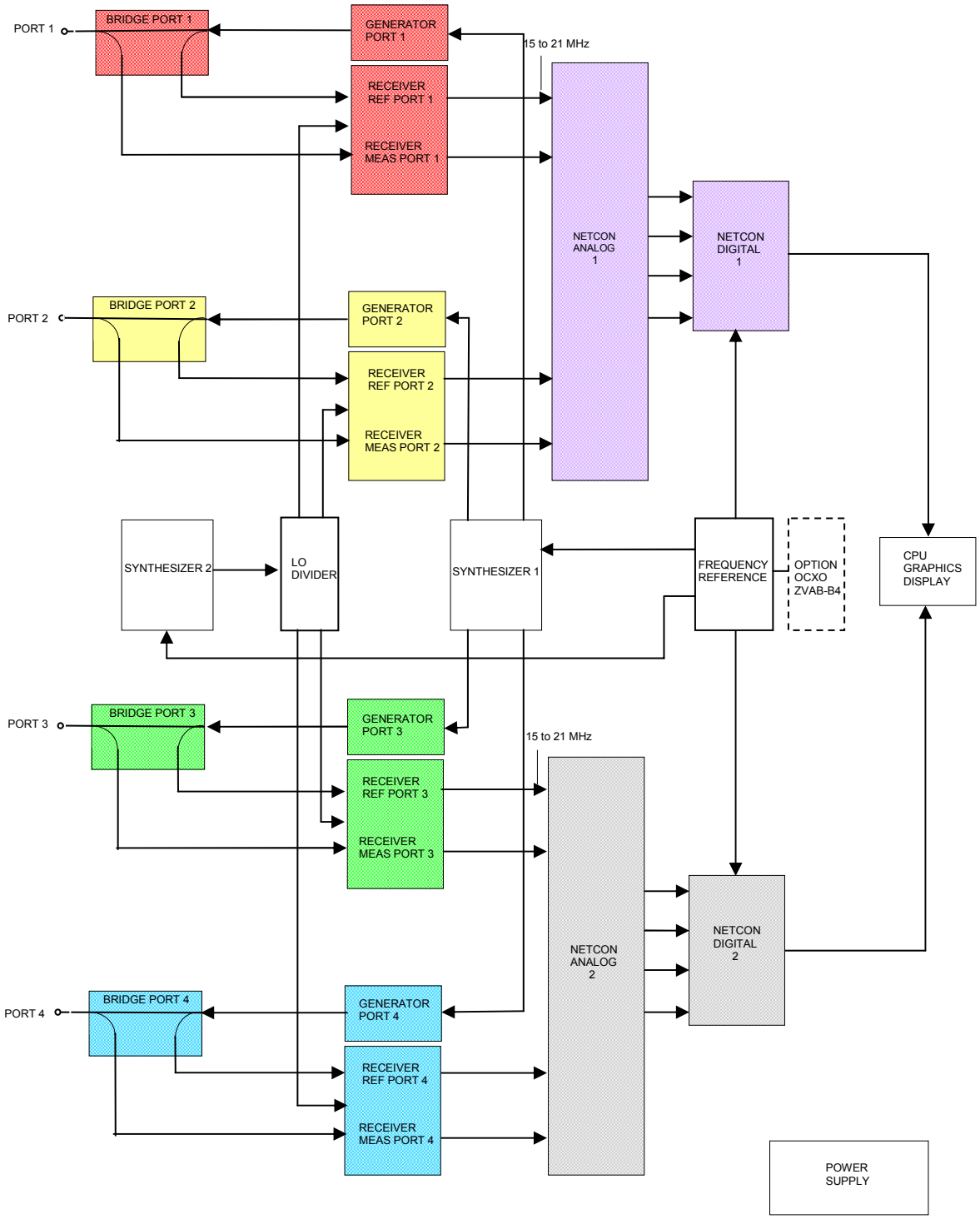


Fig. 3-1 Block diagram of ZVB4/8 4 ports

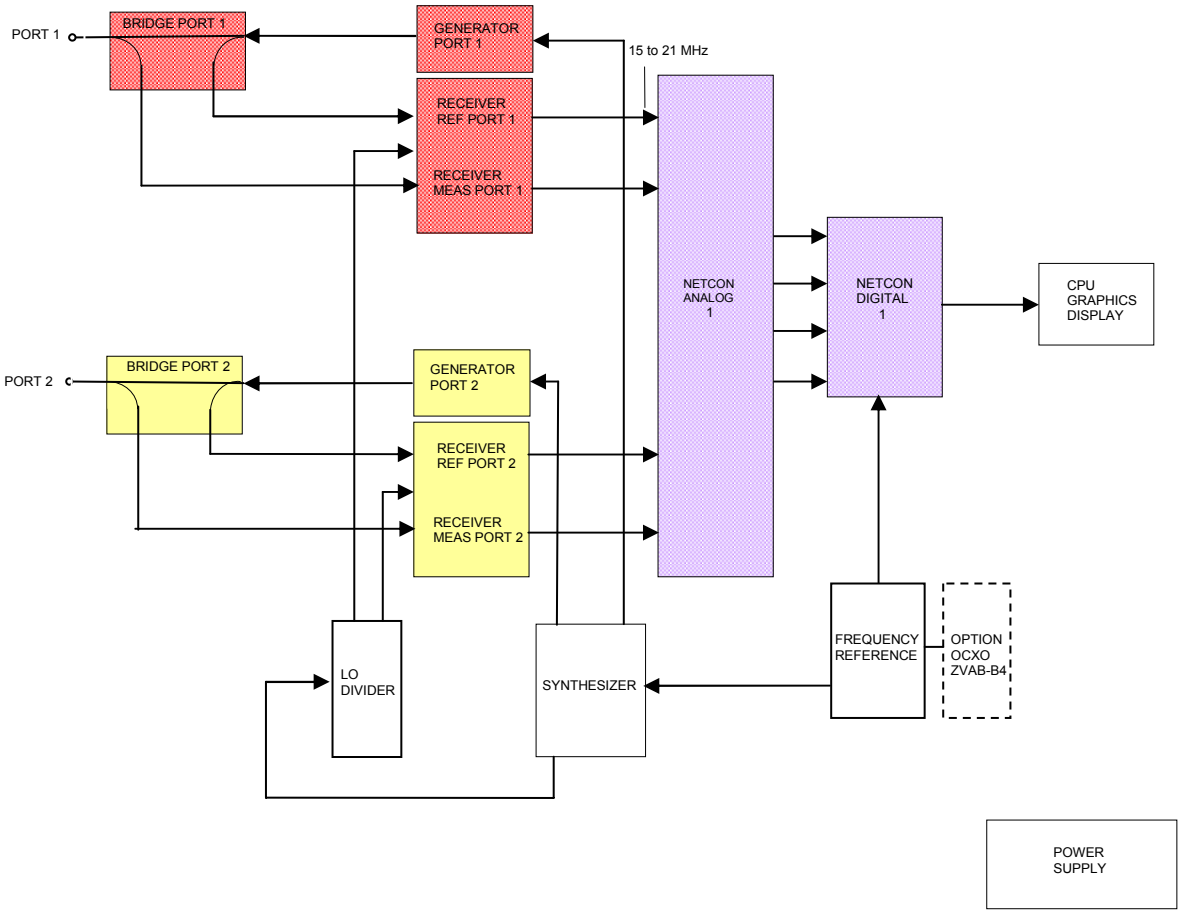


Fig. 3-2 Block diagram of the ZVB4/8 2 ports

Description of the Block Diagram

The block diagram shown in Fig. 3-1 applies to the ZVB4 4 ports and the ZVB8 4 ports, Fig. 3-2 to the ZVB4 2 ports and the ZVB8 2 ports
The ZVB is a vector network analyzer covering 300 kHz to 4 GHz (ZVB4) or 300 kHz to 8 GHz (ZVB8). The models ZVB4 and ZVB8 are available in a 2-port or in a 4-port version. The signal generator (including the LO signal for the receiver) is implemented, according to the number of ports, using one or two synthesizer boards. The signal processing path comprises a reflectometer board, an IF board, a network controller and a processor section, comprising a Pentium-PC, I/O interface and graphics board. The instrument can be expanded to handle future digital and analog requirements by retrofitting options.

The generator signal (300 kHz to 4 GHz or 300 kHz to 8 GHz) is generated on synthesizer board 1, amplified in the generator section of the reflectometer board and then passes via the bridge to the port (port1 to 4) and so to the DUT. The reference signal (Ref1 to 4) is split in the bridge and fed to the receiver section (Receiver Ref1 to 4) on the reflectometer board.

The signal reflected or transmitted by the DUT (Meas1 to 4) is fed to the port, coupled out in the bridge unit and fed to the receiver section (Receiver Meas 1 to 4) on the reflectometer board.

The internal reference frequencies are generated on the frequency reference board the128-MHz reference frequency is generated there as an internal device reference.

The following sections describe the various boards in greater detail.

Reflectometer

A reflectometer board comprising a **bridge unit**, a **generator section (Generator)** and a **receiver section (Receiver)** are incorporated in every port (Port1 to 4). These three components are screwed together to form a compact unit.

Bridge unit

The bridge unit is a resistive coupler which is used to separate the signal going to the DUT from the signal coming from the DUT. The reference signal (= measure of the signal to the DUT) is also obtained from the bridge unit. The reference signal provides a reference for relative measurements.

Generator

The generator contains three broadband amplifier stages which boost the signal coming from the synthesizer to a level > 20 dBm. Limiter diodes protect the output stage from ESDs. A total of three adjustable attenuators form the setting element to keep the output level constant and to attenuate it electronically.

Receiver

The receiver section has two channels (measurement channel and reference channel) and uses single conversion. Every channel contains a buffer amplifier, for each of the frequency ranges 300 kHz to 4 GHz and 4 GHz to 8 GHz (ZVB8 only) a mixer with LO amplifiers and an IF amplifier. In the mixer, the input signal is directly converted to the IF range, approx 15 to 21 MHz. The inputs are protected by limiter diodes.

Network controller

The network controller comprises two boards, the **netcon analog** and the **netcon digital** which are screwed together to form a single unit. The boards are four-channel – in other words, one network controller is required for two ports (2 measurement channels + 2 reference channels). After A/D conversion, the network controller performs high-speed digital processing on the IF signals from the reflectometers.

Netcon analog

The netcon analog board is a 4-channel IF amplifier with selectable amplifier stages for the AGC (Automatic Gain Control) and one 14-bit A/D converter per channel. The transmission bandwidth is 13 MHz to 26 MHz. A dither generator is used to linearize the A/D-converter characteristic. The board also accommodates a temperature sensor which is only used for general temperature checks and not to correct measurement results.

Netcon digital

The netcon digital board further processes the digitized raw data from the netcon analog board. Speed considerations mean that digital signal processing is performed in an ASIC which has a clock frequency of 80 MHz.
The main functions on the board are:
Mixing to the baseband
Filter with bandwidths from 1 Hz to 100 kHz in 1/3/5 sequence
Detectors, PCI interface
Setting and routine control
The current measured value (sample), the average, the RMS and the Max can be recorded simultaneously and passed on to the main processor via the PCI-bus. The connection to the PCI-bus is made via the PCINT-FPGA. A further FPGA "FCON" contains the central section of the procedure control from measurement point to measurement point and the trigger control. This FPGA is configured by the main processor.
The A/D converters for ext. DC measurements are also accommodated on the netcon digital board.

Frequency reference

The **frequency reference** board generates the highly stable and spectrally pure clock signals, required by the ZVB, which can be phase-locked to external synchronisation signals.

The various function blocks are:

The 128 MHz VCXO (voltage-controlled crystal oscillator) which generates a stable, low-noise reference frequency for the synthesisers, for the A/D converters and for digital signal processing.

The PLL for phase locking the VCXO signal to an external reference signal or to a 10 MHz OCXO (oven-controlled crystal oscillator) option.

The VCO and PLL which generate the clock for the netcon digital board (locked to the 128 MHz VCXO). The frequency can be varied from 75 MHz to 86 MHz. The VCO frequency is programmable;-the nominal clock frequency is 80 MHz.

A reference frequency of 10 MHz is standard. If the OCXO is fitted, the OCXO signal is brought out at the ZVAB's rear panel (10 MHz REF) so that further instruments can be synchronised.
The free-running VCXO (no OCXO, no external reference) can be calibrated using a pre-tune voltage.

If no OCXO is fitted, a 10 MHz signal is still output at the instrument's rear panel. It is derived from the 80 MHz signal which is divided down to 10 MHz by the divider for the OCXO.

The following are also accommodated on the board:
- A control-CPLD to act as an interface between the serial bus and the board,
- Register for storing divider values,
- D/A converter for pre-tuning the VCXO and OCXO
- An on-board EEPROM for storing board-specific data
- Selftest facilities

OCXO reference (option B4)

As an option, the frequency reference board can be fitted to an OCXO (oven-controlled crystal oscillator) which considerably improves the phase noise of the reference signal close to the carrier, short-term stability and long-term stability.

Synthesizers

The source signals for the generator signals associated with each port and the LO signal for the mixers on the receiver boards for each of the reflectometers are generated on the synthesizer board. A maximum of four individual synthesizers can be accommodated on a synthesizer board.

In all, there are three different synthesizer- variants:

Model 02: Fitted with four synthesizers
Model 03: Fitted with one synthesizer
Model 04: Fitted with three synthesizers

These synthesizer models are incorporated as follows in the various ZVB models:

	Sy model 02	**Sy model 03**	**Sy model 04**
ZVB4 2 ports	--------	--------	2xsource, 1xLO
ZVB8 2 ports	--------	--------	2xsource, 1xLO
ZVB4 4 ports	4xsource	1xLO	--------
ZVB8 4 ports	4xsource	1xLO	--------

LO divider

The LO signal from the synthesiser is distributed via the LO-divider board between the receiver boards associated with the reflectometers that have been installed. A maximum of four reflectometers can be supplied with the LO signal in this way. The divider comprises a resistive power divider and a buffer amplifier in each of the four output branches. The buffer amplifiers are used to compensate for the power divider loss and to provide decoupling between the reflectometers (crosstalk).

Front unit

The front unit comprises a mounting plate on which the LCD, the flexible switch board and key pad, and the tachogenerator are accommodated.
The front module controller is mounted in the controller tray in the instrument frame.

LC display

All results and setting information the user requires is displayed on the colour LCD.
The resolution of the LCD is 800 x 600 pixels (SVGA).
The display has an integral cold-cathode tube to provide illumination. The high voltage that is required is provided by a dedicated DC/AC converter. The converter is mounted on the mounting plate next to the display and connected to both the display and the controller board via a cable.

Keyboard

The keyboard comprises a flexible switch board and a key pad. They make contact whenever a rubber key is pressed. The two LEDs for the status display associated with the Standby/On key (yellow for standby/green for on) are also accommodated on the key pad.
Key detection and LED control are performed via a foil cable connection on the controller board. They are controlled by means of a matrix method implemented by a special microprocessor on the controller board; the two LEDs are controlled accordingly. When the instrument is turned off at the mains switch, the microprocessor saves the status of the Standby/On key.

Front module controller

The front module controller accommodates all the components that are required on one board - for example, the processor, memory chips (SIMMs), I/O chips (ISA bus), the lithium battery, IEC/IEEE bus controller, two serial interfaces (COM1/2), a parallel interface (LPT), LCD graphics controller, external VGA-monitor graphics interface (Monitor) and a connector for an external keyboard (keyboard PS/2). Also integrated on the controller board are a floppy controller for an external disk drive and an IDE hard-drive controller.
In the case of the FMR6, the LAN interface is also integrated on the controller board.

Hard disk

The hard disk is screwed to the rear of the tray for the front module controller with a holder and connected to the board with a flat cable.

Power supply

The power supply produces all the voltages required to power the ZVB. It can be turned off with a switch on the instrument's rear panel.
The power supply is a primary-switched power supply with power factor correction (PFC) and standby circuit (+12 V standby).

On the secondary side, it outputs DC voltages (+3.4 V, +5.2 V, +6.5 V, +8.25 V, +12.25 V, +12 V standby, -12.25 V).

The control signal RS_PS_ON which is controlled by the front module controller (via the *STANDBY/ON* key at the front of the instrument frame), activates the power supply. In the standby mode, the power supply generates only the 12-V standby voltage to supply a crystal oven and the STANDBY status display on the front panel.

The secondary voltages are open-proof and short-proof to ground and mutually open-proof and short-proof.
A circuit that prevents overheating is also provided. Overheating is indicated to the front module controller via a status signal (*OT*).

Motherboard

The motherboard supplies power to the boards and connects them to the control and data buses. A number of RF connections are also routed via the motherboard.

As well as straight connections, a number of circuits are accommodated on the motherboard:

Motherboard controller (MBCON)
28 V supply
Preamplifier for the DC measurement inputs
Supply voltage fuses
Rear panel interfaces
Fan control

The **MBCON** unit acts as an FSU bus-slave:

- to drive the LEDs (instrument front-panel)
- to drive the fan in five stages
- for two temperature sensors on the motherboard
- for an SPI-EEPROM on the motherboard
- Furthermore, the software can detect which device (ZVB4 or ZVB8) is present using the MBCON.

In addition to the voltages delivered by the power supply, +28 V is produced from +12 V on the motherboard by means of a boosting switching regulator. This voltage is required to operate the OCXO on the reference board when option B4 is fitted.

Each board has its own fuses for the supply voltages. These fuses are soldered into position on the board.

All external supply voltages (USB etc.) are protected to prevent shorts.

Board Replacement

The following section is a detailed description of board replacement. Chapter 5 tells you how to order spare parts. It contains a list of mechanical parts and their order numbers as well as drawings relating to board replacement.

Note: *The numbers in brackets are the item numbers in the list of mechanical parts in Chapter 5. In turn, these item numbers are the same as the item numbers in the drawings relating to board replacements (also in Chapter 5):*

1145.1010 sheet 1 (ZVB base instrument, Items 10-120, 260-470)

1145.1010 sheet 2, 3, 4 (ZVB base instrument, Items 125-188)

1145.1290 sheet 1 (ZVB base instrument, Items 500-799)

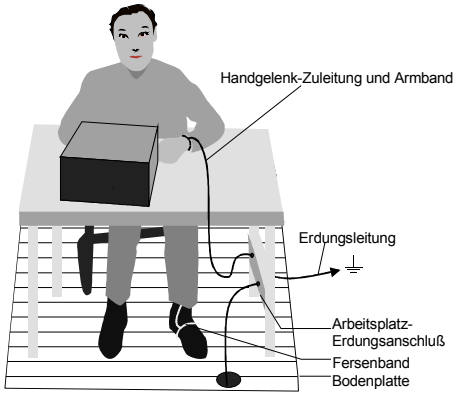
1145.1384 sheet 1 (ZVB display unit, Items 800-1060)

1145.1770 sheet 1 (ZVB Option B4)

The terms "left" and "right" always mean left and right as seen looking at the front of the instrument.

Caution

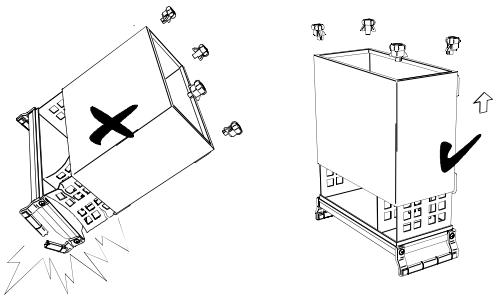
- Follow the additional safety instructions at the beginning of this manual.
- Disconnect the instrument from the mains before removing the enclosure.
- To prevent damage to electronic components, only open the instrument on an anti-static workbench.



The following methods can be used singly or in any combination to prevent damage from electrostatic discharges:

- Grounded bracelet

- Conducting floor surface and grounded ankle bracelet



- Before removing the rear-panel feet and pulling off the shell, stand the instrument on its front handles to prevent damage being caused by slipping.
- When replacing the shell, ensure that no cables are trapped or pulled out.

Board Overview

Table 3-1 Overview: Board Replacement

Board	**Measures taken after replacement**		
	Function test	**Alignment** **Recording of correction values** **System error calibration**	**Other**
Front module controller	Check error log		BIOS update
Lithium battery	Check error log		
Hard disk	Check error log	System error calibration	FW update
LC display / DC/AC converter	Functional test		
Flexible switch board (keyboard)/ key pad	Functional test		
Front cover			
Disk drive	Check the directory structure		
USB board	Test with mouse, keyboard		
Power supply	Check error log		
Fan			
Motherboard	Check error log	Alignment DC measurement inputs	
Reflectometer	Check error log	Record correction values System error calibration	
Input connector port 1 to 4	Check error log	System error calibration	
Bridge unit	Check error log	Record correction values System error calibration	
Reflectometer fan	Check error log		
Network controller	Check error log	Record correction values System error calibration Alignment DC measurement inputs	
Synthesizer	Check error log	Record correction values System error calibration	
LO divider	Check error log	Record correction values System error calibration	
Frequency reference	Check error log	Alignment Frequency accuracy	

Replacing Front Module Controller A90

(See Chapter 5, Spare Parts List, Item 580, and drawings 1145.1010, 1145.1290)

The front module controller is located behind the front unit.

Opening the instrument and removing the front unit

Turn off the instrument and disconnect from the mains.

Remove the 4 screws from the front handles (410), left and right, and take off the front handles.

Remove the countersunk screw (390) next to the display and pull off the front cover (300, 303, 306, 310, 313, 316, 320, 323) forwards

- Remove the 2 countersunk screws (610) in the top of the front frame and the 2 in the bottom.
- Remove the countersunk screws (176) (4), (177) (6), (178) (8)
- Pull out the front unit together with the keyboard and display (600, 601, 602, 603) forwards.

Caution

The cables to the front module controller are still connected.

Disconnect the cables to the LCD, the DC/AC illumination converter, the key pad (keyboard), the tachogenerator and, if necessary, the network connection on the front module controller.

N.B.: *When disconnecting cables, be especially careful with the cable to the keyboard. It is a foil cable and can only be removed when the locking device on the foil-cable connector is released.*

Removing the front module controller

Remove the 10 sems screws (590) in the front module controller and remove the front module controller in the following way (see Fig. 3-2):

Note: *The insertion force for the front module controller on the motherboard is very large.*
The slot in the bottom of the controller tray is provided to facilitate pushing out the front module controller forwards.
Using a blunt, flat tool, carefully edge the board forwards.

Caution

Do not insert the tool too far into the slot; only apply pressure to the board.
To ease the board out, apply light pressure to each and every slot.
Do not bend the board.

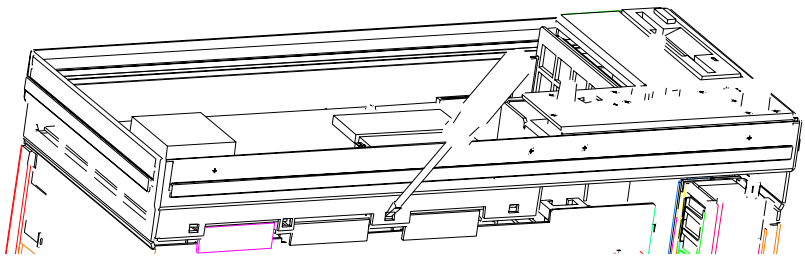


Fig. 3-2 Removing the front module controller

Installing the new front module controller and putting the instrument back together

Carefully insert the new front module controller on the motherboard and screw into place with 10 sems screws (590).

Caution: *With type FMR6 1091.2520.00, there is a danger of shorting between board components, tracks and screws (590). Use suitable insulation.*

Reconnect the cables to the front module controller, ensuring correct polarity.

Front Module Controller Typ FMR6

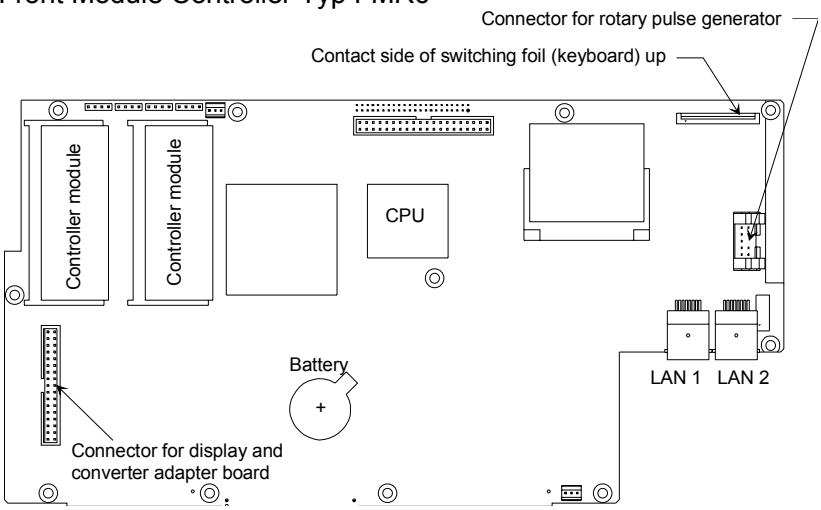


Fig. 3-3 Location of the edge connectors on the front module controller

- Re-insert the front unit into the instrument and secure to the front frame with 4 countersunk screws. (610).
- Fit the following countersunk screws (176) (4), (177) (6), (178) (8).

Caution

Avoid trapping cables and ensure cabling is tidy.

- Replace the front cover (300 to 323) and secure with the countersunk screw (390).
- Secure the 2 front handles (410) with the 4 screws.

Putting into operation

- Connect the mains cable and turn on at the power on switch. The instrument is now in standby mode.
- Insert the BIOS disk in the floppy disk drive.

- Turn on the instrument and wait for the first beep. Press the DEL key. The instrument should now display the setup menu.
  - Select Advanced BIOS Features
  - Enter
  - Select First Boot Device
  - Select Floppy using page up/down key
  - Press F10 key (save)
  - Enter
- BIOS has now been programmed.
  Do not turn the instrument off when the program is running.
- Follow the instructions on the screen.
- Select Service Level 2 (see Service Functions).
- Check the protocol file for errors:
  [INFO : Error Log]

Replacing the Lithium Battery on the Front Module Controller

(See Chapter 5, Spare Parts List, Item (582), and drawings 1145.1010, 1145.1290*)*

The lithium battery is located on the front module controller behind the front unit.

Caution

Do not expose lithium batteries to high temperatures or naked flames.

Keep batteries away from children.

If the battery is not replaced correctly, there is a risk of explosion. Only use R&S-type replacement batteries (See Chapter 5, Spare Parts List, Item 776 for type FMR6).

Lithium batteries are classified as special waste – only use designated containers for disposal.

Opening the instrument and removing the front unit

- Turn off the instrument and disconnect from the mains supply.
- Remove the 4 screws in the front handles (410), right and left, and take off the front handles
- Remove the countersunk screw (390) next to the display and pull off the front cover (300, 303, 306, 310, 313, 316, 320, 323) forwards.
- Remove the 2 countersunk screws (610)in the top of the front frame and the 2 in the bottom.
- Remove the countersunk screws (176) (4), (177) (6), (178) (8).
- Pull out forwards the front unit together with the keyboard and display (600, 601, 602, 603).

Caution

The cables to the front module controller are still connected.

Disconnect the cables to the LCD, the DC/AC illumination converter, the key pad (keyboard), the tachogenerator and, if necessary, the network connection on the front module controller.

Note: *When disconnecting cables, be especially careful with the cable to the keyboard. It is a foil cable and can only be removed when the locking device on the foil-cable connector is released.*

Removing the lithium battery

➢ Carefully lift up and pull out the battery.

Note: *Lithium battery 3.4 V (dia. 20 mm * 3 mm) R&S Item No. 0858.2049.00*

Front Module Controller Typ FMR6

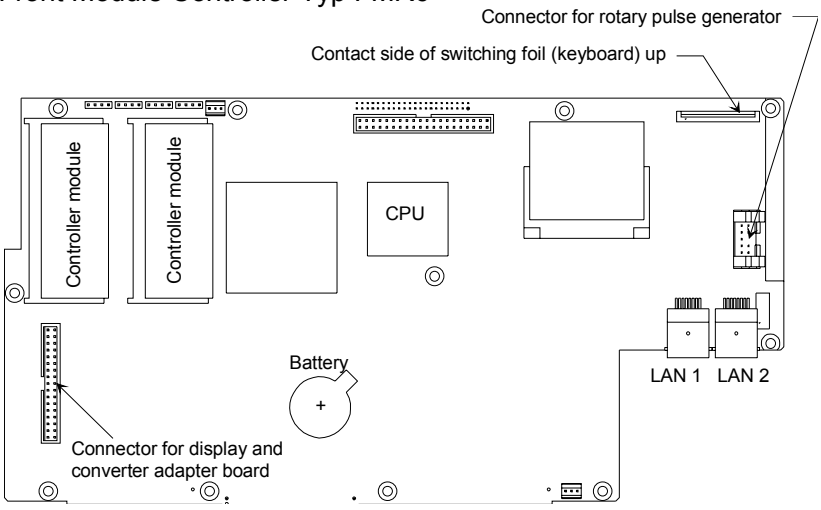


Fig. 3-4 Location of the lithium battery on the front module controller

Installing the new battery and reassembling the instrument

Caution

Never short circuit the battery

➢ Insert the battery under the spring in the holder.

N.B.: The positive pole of the battery (+) must be uppermost.

➢ Reinsert the front unit in the instrument and secure to the front frame with 4 countersunk screws (610).

➢ Refit the countersunk screws (176) (4), (177) (6), (178) (8).

Caution

Avoid trapping cables and ensure cabling is tidy.

➢ Replace the front cover (300, 303, 306, 310, 313, 316, 320, 323) and screw in the countersunk screw (390).

➢ Refit the 2 front handles (410) using 4 screws.

Putting into operation

- Connect the mains cable and turn on at the power switch. The instrument is now in standby mode.
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]

Replacing Hard Disk A60

(See Chapter 5, Spare Parts List, Item 710, and drawings 1145.1010 and 1145.1290)

The hard disk is located between the controller tray and the boards. The spare disk is delivered with the software pre-installed.

Before removal:

Whenever possible, back up the user data on an external data storage medium.

Opening the instrument and replacing the hard disk

Turn off the instrument, disconnect from the mains, unscrew the 4 rear-panel feet (460) and pull off the enclosure (400) backwards

- Lift off the instrument cover (296) at the top after undoing the 23 (2 ports) or. 28 (4 ports) countersunk screws (298).
- Disconnect the flat cable (715) at the hard disk drive.

  Note: *Do not pull or push on the flat cable – instead, carefully lever out the connector strip with a small screwdriver.*
- Remove the 2 countersunk screws (725) in the hard disk holder (720).
- Remove the hard disk (710) and holder (720).
- Undo the 4 countersunk screws (730), remove the old hard disk and screw the new hard disk to the holder (720).

Installing and putting the new hard disk into operation

- Refit the hard disk and holder into the instrument using 2 countersunk screws (725).

  Note: *The bottom of the holder is inserted into a sheet-metal wall.*
- Connect the flat cable (715) to the hard disk.
- Replace the instrument's top cover (296) and screw back into position with 23 or 28 countersunk screws (298).
- Slide on the enclosure (400) and screw the 4 rear-panel feet (460) back into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in standby mode
- Select Service Level 2 (see Service Function)
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]

Replacing LCD A70 and the DC/AC Converter

(See Chapter 5, Spare Parts List Items 910, 930 and drawings 1145.1290, 1145.1384)

The LCD and the associated DC/AC converter are accommodated on a mounting plate. The connection to the front module controller is made with cables which should also be replaced individually. The replacement procedure is as follows:
f

Opening the instrument and removing the front unit

- Turn off the instrument and disconnect from the mains.
- Remove the 4 screws in the front handles (410), left and right, and take off the front handles.
- Remove the countersunk screw (390) next to the display and pull off the front cover (300, 303, 306, 310, 313, 316, 320, 323) forwards.
- Remove the 2 countersunk screws 610) in the top of the frame and the 2 in the bottom.
- Remove the countersunk screws (176) (4), (177) (6), (178) (8).
- Pull out the front unit together with the keyboard and display (600, 601, 602, 603) forwards.

Caution
The cables to the front module controller are still connected

- Disconnect the cables to the LCD, the DC/AC illumination converter, the key pad (keyboard), the tachogenerator and, if necessary, the network connection to the front module controller.

  Note: *When disconnecting cables, be especially careful with the cable to the keyboard. It is a foil cable and can only be removed when the locking device on the foil-cable connector has been released.*

Place the key-side of the front unit on a clean surface.

Removing the DC/AC converter

- Disconnect the cable from the display (910) to the DC/AC converter (930).
- Disconnect the converter cable (950) to the DC/AC converter (930)
- Remove the DC/AC converter (930) by undoing the 2 screws (940)

Removing the LCD

- Disconnect the display cable (945) by cutting through the adhesive label(946).
- Remove the display connector (1020) after you have undone the two screws (1040).
- Disconnect the display cable (1030) at the display (910).
- Remove the display (910) after removing the 4 screws (920)

Installing and putting into operation a new LCD or DC/AC converter

- Reinstall the new LCD or new DC/AC converter by reversing the disassembly procedure, refit all screws and reconnect the cables that have been disconnected (drawing 1145.1384).
- When replacing the display (921) or display cable (945), use a new adhesive label (946) to secure the cabling.
- Place the key-side of the front unit on the top of the instrument so that the cables can be connected to the front module controller.
- Carefully connect all cable connectors to the front module controller, ensuring that the polarity is correct.

Front Module Controller Typ FMR6

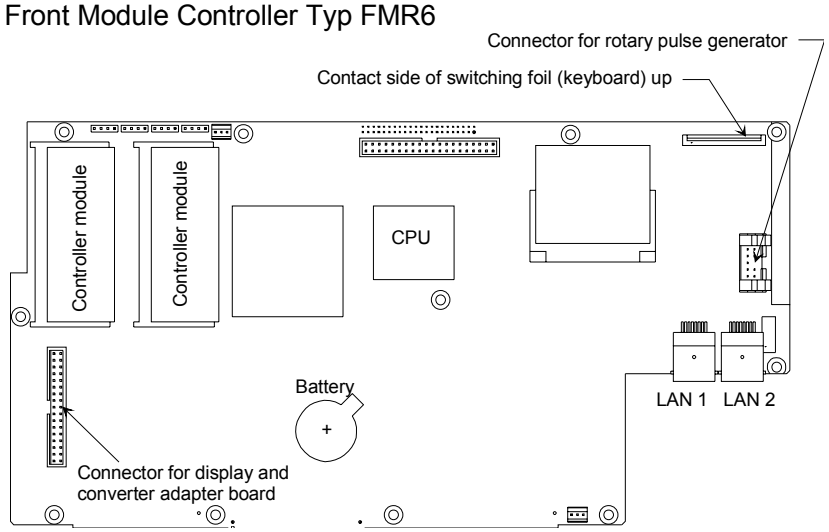


Fig. 3-5 Location of the edge contacts on the front module controller

- Reinsert the front unit in the instrument and secure to the front frame with 4 countersunk screws (610).
- Refit the countersunk screws (176) (4), (177) (6), (178) (8).

Caution

Avoid trapping cables and ensure cabling is tidy.

- Replace the front cover (300, 303, 306, 310, 313, 316, 320, 323) and secure with countersunk screw (390).
- Refit the 2 front handles (410) using the 4 screws.
- Connect the mains cable, turn on at the mains switch and press the ON key.

Replacing Flexible switch board (Keyboard) A16 / Key Pad A15

(See Chapter 5, Spare Parts List, Items 860, 870, 875, 877 and drawings 1145.1010, 1145.1384)

The flexible switch board (keyboard) and key pad are located behind the front cover and the keyboard frame

Opening the instrument and removing the front unit

- Turn off the instrument and disconnect from the mains.
- Remove the 4 screws in the front handles (410),right and left, and take off the front handles
- Remove the countersunk screw (390) next to the display and pull off the front cover (300, 303, 306, 310, 313, 316, 320, 323) forwards
- Remove the 2 countersunk screws (610) in the top of the front frame and the 2 in the bottom.
- Remove the countersunk screws (176) (4), (177) (6), (178) (8).
- Pull out the front unit together with the keyboard and display (600, 601, 602, 603) and place it with the key-side on top of the instrument.

Caution

The cables to the front module controller are still connected.

- Disconnect the cables to the LCD, the DC/AC illumination converter, the key pad (keyboard), the tachogenerator and, if necessary, the network connection to the front module controller.

Note: *When disconnecting cables, be especially careful with the cable to the keyboard. It is a foil cable and can only be removed when the locking device on the foil-cable connector is released.*

Removing the flexible switch board (keyboard) / key pad

- Place the front unit with the key-side upwards on a clean surface.
- Remove knob (990) from the tachogenerator.
- Undo the 10 countersunk screws (890) and remove the keyboard frame (800, 801, 805).
- The flexible switch board (860) and the key pad (870, 875) can now be replaced.

Installing a new flexible switch board / key pad and reassembling the instrument

- Insert the new flexible switch board (860) into the keyboard frame (800, 801, 805) from behind.

  N.B.: *The positioning pins must be inserted in the holes in the keyboard frame.*
- Place the new key pad (870, 875) on the rear of the flexible switch board (860).

Note: *Thread the foil cable's connector through the slot in the mounting tray.*
Position the key pad *so that the pins on the flexible switch board pass through the holes in the key pad.*

- Place the rear of the display unit on the key pad (870, 875).

N.B.: *Position the display unit so that the pins on the flexible switch board pass through the holes in the mounting tray.*

- Press the front unit together, with the key-side upwards turn and screw back together again with 10 countersunkl screws (890).
- Place the front unit with the key-side on top of the instrument so that the cables can be connected to the front module controller
- Reconnect the cables to the front module controller, ensuring correct polarity.

Front Module Controller Typ FMR6

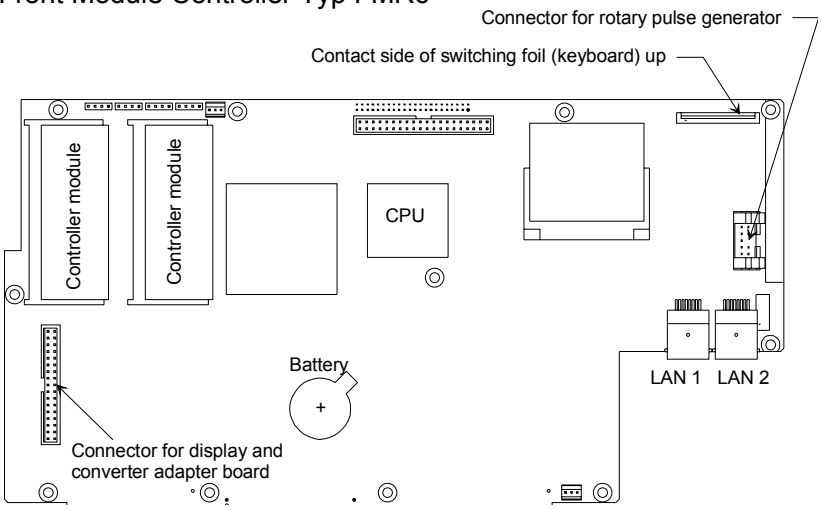


Fig. 3-6 Location of the edge contacts on the front module controller

- Reinsert the front unit into the instrument and secure to the front frame with 4 countersunk screws (610).
- Refit the countersunk screws (176)(4), (177) (6), (178) (8).

Caution
Avoid trapping cables and ensure cabling is tidy.

- Replace the front cover (300, 303, 306, 310, 313, 316, 320, 323) and secure with the countersunk screw (390).
- Refit the 2 front handles (410) using 4 screws.
- Connect the mains cable, turn on at the mains switch and press the ON key.

Replacing the Front Cover

(See Chapter 5, Spare Parts List, Items 300, 303, 306, 310, 313, 316, 320, 323, and drawing 1145.1010)

The front cover is the outermost front panel with lettering. Each instrument type has its own front cover.

- Turn off the instrument and disconnect from the mains.
- Remove the 4 screws in the front handles (410), right and left, and take off the front handles
- Remove the countersunk screw (390) next to the display and pull off the front cover (e.g. 300) forwards
- Fit the new front cover and reassemble the instrument by reversing the disassembly procedure.
- Connect the mains cable, turn on at the mains switch and press the ON key.

Replacing Disk Drive A30

(See Chapter 5, Spare Parts List, Item 670 and drawing 1145.1290)

Opening the instrument and removing the disk drive

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the 2 sems screws (700) and carefully lift out the floppy disk drive (670), together with the floppy disk holder (680).

  N.B.: *The floppy cable to the motherboard is still connected.*
- Disconnect floppy cable (690) on the floppy disk drive.

Installing a new disk drive and reassembling the instrument

- Release the floppy disk drive by removing the 3 sems screws (702) from the floppy drive holder (680) and insert a new floppy disk drive (670) into the floppy drive holder (680).
- Connect floppy cable (690) on the floppy disk drive.
- Resecure the floppy disk drive (680) from above to the side of the instrument with the fan using 2 sems screws (700).

  N.N.: *Center the floppy disk drive wrt the cut-out in the front cover.*
- Slide the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable, turn on at the mains switch and press the ON key.

Function test

- The instrument boots up and starts the instrument firmware.
- Insert the 3 ½ ″disk with the files.
- Press the FILE key, then the File Manager softkey and Edit Path.
- Enter “ a “ and “ : “ with the screen functions and terminate with the Enter key.
- The directory structure of the disk displayed on the screen shows that the floppy disk drive is operating properly.

Replacing USB Board A40

(See Chapter 5, Spare Parts List, Item 1050 and drawings 1145.1290 and 1145.1384)

The USB board is located behind the front cover and the keyboard frame next to the ON key.

Opening the instrument and removing the USB-board

- Turn off the instrument and disconnect from the mains.
- Remove the 4 screws in the front handles (410), right and left, and take off the front handles
- Remove the countersunk screw (390) next to the display and pull off the front cover (300, 303, 306, 310, 313, 316, 320, 323) forwards.
- Remove the 2 countersunk screws (610) in the top of the front frame and the 2 in the bottom.
- Remove the countersunk screws (176) (4), (177) (6), (178) (8).
- Pull out the front unit together with the keyboard and display (600, 601, 602, 603) forwards and place it with the key side on top of the instrument.

Remove the 2 screws (1060), disconnect the cable and remove the USB board (1050).

Fitting the USB board and reassembling the instrument

- Install the new USB board by reversing the removal procedure, replace all screws and connect and install the relevant cables (drawing 1145.1384).
- Insert the front unit back into the instrument and secure to the front frame with 4 countersunk screws (610).
- Refit the countersunk screws (176)(4), (177) (6), (178) (8).
- Replace the front cover (300, 303, 306, 310, 313, 316, 320, 323) and secure with the countersunk screw (390).
- Refit the 2 front handles (410) using 4 screws.
- Connect the mains cable, turn on at the mains switch and press the ON key.
- Check the USB board: Connect the mouse or keyboard and perform a function check.

Replacing Power Supply A20

(See Chapter 5, Spare Parts List, Items 790 and drawings 1145.1010, 1145.1290)

The power supply is installed at the rear of the instrument frame.

Removing the power supply

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) towards the rear.
- Remove the 2 countersunk screws (796) in the top of the instrument and the 8 sems screws. (795) in the rear panel of the power supply.
- Pull out the power supply unit a little at the rear of the instrument, remove screw (737) and anti-touch guard (736).
- On the left-hand side of the power supply, pull off the protective conductor cable and fuse board (735) to the left.
- On the right-hand side of the power supply, remove the plug-on connections to the motherboard.
- Remove the power supply unit.
- Remove the 4 screws (793) and washers (792) and remove the power supply (790) from the power supply plate (791).

Installing the new power supply

- Fit the new power supply by reversing the removal procedure.
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable, turn on at the mains switch and press the ON key.
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors
  [INFO : Error Log]

Replacing Fuse board A21

(See Chapter 5, Spare Parts List, Item 735, and drawings 1145.1010, 1145.1290)

The fuse board is installed on the left-hand side of the power supply.

Removing the power supply and the fuse board

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the 2 countersunk screws (796) in the top of the instrument and the 8 sems screws. (795) in the rear panel of the power supply.
- Pull out the power supply unit a little at the rear of the instrument, remove screw (737) and anti-touch guard (736).
- On the left-hand side of the power supply, pull off the fuse board (735) to the left.
- Disconnect the two mains cables from the fuse board.

Fitting the new fuse board and the power supply

- Connect the mains cables to the fuse board and refit the fuse board to the power supply.
- Secure the anti-touch guard (736) with screw (737).
- Reinstall the power supply by reversing the removal procedure.
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable, turn on at the mains switch and press the ON key.
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors
  [INFO : Error Log]

Replacing a Fan

(See Chapter 5, Spare Parts List, Item 15 and drawings 1145.1010, 1145.1290, 1145.1332)

The fans, three in all, are located behind the right-hand side panel.

Opening the instrument and removing the fan

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Lift off the top instrument cover (296) after undoing the 23 (2 ports) or 28 (4 ports) countersunk screws (298).
- Remove the 4 screws in the front handles (410), right and left, and take off the front handles.
- Remove the countersunk screw (390) next to the display and pull off the front cover (300, 303, 306, 310, 313, 316, 320, 323) forwards
- Remove the 2 countersunk screws (610) in the top of the front frame and the 2 in the bottom.
- Remove the countersunk screws (176) (4), (177) (6), (178) (8)
- Pull out the front unit together with the keyboard and display (600, 601, 602, 603) forwards.
- Disconnect the fan cable on the motherboard X35, X36 and X37 (FAN).
- Undo the 2 screws (19) and the 5 screws (17) and remove fan plate (50) with the 3 fans (15).
- Remove fan (15) by undoing the 4 fan screws (18).

Fitting a new fan and reassembling the instrument

- Install the fan using the 4 fan screws.

  N.B.: *The arrows on the fan show the installation position. The fan blows air into the instrument. Route the fan cable so that it cannot get caught in the fan.*
- Reinsert the fan plate with the 3 fans on it into the instrument and secure with 2 screws (19) and 5 screws (17).
- Connect the fan cabling on the motherboard X35, X36 and X37 (FAN).
- Reinsert the front unit into the instrument and secure to the front frame with 4 countersunk screws (610).
- Refit the countersunk screws (176) (4), (177) (6), (178) (8).

Caution

Avoid trapping cables and ensure cabling is tidy.

- Replace the front cover (300 to 323) and secure with the countersunk screw (390).
- Refit the 2 front handles (410) using 4 screws.
- Refit the top instrument cover (296) with 23 (2 ports) or 28 (4 ports) countersunk screws (298).
- Connect the mains cable, turn on at the mains switch and press the ON key.
- Check that all three fans are operating correctly (fans are blowing air into the instrument).
- Turn off the instrument and disconnect the mains cabling again.
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable, turn on at the mains switch and press the ON key.

Replacing Motherboard A10

(See Chapter 5, Spare Parts List, Item 510 and drawings 1145.1010, 1145.1290)

The motherboard is located on the base of the instrument.

Opening the instrument and removing the motherboard

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Lift off the top instrument cover (296) after undoing the 23 (2 ports) or 28 (4 ports) countersunk screws (298).
- Extract the top boards: Use ejector lever for the synthesizer and network controller, hold the frequency reference by the enclosure.
- Remove the power supply (550).
    - Remove the 2 countersunk screws (796) in the top of the instrument and the 8 sems screws (795) in the rear panel of the power supply.
    - Pull out the power supply unit a little at the rear of the instrument, remove screw (737) and anti-touch guard (736).
    - On the left-hand side of the power supply, pull off the protective conductor cable and the fuse board (735) to the left.
    - On the right-hand side of the power supply, pull off the plug-in connections to the motherboard.
    - Remove the power supply unit.
- Remove the 4 screws in the front handles (410), right and left, and take off the front handles.
- Remove the countersunk screw (390) next to the display and pull off the front cover (300, 303, 306, 310, 313, 316, 320, 323) forwards
- Remove the 2 countersunk screws (610) in the top of the front frame and the 2 in the bottom.
- Remove the countersunk screws (176) (4), (177) (6), (178) (8).
- Pull out the front unit together with the keyboard and display (600, 601, 602, 603) forwards.

Caution!

The cables to the front module controller are still connected.

- Disconnect the cables to the LCD, the DC/AC illumination converter, the key pad (keyboard), the tachogenerator and, if necessary, the network connection to the front module controller.

Note: *When disconnecting cables, be especially careful with the cable to the keyboard. It is a foil cable and can only be removed when the locking device on the foil-cable connector is released.*

- Remove the front module controller (for instructions see “Replacing Front Module Controller A90“)
- Place the instrument on its top and remove the instrument’s base cover (297) by undoing the 12.countersunk screws (299).

- Undo the RF cabling from the reflectometers (165, 170, 175) to the LO divider (125) and to the motherboard.
- Release the 50-pin flat cable and disconnect from the reflectometers
- Remove screws (151, 156, 161) and take out the reflectometers.
- Undo RF cabling at the LO divider (125).
- Disconnect the 12-pin flat cable from the LO divider
- Remove screws (127) (2 in the strut, 4 in the rear panel) and take out the LO divider together with plate (126)

Undo the screws holding the connectors on the rear panel:

- The 6 hexagonal nuts and washers for the BNC connectors.
- 2 hexagonal bolts (530, 540) each for the monitor interface and the user-control interface.
- 2 hexagonal screws (550) each for the USB interface and in the dummy panel (555).

- Remove the 3 screws (144) each for the left and right side panels and the 2 screws (143) in the center and take out both motherboard rails (140, 141).
- Disconnect any cabling still on the motherboard (fan, floppy, IEC-bus, etc.).
- Remove the 14 screws holding the motherboard (520) and take out the motherboard.

Installing the motherboard and reassembling the instrument

N.B.: *The Eprom on the new motherboard contains the serial No. of the instrument. Therefore, it should not be installed in any instrument other than the one for which it was ordered.*
The motherboard is the passport of the instrument and unique for every unit. It does not make sense to order this part for stock.

- Install the new motherboard by reversing the removal procedure.

  N.B.: *Install the motherboard carefully to prevent any damage to components.*
  Lettering indicates where cables are to be connected.

- Reinstall the front module controller, front unit, power supply, boards and cables, instrument covers, enclosure and rear-panel feet by reversing the disassembly procedure.
- Connect the mains cable, turn on at the mains switch and press the ON key.
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]
- Align the DC inputs (see **Aligning the DC Inputs**)

Replacing a Reflectometer A510 to 540

(See Chapter 5, Spare Parts List, Items 165, 175 and drawing 1145.1010)

The boards are located under the motherboard.

Opening the instrument and removing the board

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the bottom instrument cover (297) after undoing the 12 countersunk screws (299).
- Remove the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Disconnect the source cable, the LO cable, the two IF cables and the 50-pin control cable from the reflectometer.
- Remove the 2 screws (151, 156, 161) at the end of the reflectometer and take out the reflectometer

Installing the board and reassembling the instrument

- Insert the new board into the instrument and reconnect any cables that have been disconnected

  N.B.: *Use the lettering on the motherboard as an aid.*
- Screw in the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Screw in the 2 screws (151, 156, 161) in the end of the reflectometer.
- Fit the instrument base cover (297) and secure with 12 countersunk screws (299).
- Slide the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in the standby mode
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]
- Record the generator and receiver correction data (see **Recording Correction Values**).
- Perform the factory system error calibration (see **Factory System Error Calibration**).

Replacing the Inner Conductor of a Port Connector

(See Chapter 5, Spare Parts List, Item 110, and drawings 1145.1010, 1145.3593, 1145.3664)

Opening the instrument and removing the reflectometer

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the instrument base cover (297) after undoing the 12 countersunk screws (299).
- Remove the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Disconnect the source cable, the LO cable, the two IF cables and the 50-pin control cable from the reflectometer
- Remove the 2 screws (151, 156, 161) at the end of the reflectometer and take out the reflectometer

Replacing the inner conductor

- Unscrew the N outer conductor with a spanner (narrow, SW 14mm) and take out inner conductor unit.

  N.B.: *Ensure that the centring disk (135) is also removed.*
- Carefully insert the new inner conductor in the bridge unit enclosure and screw back the N outer-conductor (lock with Loctite 262, mount with torque 3.5 Nm).

Reassembling the instrument

- Insert the reflectometer into the instrument and reconnect all the cables that have been disconnected.

  N.B.: *Use the lettering on the motherboard as an aid.*
- Screw in the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Screw in the 2 screws (151, 156, 161) in the end of the reflectometer.
- Fit the instrument base cover (297) and secure with 12 countersunk screws (299).
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in standby mode.
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]
- Perform factory system error calibration (see **Factory System Error Calibration**).

Replacing the Bridge unit

(See Chapter 5, Spare Parts List, Item 100 and drawings 1145.1010, 1145.3664)

Opening the instrument and replacing the reflectometer

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the instrument base cover (297) after undoing the 12 countersunk screws (299).
- Remove the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Disconnect the source cable, the LO cable, the two IF cables and the 50-pin control cable from the reflectometer
- Remove the 2 screws (151, 156, 161) at the end of the reflectometer and take out the reflectometer.

Removing the bridge unit

- Loosen the MEAS, REF and GEN cables (310, 320, 300) at both ends and disconnect at the bridge unit.

  N.B.: *When loosening support the cable with a 7mm spanner!*
- Remove the 3 screws (160) and carefully pull the bridge unit off the reflectometer.
- Remove the 2 screws (240) and remove the plate (230).

Fitting the new bridge unit

- Secure plate (230) to the new bridge unit using the 2 screws (240).
- Carefully place the bridge unit on the reflectometer and secure with 3 screws (160).
- Screw the MEAS- REF and GEN cables (310, 320, 300) to the bridge unit, and then tighten at both ends.

  N.B.: *When tightening with a 7 mm spanner support the cable.*

Reassembling the instrument

- Insert the reflectometer into the instrument and reconnect all the cables that have been disconnected.

  N.B.: *Use the lettering on the motherboard as a guide.*
- Screw in the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Screw in the 2 screws (151, 156, 161) in the end of the reflectometer.
- Fit the instrument base cover (297) and secure with 12 countersunk screws (299).
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in standby mode

- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]
- Record generator and receiver correction data (see **Recording Correction Data**).
- Perform factory system error calibration (see **Factory System Error Calibration**).

Replacing the Reflectometer Fan

(See Chapter 5, Spare Parts List, Item 190 and drawings 1145.1010, 1145.3664)

Opening the instrument and removing the reflectometer

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the instrument base cover (297) after undoing the 12 countersunk screws (299).
- Remove the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Disconnect the source cable, the LO cable, the two IF cables and the 50-pin control cable from the reflectometer.
- Remove the 2 screws (151, 156, 161) at the end of the reflectometer and take out the reflectometer.

Replacing the fan

- Disconnect the fan cable at the reflectometer.
- Undo the 4 holding screws (194) and remove the fan.
- Insert the new fan (cable outlet to the outside).
- Screw back the 4 screws (194) and washers (192, 193).

Reassembling the instrument

- Fit the reflectometer into the instrument and reconnect all the cables that have been disconnected.

  N.B.: *Use the lettering on the mother board as a guide.*
- Screw in the 2 screws (176, 177, 178) in the front of the instrument next to the port connector.
- Screw in the 2 screws (151, 156, 161) in the end of the reflectometer.
- Connect the mains cable, turn on at the mains switch and press the ON key.
- Check that the fan is operating.
- Turn off the instrument again and disconnect from the mains.
- Fit the instrument base cover (297) and secure with 12 countersunk screws (299).
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Reconnect the mains cable and turn on at the mains switch. The instrument is now in the standby mode.

Replacing Network Controller Board A130, A140

(See Chapter 5, Spare Parts List, Items 100, 105 and drawing1145.1010)

The board is in the upper section of the instrument.

Opening the instrument and removing the board

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Lift off the instrument top cover (296) after undoing the 23 (2 ports) or 28 (4 ports) countersunk screws (298).
- Extract the network controller using the ejector lever

Fitting the board and reassembling the instrument

- Fit the new board in the instrument.
- Refit the top instrument cover (296) with 23 (2 ports) or 28 (4 ports) countersunk screws (298).
- Slide the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in the standby mode
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]
- Record the receiver correction data (see **Recording Correction Values**).
- Perform factory system error calibration (see **Factory System Error Calibration**).
- Align the DC inputs (see **Aligning the DC Inputs**).

Replacing Synthesizer Board A150, A160

(See Chapter 5, Spare Parts List, Items 110, 115 and drawing 1145.1010)

The board is located in the upper section of the instrument.

Opening the instrument and removing the board

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Lift off the instrument top cover (296) after undoing the 23 (2 ports) or the 28 (4 ports) countersunk screws (298).
- Extract the synthesizer with the ejector lever.

Installing the board and reassembling the instrument

- Insert the new board into the instrument.
- Refit the instrument top cover (296) securing with the 23 (2 ports) or the 28 (4 ports) countersunk screws (298).
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in the standby mode
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]
- Record the generator and receiver correction data (see **Correction Value Recording**).
- Perform factory system error calibration (see **Factory System Error Calibration**).

Replacing LO Divider A600

(See Chapter 5, Spare Parts List, Item 125 and drawing 1145.1010)

The board is located under the motherboard.

Opening the instrument and removing the board

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the instrument base cover (297) after undoing the 12 countersunk screws (299).
- Disconnect the RF cable and the 12 pin control cable from the LO divider.
- Remove the 2 screws (128) and remove the LO divider.

Installing the board and reassembling the instrument

- Insert the new board into the instrument and secure with 2 screws (128).
- Reconnect the RF cable and the 12 pin control cable.
- Fit the instrument base cover (297) and secure with 12 countersunk screws (299).
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in the standby mode
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]
- Record the receiver correction data (see **Recording Correction Data**).
- Perform factory system error calibration (see **Factory System Error Calibration**).

Replacing Frequency Reference Board A100

(See Chapter 5, Spare Parts List, Item 120 and drawings 1145.1010, 1145.1770)

Opening the instrument and replacing the board

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Lift off the instrument top cover (296) after undoing the 23 (2 ports) or the 28 (4 ports) countersunk screws (298).
- Extract the frequency reference board (120).

Installing the board and reassembling the instrument

- Insert the new board into the instrument
- Refit the instrument top cover (296) with the 23 (2 ports) or the 28 (4 ports) countersunk screws (298).
- Push the enclosure (400) back on and screw the 4 rear-panel feet (460) into position.
- Connect the mains cable and turn on at the mains switch. The instrument is now in the standby mode
- Select Service Level 2 (see Service Functions).
- When the instrument has been started, check the protocol file for errors:
  [INFO : Error Log]

Troubleshooting

The instructions in this manual describe troubleshooting down to the board level. Any defective boards can then be replaced and the instrument put back into operation. A selftest which checks the board diagnostic voltages and displays limit violations is provided to facilitate troubleshooting and diagnosis.

We recommend that you return your instrument to the technical specialists at an R&S service facility for board replacement and any further repairs that may be needed (see the address list at the beginning of this manual).

Warning

Do not insert or remove boards that are still live

Avoid causing shorts when measuring voltages

The ZVB has the following facilities to simplify diagnosis:

- Selftest
- Service functions

N.B. *The first thing to do if you encounter any problems is to check if any connection (cables, edge connectors etc.) are damaged or even incorrectly inserted.*

Test Equipment and Accessories

Item.	Instrument type	Recommended features	Recommended model	R&S Order No.	Qty.
1	DC meter		URE	0350.5315.02	1
2	Power supply	0 to 10 V			
3	Spectrum analyzer	Frequency range 0 to 8 GHz	FSEB 20	1066.3010.20	1
4	Adapter cable	1 m long SMP male to SMA male	-	1129.8259.00	1
5	Adapter cable	0.5 m long SMP male to SMP male	-	1129.8265.00	1
6	SMA cable	0.5 m long SMA male to SMA male	-	1142.5895.00	2
7	SMA cable	1 m long SMA male to SMA male	-	1142.5889.00	2
8	BNC cable	1 m to 2 m long BNC male to BNC male	-	e.g. 1100.8850.00	1
9	Adapter	SMA female to N male	-	4012.5837.00	2
10	Adapter	N male to BNC female	-	0118.2812.00	1
11	Termination	SMA termination. 50 Ω male	-	0249.7823.00	3
12	SMP adapter	SMP female to SMP female	-	1093.6869.00	1
13	Adapter board	Extension 150 mm high, 48 pins, 2 mm pitch	-	1100.3542.02	1
14	Conn. Cables for DC Inputs	4-pin mini-DIN plug	ZV-Z71	1164.1005.02	1

Troubleshooting - Power-up Problems

- **Fault: It is not possible to turn on the ZVB.**

Action	Cause of fault / remedy
Check mains switch on the rear panel ⇓ Check LED is yellow (standby) ⇓	Mains switch OFF: Turn on at mains switch. LED does not come on: ➢ Measure voltage at X92.C23 (Front module controller): Nom. value: +13.5 V ± 1V Nom. value reached: Fault in key pad or controller. No voltage: Power supply defective or short to12 V standby.
Turn on instrument. Check LED is green ⇓	LED does not come on: ➢ Measure the PWR-ON signal at power supply X92.B24: < 1V for ON Voltage > 1V: Key pad or controller defective.

- **Fault: Fan not working.**

Action	Cause of fault / remedy
Check voltage at connector: X35, X36, X37 pin 3: nom. value 12V ⇓ Select Service Function Set Service Level 1 Set Service Function 2.5.0.11.1.5 (max. fan speed) Check voltage at connector: X35, X36, X37 pin 3: nom. value 0.9V	If no voltage can be measured the fan fuse may be defective (F12, F62, F63)

Troubleshooting Boot Problems

- **Fault: ZVB does not start the measurement application.**

The first action the ZVB performs after power-up is booting BIOS for the processor. When the processor has been successfully initialised, the Windows XP start-up procedure begins. Then, the measurement application is loaded as an autostart program.

If there are errors during the boot phase, messages indicate possible defects.

The message “No System Disk or Disk error…” indicates that the hard disk data is corrupt. If this is the case, replace the hard disk.

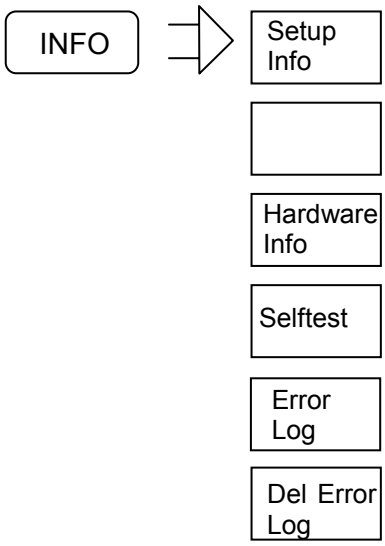
If the operating system on the hard disk has been corrupted and so cannot be loaded correctly, Windows XP outputs a “blue screen”.
This screen summarizes all the key information about the internal status of the processor.

Troubleshooting - Boot Error

If the message below appears on the screen when the boot procedure has been completed,

Warning: Boot error occurred. For details browse Error Log file.

the cause of the error can be found in the Error-Log file.



Press the *Error Log* softkey.

The results are displayed on the screen.

Cause of error: Data cannot be read from one or more boards.

When the instrument is booted, all the calibration data that is required must be written to the processor's RAM.
When the NWA application is started, the entry on the hard disk is compared with the Eprom data on the board. If the data matches, the data is loaded from the hard disk into RAM. If there is not a match, the Eprom data is written to the hard disk and then loaded into RAM.
If the data at the specified address cannot be read, a check is made in Config.ini to check if the board in question should be present. If so, the board is simulated (i.e. if this board is present and is functioning physically, the instrument will function) and an entry is made in the ErrorLog file.
If a board must always be physically present, (frequency reference, synthesizer1, NetworkControler1, reflectometer1, reflectometer2), an error message is output.

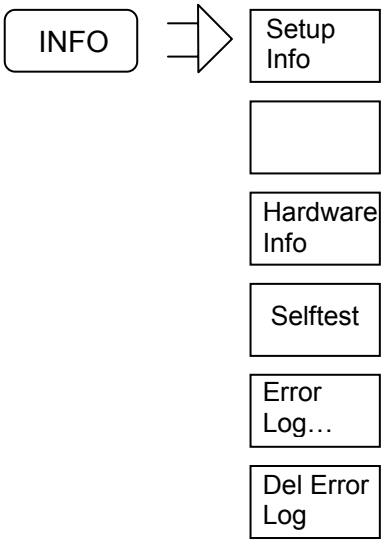
See: Troubleshooting with the Selftest

Troubleshooting with the Selftest

The selftest is used to check supply voltages to the boards, including voltages generated on the boards themselves. On the frequency reference board, two clock signals (128 MHz and ADC-CLK) are also measured.

Starting the selftest:

- Select Service Level 2 (see Service Functions) – this means that the temperature sensor readings are displayed and tighter voltage tolerances used.
- Call the selftest in the INFO menu:



Start the selftest with the *Selftest* softkey.

The selftest results are displayed on the screen.

In the selftest result-table, an abbreviation is used for every board designation:

Fr	Frequency reference
Nd1	Network controller1, digital section
Nd2	Network controller2, digital section (only 4-oort instruments)
Sy1/DDSCON	Synthesizer1
Sy1/DDSCON	Synthesizer2(only 4-port instruments)
Rm1	Reflectometer port1
Rm2	Reflectometer port2
Rm3	Reflectometer port3 (applies only to 3-port and 4-port-instruments y)
Rm4	Reflectometer port4 (applies only to 4-port instruments)

Total selftest status: user mode ---PASSED---

Instrument Type: ZVB8 with 4 Ports
Part Number: 1145.1010k10
Product ID: 01.00
Serial Number: 100124
IP Addresses
IP Address: 0.0.0.0&nbs; Subnet Mask: 0.0.0.0
IP Address: 0.0.0.0 Subnet Mask: 0.0.0.0
IP Address: 127.0.0.1 (Localhost) Subnet Mask: 255.0.0.0
SyMapping: ZVB8_P4
LO Divider: is active

Date: 05/28/04
Time: 14:52:57

Voltages Fr

Test description	Min	Max	Result	State
+10V_A SUPPLY	1.550V	1.950V	1.756V	PASSED
+5V_A SUPPLY	1.400V	1.800V	1.560V	PASSED
+5V_REF	1.400V	1.800V	1.560V	PASSED
+12V_STB	1.900V	2.300V	2.112V	PASSED
128_VCXO	0.800V	4.000V	2.696V	PASSED
ADC_CLK	0.800V	4.000V	2.060V	PASSED
-10V_A SUPPLY	1.900V	2.300V	2.128V	PASSED
-5V_A SUPPLY	2.100V	2.500V	2.264V	PASSED

Voltages Nd1

Test description	Min	Max	Result	State
+5VA_ADC	2.250V	2.750V	2.488V	PASSED
+2.5VD_MDD1	1.125V	1.375V	1.264V	PASSED
+2.5VD_MDD2	1.125V	1.375V	1.264V	PASSED
+1.5VD_FCON	0.675V	0.825V	0.752V	PASSED
-5VA_ADC	2.250V	2.750V	2.464V	PASSED
DGND1	0.000V	0.200V	0.000V	PASSED
DGND2	0.000V	0.200V	0.000V	PASSED
AGND	0.000V	0.200V	0.000V	PASSED

Voltages Nd2

Test description	Min	Max	Result	State
+5VA_ADC	2.250V	2.750V	2.484V	PASSED
+2.5VD_MDD1	1.125V	1.375V	1.260V	PASSED
+2.5VD_MDD2	1.125V	1.375V	1.260V	PASSED
+1.5VD_FCON	0.675V	0.825V	0.752V	PASSED
-5VA_ADC	2.250V	2.750V	2.460V	PASSED
DGND1	0.000V	0.200V	0.000V	PASSED
DGND2	0.000V	0.200V	0.000V	PASSED
AGND	0.000V	0.200V	0.000V	PASSED

Voltages Sy1\DDSCON

Test description	Min	Max	Result	State
+10V_A SUPPLY	1.500V	2.000V	1.752V	PASSED
+5V_A SUPPLY	1.300V	1.800V	1.560V	PASSED
+5V_REF	1.300V	1.800V	1.568V	PASSED
+7V_A SUPPLY	1.400V	1.900V	1.628V	PASSED

Voltages Sy2\DDSCON

Test description	Min	Max	Result	State
+10V_A SUPPLY	1.500V	2.000V	1.752V	PASSED
+5V_A SUPPLY	1.300V	1.800V	1.560V	PASSED
+5V_REF	1.300V	1.800V	1.564V	PASSED
+7V_A SUPPLY	1.400V	1.900V	1.616V	PASSED

Voltages Rm1

Test description	Min	Max	Result	State
GND	0.000V	0.200V	0.000V	PASSED
GND	0.000V	0.200V	0.000V	PASSED
+5V SUPPLY	2.300V	2.700V	2.496V	PASSED
+10.5VA SUPPLY	2.300V	2.800V	2.564V	PASSED
+10.5VB SUPPLY	2.300V	2.800V	2.564V	PASSED
+12V FAN	2.000V	2.600V	2.216V	PASSED
+12V SUPPLY	2.000V	2.600V	2.204V	PASSED
-12V SUPPLY	1.600V	2.000V	1.796V	PASSED

Voltages Rm2

Test description	Min	Max	Result	State
GND	0.000V	0.200V	0.000V	PASSED
GND	0.000V	0.200V	0.000V	PASSED

+5V SUPPLY	2.300V	2.700V	2.500V	PASSED
+10.5VA SUPPLY	2.300V	2.800V	2.576V	PASSED
+10.5VB SUPPLY	2.300V	2.800V	2.592V	PASSED
+12V FAN	2.000V	2.600V	2.204V	PASSED
+12V SUPPLY	2.000V	2.600V	2.204V	PASSED
-12V SUPPLY	1.600V	2.000V	1.796V	PASSED

Voltages Rm3

Test description	Min	Max	Result	State
GND	0.000V	0.200V	0.000V	PASSED
GND	0.000V	0.200V	0.000V	PASSED
+5V SUPPLY	2.300V	2.700V	2.500V	PASSED
+10.5VA SUPPLY	2.300V	2.800V	2.584V	PASSED
+10.5VB SUPPLY	2.300V	2.800V	2.600V	PASSED
+12V FAN	2.000V	2.600V	2.196V	PASSED
+12V SUPPLY	2.000V	2.600V	2.220V	PASSED
-12V SUPPLY	1.600V	2.000V	1.800V	PASSED

Voltages Rm4

Test description	Min	Max	Result	State
GND	0.000V	0.200V	0.000V	PASSED
GND	0.000V	0.200V	0.000V	PASSED
+5V SUPPLY	2.300V	2.700V	2.492V	PASSED
+10.5VA SUPPLY	2.300V	2.800V	2.604V	PASSED
+10.5VB SUPPLY	2.300V	2.800V	2.568V	PASSED
+12V FAN	2.000V	2.600V	2.216V	PASSED
+12V SUPPLY	2.000V	2.600V	2.136V	PASSED
-12V SUPPLY	1.600V	2.000V	1.804V	PASSED

Voltages Fr
Voltages Nd1
Voltages Nd2
Voltages Sy1\DDSCON
Voltages Sy2\DDSCON
Voltages Rm1
Voltages Rm2
Voltages Rm3
Voltages Rm4
Home

Interpreting the Results of the Selftest

Negative voltages are transformed into positive voltages by means of a positive voltage and a resistor network because the A/D converters that are used can handle only positive voltages. This is why an acceptable negative voltage may elicit a FAIL because the associated positive voltage is out of tolerance.

The voltages supplied by the power supply are not checked directly. The failure of a power supply voltage can, however, be deduced from FAILs of certain voltages on several boards. The following Table shows how the board-oriented voltages checked during the selftest are derived from the power supply voltages.

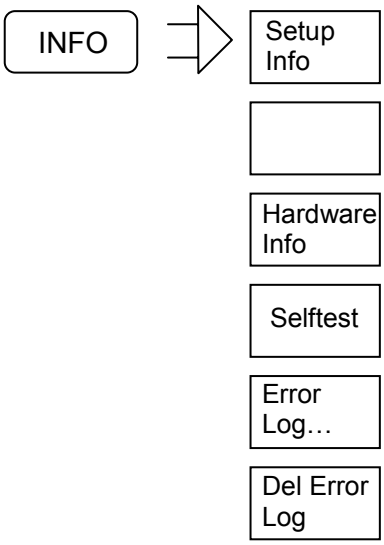
Power supply	+3.4 V	+5.2 V	+6.5 V	+8.25 V	+12.25 V	-6.5 V	-12.25 V
Fr			+5V_A +5V_REF		+10V_A +12V_STB	-5V_A	-10V_A
Nd	+2.5VD_MDD1 +2.5VD_MDD2 +1.5VD_FCON		+5VA_ADC			-5VA_ADC	
Sy			+5V_A +5V_REF		+7V_A +10V_A		
Rm			+5V		+10.5VA +10.5VB +12V +12V FAN		-12V

If the voltages listed in a column are all FAIL, the corresponding power supply voltage has failed or is out-of-tolerance. The power supply must then be replaced.
On the motherboard, there is a separate fuse for each board and for each of the power supply voltages used on the board. If a FAIL message is output, the first action to take is to check the fuse. The LO divider board must be removed before the fuses on the motherboard can be checked (See Chapter Board Replacement).

If an internal board voltage is out-of-tolerance, even though the power supply voltages used on the board are OK, the board must be replaced.

Checking the Temperature Sensors

Select Service Level 2 (see Service Functions).



When the *Hardware Info* softkey is pressed information about the installed hardware, the results of temperature measurements and … are displayed.

Temperature Info

Current Temperature Readings

Component	Sensor	Temperature	Sensor	Temperature	Sensor	Temperature
Motherboard	Near NC:	33.75°C	Near SY:	34.75°C	Near PS:	38.50°C
Netcon 1	Analog:	40.25°C	Digital:	49.75°C		
Netcon 2	Analog:	-----	Digital:	-----		
Reflectometer 1	Generator:	38.50°C	Receiver:	42.50°C		
Reflectometer 2	Generator:	36.00°C	Receiver:	38.75°C		
Reflectometer 3	Generator:	38.25°C	Receiver:	40.25°C		
Reflectometer 4	Generator:	39.25°C	Receiver:	41.75°C		

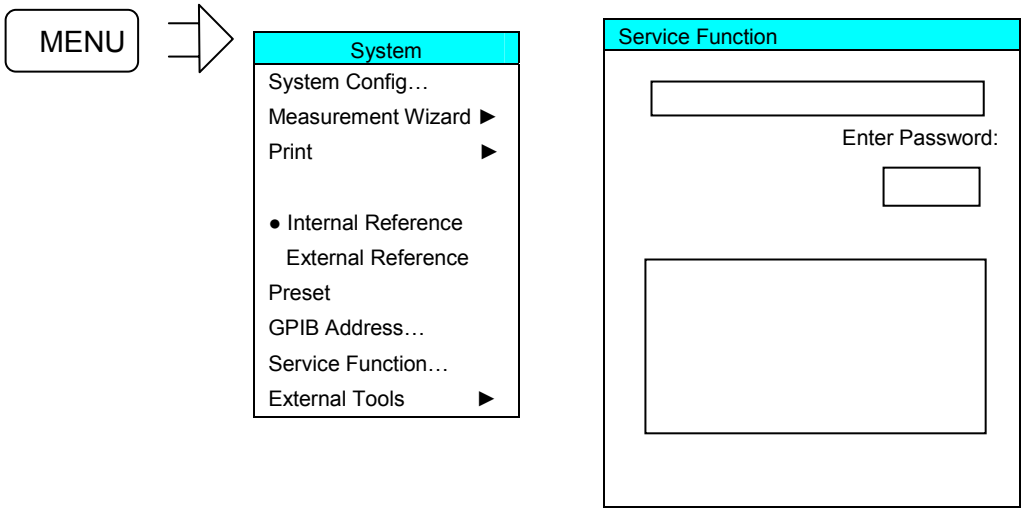
Highly elevated temperature values indicate a fan failure.

Service Functions

The service functions allow you to examine particular circuit sections on specific boards or to make well-defined settings that would normally change automatically according to the state of the instrument (e.g. the IF). There are a number of service functions which, if used incorrectly, could cause the instrument to malfunction. Usually, these functions are disabled. They are enabled only after a code number (PASSWORD) has been entered.

There are three different service levels:

Service level	Password
0	No password necessary
1	894129
2	30473035



Service Function Structure

Group . Main ID . Sub ID . Function . Address . Data

Group	Applies to
1	API
2	HW (boards)

Boards Main ID	Boards Sub ID
0: All boards	0
1: Network controller1	0: All board 1: PCI 2: ND 3: NA
2: Network controller2	
5: Motherboard	0:
9: Frequency reference	0:
11: Synthesizer1	0: All board 1: SY1 2: SY2 3: SY3 4: SY4
12: Synthesizer2	
21: Reflectometer1	0: all board 1: GEN 2: REC
22: Reflectometer 2	
23: Reflectometer 3	
24: Reflectometer 4	

Group 1:
General Functions

Functions	**Service function**	**Data**	**Serv. Lev.**
Enable/disables the arbitrary mode settings in the port configuration (e.g. LowNoise/ LowDistortion) independently of the model	1.0.0.0.X	0 → Use disabled 1 → Use enabled	2
Enables/disables the peak detector and RMS detector independently of the model	1.0.0.1.X	0 → Use disabled 1 → Use enabled	2
Activates or deactivates the setting of measured values to default values when status messages are issued due to HW faults	1.1.0.2.X	0 → Deactivate default values 1 → Activate default values	0
Activates or deactivates factory calibration for the active setup	1.1.0.3.X	0 → Deactivate factory calibration 1 → Activate factory calibration	0

Group 2:
General Functions

Functions	Service function	**Data**	**Serv. Lev.**
Suppress error-message box	2.0.0.0.X	X=0 → MSG box is output (default state) X=1 → MSG box is suppressed (error is nevertheless entered in the log file)	1
Selftest all boards	2.0.0.5.0.0		0, 1 or 2

Network controller

Functions	Service function	**Data**	**Serv. lev.**
ND1:Read Temp (addr.:68)	2.1.2.3		1
ND2:Read Temp (addr.:68)	2.2.2.3		1
ND[1..2] Selftest	2.[1-2].2.5.0.0		0, 1 or 2
NA1:Read Temp (addr.:69)	2.1.3.3		1
NA2:Read Temp (addr.:69)	2.2.3.3		1

Motherboard

Functions	Service function	**Data**	**Serv. lev.**
MB: Fan manual	2.5.0.11.1.X	X= 0 to 5	1
MB: Fan automatic	2.5.0.11.0		1
MB:Read Temp Front (NC) (addr.:205)	2.5.0.3.1		1
MB: Read Temp Rear (SY) (addr.: 204)	2.5.0.3.2		1
MB: Read Temp Back (PS) (addr.: 202)	2.5.0.3.3		1

Frequency reference

Functions	Service function	**Data**	**Serv.lev.**
FR Selftest	2.9.0.5.0.0		0, 1 or 2

Reflectometers

Functions	Service function	**Data**	**Serv.lev.**
RM[1-4]: Fan manual	2.[21-24].0.11.X	X = 1 to 5	1
RM[1-4]:Fan automatic	2.[21-24].0.11.0		1
RM[1-4]: Read Temp Gen	2.[21-24].1.3		1
RM[1-4]: Read Temp Rec	2.[21-24].2.3		1
RM[1-4]: Selftest	2.[21-24].0.5.X	X = 0 to 4	1
RM[1-4]: Read OVL	2.[21-24].0.12		1
RM[1-4]: OVL Reset	2.[21-24].0.13		1
RM[1-4] Generator Selftest	2.[21-24].1.5.0.0		0, 1 or 2
RM[1-4]: IF shift	2.[21-24].2.18.ZF	IF in Hz 0 = IF via shift table	0

Determining which Boards are defective

The table below lists boards that are probably defective based on the faults that occurred during the performance test.

	Defective board	
Problem with:	**Probable**	**Also possible**
Frequency accuracy	Frequency reference	
SSB phase-noise Only one port All ports	Synthesizer1 Frequency reference	
Level accuracy Only one port All ports	Reflectometer associated with defective port Synthesizer1	
Max. output level Only one port All ports	Reflectometer associated with defective port Synthesizer1	
Absolute accuracy wave quantity a	Reflectometer associated with defective port	
Level linearity	Reflectometer associated with defective port	
Harmonic ratio	Reflectometer associated with defective port	Synthesizer1
Spurious suppression	Synthesizer1	
Matching portx	Bridge unit of reflectometer associated with the defective port	
Directivity portx	Bridge unit of reflectometer associated with the defective port	
Receiver absolute accuracy Port 1, 2 Port 3, 4 All ports	Reflectometer associated with defective port Reflectometer associated with defective port Synthesizer1	Network controller1 Network controller2 Frequency reference
Receiver linearity for high levels Portx All ports	Reflectometer associated with defective port LO divider	LO divider Synthesizer2
Receiver linearity for low levels Port1, 2 Port3, 4	Network controller1 Network controller2	
Receiver noise level portx	Reflectometer associated with defective port	Synthesizer2 or synth.1 for 2-port models
Dynamic range portx	Reflectometer associated with defective port	Synthesizer2 or. synth.1 for 2-port models
DC measurement input1V	Motherboard	Network controller1
DC measurement input 10V	Motherboard	Network controller1
Frequency reference input/output	Frequency reference	

A board test should be performed before the board that has been deduced to be defective is replaced.

Board Test

When boards are being tested, internal sources are used whenever possible. This means that it is always assumed that the downstream board in the signal path is OK. If a clear fault is not present, the order of the board tests given below should always be followed.

The inputs and outputs of the boards to be tested can be accessed via cables in the lower section of the instrument (except the frequency reference board).

Opening the instrument

(See Chapter 5, drawing1145.1010)

- Turn off the instrument and disconnect from the mains, screw off the 4 rear-panel feet (460) and pull off the enclosure (400) backwards.
- Remove the instrument base cover (297) after undoing the 12 countersunk screws (299).

Only when testing the frequency reference board:

- Lift off the instrument top cover (296) after undoing the 23 (2 ports) or the 28 (4 ports) countersunk screws (298).

Testing the frequency reference board

(see **Test Equipment**)

- Remove the board from the instrument.
- Reinsert board and extension card.
- Connect the output to be tested to the spectrum analyzer using an adapter cable and adapter SMA-N.
- Set the frequencies listed in the table.
- Check signals according to following table.

Signal	Connector	Frequency	Nom. level	Setting
NA1_AD_CLK	X103	80 MHz	10 dBm ±1dB	
NA2_AD_CLK	X104	80 MHz	10 dBm ±1dB	
SY1_REF	X105	128 MHz	10 dBm ±1dB	
SY2_REF	X106	128 MHz	10 dBm ±1dB	
REF_10_OUTIN	X107	10 MHz	6 dBm ±1dB	Menu/System/Internal Reference

The board must be replaced if the signal is more than 2 dB below the stated nominal level.

- Connect the frequency reference output of the spectrum analyzer to X107 (REF_10_OUTIN) using an adapter cable and adapter SMA-N.
- Connect X105 or X106 (SY1_REF or. SY2_REF) to the spectrum analyzer using an adapter cable and adapter SMA-N.
- The 128 MHz signal's frequency must precisely equal its nominal frequency.

If the frequency differs in any way (e.g. 128.001 MHz), replace the board.

Testing the Synthesizer Board

Synthesizer1

- Disconnect source cable at the reflectometer (1 to 4, depending on which synthesizer section is to be tested).
- Connect the end of the source cable to the spectrum analyzer input via an adapter cable and adapter SMA-N.

N.B.: Bend the source cable as little as possible*, if necessary secure adapter cable with adhesive tape.*

- Set the frequencies listed in the table on the ZVB and check the values.
  [**Sweep** : Sweep Type : CW Mode : CW Frequency : **…Hz**]
  [**Sweep** : Single : **Restart**]

Frequency	**Level**	**2nd harmonic**	**3rd harmonic**	**SSB noise** carrier offset 100 kHz
300 kHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-130 dBc
100 MHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-130 dBc
1 GHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-126 dBc
2 GHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-120 dBc
3 GHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-116 dBc
4 GHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-112 dBc
6 GHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-108 dBc
8 GHz	0 dBm ±2 dB	< -28 dBc	< -28 dBc	-105 dBc

The cable loss must also be taken into account at the stated levels. For the specified cable it is 0.25 dB/GHz (0.5 m) 0.5 dB/GHz (1 m).

The board must be replaced if the level is more than 2 dB below the specified value or the other values are more than 2 dB above their specified value.

Synthesizer2 or synthesizer1 for ZVB4/8 2 ports

- Disconnect the LO cable at the LO divider.
- Connect the end of the LO cable to the spectrum analyzer input using an adapter cable and adapter SMA-N.

N.B.: Bend the source cable as little as possible*, if necessary secure adapter cable with adhesive tape.*

- Set the frequencies listed in the table above on the ZVB and check the values.

Testing the Reflectometer

Generator levels

It is assumed that the synthesizer section (synthesizer1) associated with the reflectometer to be tested is OK.

- Loosen cable W514 (GEN -> Bridge unit) at both ends and screw off at the generator output GEN.

  Note: *When loosening, support the cable with a 7mm spanner*

- Connect the generator output to the spectrum analyzer using the SMA cables () and adapter SMA-N.
- Set the power to 8 dBm
- Set the ZVB to the CW sweep mode.
- Set the frequencies listed in the table.

Frequency	Level	2nd harmonic	3rd harmonic
300 kHz	16 dBm	---	---
50 MHz	16 dBm	< - 21 dBc	< - 21 dBc
1 GHz	16 dBm	< - 21 dBc	< - 21 dBc
3 GHz	16 dBm	< - 21 dBc	< - 21 dBc
6 GHz	16 dBm	< - 21 dBc	---
8 GHz	16 dBm	< - 21 dBc	---

With the stated levels, the cable loss must still be taken into account. For the specified cable it is 0.25 dB/GHz.

Receiver levels

The following is assumed:

- The LO synthesizer section (synthesizer1 mod. 04, synthesizer2) associated with the reflectometer to be tested is OK.
- The network controller associated with the reflectometer to be tested is OK.
- One reflectometer in the instrument is functioning.

- Loosen cable W515 (Bridge unit -> MEAS) and cable W518 (Bridge unit -> REF) at both ends and screw off at the MEAS and REF receiver inputs.

  N.B.: *When loosening, support the cable with a 7mm spanner*

Connect the receiver input (MEAS or REF) to a functioning instrument port using an adapter cable and adapter SMA-N.

- Set the ZVB to the CW sweep mode.
- Set the frequencies and output levels for the port used for the measurement as indicated in the table and read off the level for the receiver to be tested (wave quantity ax or bx).

Frequency	Output level	Displayed level ax or bx
300 kHz	-20 dBm	0 dBm
50 MHz	-20 dBm	0 dBm
1 GHz	-20 dBm	0 dBm
3 GHz	-20 dBm	0 dBm
6 GHz	-20 dBm	0 dBm
8 GHz	-20 dBm	0 dBm

With the stated levels, the cable loss must still be taken into account. For the specified cable, it is 0.25 dB/GHz (0.5 m) or. 0.5 dB/GHz (1 m).

If the measured values are more than 2 dB below the levels and ratios list in the table, the board must be replaced.

Bridge unit levels

The following is assumed:

- One reflectometer in the instrument is OK.

Method 1:

The generator section of the associated reflectometer is OK (output level at the port meets specifications).

- Loosen cable W515 (Bridge unit -> MEAS) and cable W518 (Bridge unit -> REF) at both ends and disconnect at the bridge unit.

  N.B.: *When loosening, support the cable with a 7mm spanner*
- Connect the bridge unit output (MEAS = connector W515 or REF = connector W518) to a functioning port using the SMA cable and adapter SMA-N to a functioning port. Terminate the bridge unit output that is not used with an SMA termination.
- Screw a SHORT from the N calibration kit to the port connector.
- Set the frequencies and levels listed in the table for the reflectometer associated with the bridge unit (port) and measure the level (wave quantity bx) at the port used for the measurement.

Frequency	Level	Output level MEAS	Output level REF
300 kHz	0 dBm	-18 dBm	-32 dBm
50 MHz	0 dBm	-18 dBm	-32 dBm
1 GHz	0 dBm	-18 dBm	-32 dBm
3 GHz	0 dBm	-18 dBm	-32 dBm
6 GHz	0 dBm	-18 dBm	-32 dBm
8 GHz	0 dBm	-18 dBm	-32 dBm

With the stated levels, the cable loss must still be taken into account. For the specified cable it is 0.25 dB/GHz.

If the measured values are more than 2 dB below the levels in the table, the board must be replaced.

Method 2:

The receive section of the associated reflectometer is OK.

- Loosen cable W514 (GEN -> Bridge unit) at both ends and screw off at the bridge unit.

  N.B.: *When loosening, support the cable with a 7mm spanner*
- Connect the bridge input (connector. W514) to a functioning port using the SMA cable and SMA-N adapter.
- Screw a SHORT from the N calibration kit to the port connector.
- Set the frequencies and levels listed in the table at the port used for the measurement and measure the level (wave quantity ax or bx) at the reflectometer associated with the bridge unit (port).

Frequency	Level	Output level MEAS	Output level REF
300 kHz	8 dBm	-18 dBm	-32 dBm
50 MHz	8 dBm	-18 dBm	-32 dBm
1 GHz	8 dBm	-18 dBm	-32 dBm
3 GHz	8 dBm	-18 dBm	-32 dBm
6 GHz	8 dBm	-18 dBm	-32 dBm
8 GHz	8 dBm	-18 dBm	-32 dBm

With the stated levels, the cable loss must still be taken into account. For the specified cable it is 0.25 dB/GHz.

If the measured values are more than 2 dB below the levels given in the table, the board must be replaced.

Bridge Directivity

The following is assumed:

- The generator and receiver sections of the reflectometer associated with the bridge unit are OK.

- Screw the SHORT from an N calibration kit to the port connector.
- Perform a sweep from 300 kHz to 8 GHz, measure S11, save measured values (Data -> Mem : Math = Data/Mem).
- Screw the MATCH from the N calibration kit to the port connector.
- The trace gives the directivity.

Frequency range	Directivity
300 kHz to 50 MHz	< -10 dB
50 MHz to 8 GHz	< -16 dB

If the measured values are greater than the values stated in the table, the bridge unit must be replaced.

Bridge unit: Port Matching

It is assumed that there is a functioning reflectometer in the instrument.

- Loosen cables W514 (GEN -> Bridge unit), W515 (Bridge unit -> MEAS) and W518 (Bridge unit -> REF) at both ends and unscrew at the bridge unit.

  N.B.: *When loosening, support the cable with a 7mm spanner*
- Terminate the bridge unit input and bridge unit outputs with 3 SMA terminations.
- Connect N test cable to a functioning instrument port and perform a 1-port calibration at the end of the cable.
- Connect the end of the test cable to the port of the bridge unit under test and display the Sxx magnitude on the screen.

Frequency range	Sxx dB
300 kHz to 2 GHz	-12 dB
2 GHz to 8 GHz	-18 dB

If the values in the table are exceeded, the board must be replaced.

Testing the LO Divider Board

It is assumed that the LO-synthesizer section (synthesizer2 for 3-port and 4-port-models, synthesizer 1, mod. 04) is OK.

- Disconnect cable W656, WW659, W666 or W669, depending on which LO-branch is being tested.
- Connect the output under test (X6, X7, X8 or X9) to the spectrum analyzer using the adapter cable and SMA-N adapter.
- Enter service- function 2.21.2.18.20000000 (IF = 20 MHz).
- Set the ZVB to the CW sweep mode.
- Set the frequencies listed in the table.

Frequency ZVB	**Frequency spec.** = Frq ZVB + IF	**Level**
300 kHz	20.3 MHz	5 dBm to 14 dBm
50 MHz	70 MHz	5 dBm to 14 dBm
1 GHz	1.02 GHz	5 dBm to 14 dBm
3 GHz	3.02 GHz	5 dBm to 14 dBm
6 GHz	6.02 GHz	5 dBm to 19 dBm
8 GHz	8.02 GHz	5 dBm to 19 dBm

With the stated levels, the cable loss must still be taken into account. For the specified cable, it is 0.25 dB/GHz (0.5 m) or 0.5 dB/GHz (1 m).

If the measured values are below the levels in the table, the board must be replaced.

Testing the Network Controller Board

Testing the IF inputs

It is assumed that there is one functioning reflectometer in the instrument.

- Disconnect the IF-MEAS and IF-REF cable from each of the reflectometers.
- Connect the input to be tested at the end of the appropriate IF cable (W136, W137, W138, W139, and W146, W147, W148, W149) to a functioning port using the adapter cable and SMA-N adapter .
- Set the ZVB to CW sweep mode, CENTER 20 MHz.
- Setting at the port used for the measurement: POWER -10 dBm
- Setting at the port associated with the network controller under test: WAVE QUANTITY ax or bx.
- Enter service function 2.21.2.18.20000000 (IF = 20 MHz).
- Disable level corrections with SF 2.21[..24].2.15.1

If the level displayed on the ZVB's screen is not within the range -4 dBm ± 2 dB, the board must be replaced.

Testing the Motherboard

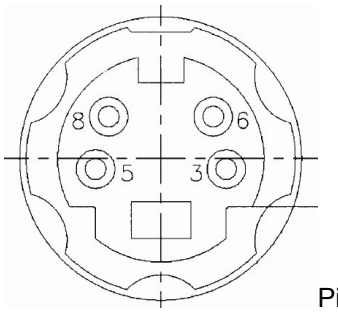
28 V supply

Using a multimeter, measure the voltage at X 100.B5 (wrt ground).
Permissible deviation: ± 0.5 V

Preamplifier for DC measurement inputs

Apply the DC voltages listed in the table using the 4-pin Mini-DIN connector at the DC measurement input.
Measure the DC voltage with a multimeter.

Input	Voltage at	Gnd	APPLIED VOLTAGE	Measurement at	Rated value
DC MEAS -1 V to +1 V	8	3, 5, 6	- 1 V	X 141.B10	2.33 V
DC MEAS -1 V to +1 V	6	3, 5, 8	+ 1 V	X 141.B11	2.33 V
DC MEAS -10 V to +10 V	8	3, 5, 6	- 10 V	X 141.D10	2.33 V
DC MEAS -10 V to +10 V	6	3, 5, 8	+ 10 V	X 141.D11	2.33 V



Pin assignment DC MEAS connector

If the measured value is more than 10% above or more than 10% below the stated nominal value, the motherboard must be replaced.

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4 Software Update / Installation of Options 4.1

Installing New ZVB Software 4.1

Installing Options 4.2

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4 Software Update / Installation of Options

Chapter 4 provides information on updating software, restoring the operating system installation and installing options. Descriptions accompanying the software update or the options can be included in this folder as part of Chapter 4.

Installing New ZVB Software

The instrument firmware can be downloaded from the PDM system. This is a Microsoft Installation file (.MSI). The file name is ZVAB_XX_YY.MSI for a released version and ZVAB_XX_YY_BETAZZ.MSI for a test version. This file must be made available to the instrument via a suitable medium (Memory Stick, USB CD-ROM drive network or Remote Desktop. The instrument firmware is installed when you double click on the file. The instrument is ready for operation after you switch off and then switch back on again.

Installing Options

The following options can be fitted to the ZVB:

Oven Controlled Crystal Oscillator (OCXO)	R&S ZVAB-B4	1164.1757.02

The OCXO option is permanently integrated on the frequency reference board (mod. 03) and, as a rule, it is specified when the instrument is ordered. When it is retrofitted, the frequency reference board must be replaced (replace mod. 02 with mod. 03). Follow the replacement instructions in Chapter 3 and install according to the instructions that are supplied with the option.

These installation instructions can be appended to this chapter.

Caution

Before installing the options, disconnect the mains cable.

Observe the safety instructions at the beginning of this manual.

The boards in the instrument are electrostatically sensitive devices (ESD). The appropriate handling instructions for these devices must be observed (ESD workstation).

Installing hardware options:

- Turn off the instrument and disconnect the mains cable.
- Unscrew the 4 back-panel feet (460) and pull off the enclosure (400) towards the rear.
- When installation has been completed, push the enclosure back into position and refit the the back-panel feet.

Caution

When replacing the enclosure, ensure that no cables are damaged or pulled out:

- Connect the mains cable and turn on the instrument.

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5 Documents

This chapter provides information on the ordering of spare parts and contains the spare parts list and the documents for the complete ZVB unit.

Shipping of Instrument and Ordering of Spare Parts

Please contact your Rohde & Schwarz support center or our spare parts express service if you need service or repair of your equipment or to order spare parts and modules.

The list of the Rohde & Schwarz representatives and the address of our spare parts express service are provided at the beginning of this service manual.

We require the following information in order to answer your inquiry fast and correctly and to decide whether the warranty still applies for your instrument:

- Instrument model
- Stock No.
- Serial number
- Firmware version
- Detailed error description in case of repair
- Contact partner for checkbacks

Shipping of Instrument

When shipping the instrument, be sure to provide sufficient mechanical and antistatic protection:

- When transporting or shipping the instrument, repack it as originally packed. The two protective caps for the front and rear panels prevent the control elements and connectors from being damaged. The antistatic packing foil prevents any undesired electrostatic charging from occurring.
- If you do not use the original packaging, provide enough padding around the instrument to keep it from slipping inside the package. Wrap antistatic packing foil around the instrument to protect it from electrostatic charging.

Shipping of a Module

When shipping a module, also be sure to provide it with sufficient mechanical and antistatic protection:

- Ship the module in a sturdy, padded box.
- Wrap the board in antistatic foil.
  If the packaging is antistatic but not conductive, additional conductive packaging is required. The additional packaging is not required if the enclosed packaging is conductive.
  Exception: If the module contains a battery, the tight-fitting packaging must always consist of antistatic, non-chargeable material to protect the battery from being discharged.

Ordering Spare Parts

To deliver replacement parts promptly and correctly, we need the following information:

- Stock No. (see component lists in this chapter)
- Designation
- Component number according to component list
- Number of pieces
- Instrument type for the replacement part
- Contact person for any questions

The stock numbers necessary for ordering replacement parts and modules as well as power cables can be found later in this chapter.

Refurbished Modules

Refurbished modules are an economical alternative to original modules. It should be kept in mind that refurbished modules are not new, but are repaired and fully tested parts. They may bear signs of use, but they are electrically and mechanically equivalent to new modules.

To find out which refurbished modules are available, please refer to your Rohde & Schwarz representative (or to Central Service at Rohde & Schwarz Munich).

Return of Defective Replaced Modules

Defective modules that are covered by the replacement program and can be repaired can be returned within **3 months** after delivery of the replaced module. A repurchasing value is credited.

Excluded are parts that cannot be repaired, e.g. PCBs that are burnt, broken or damaged by repair attempts, incomplete modules, or parts that are heavily damaged mechanically.

The defective parts must be sent back with a **returned accompanying document** containing the following information:

- Stock No., serial number and designation of the removed part
- **Precise** description of the malfunction
- Stock No., serial number and designation of the instrument the part was removed from
- Date part was removed
- Name of the technician who exchanged the part

A returned accompanying document is provided with each replacement module.

Spare Parts

The Stock Nos. necessary for ordering replacement parts and modules can be found in the component lists provided later in this chapter.

Important!

When replacing a module, please observe the safety instructions and repair instructions provided in chapter 3 and at the beginning of this service manual

When shipping a module, be sure to provide sufficient mechanical and antistatic protection.

Available Power Cables

Table 5-1 List of power cables available

Stock No.	Safety plug in accordance with	Mainly used in
DS 0006.7013	BS1363: 1967' complying with IEC 83: 1975 standard B2	Great Britain
DS 0006.7020	Type 12 complying with SEV regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 0006.7036	Type 498/13 complying with US regulation UL 498, or with IEC 83	USA/Canada
DS 0006.7107	Type SAA3 10 A, 250 V, complying with AS C112-1964 Ap.	Australia
DS 0099.1456	DIN 49 441, 10 A, 250 V, straight	Europe (except Switzerland)

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Spare Parts List

Mechanical Drawings

List of ZVB parts including spare parts

The ZVB is constructed in accordance with R&S Design 2000.

Rackmount: 5E 1/1 T350

Overall dimensions: B x H x T: 426.7 x 265.4 x 417.00

Accessories: 19" Adapter ZZA-511, Stock No. 1096.3290.00

Note: *The recommended spare parts are marked with an x in the last column.*

Table 5-2 List of all ZVB part and spare parts

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
DRAWING 1145.1010.01 (ZVB BASE UNIT) & 1145.1332.00 (METAL FRAME)					
10	ZM FUNDAMENTAL UNIT ZVB	1145.1290.08	1		
11	ZM FUNDAMENTAL UNIT ZVB	1145.1290.09	1		
15	ZM FAN ZVB	1145.2200.00	3	E1 E2 E3	x
16	VS 7985/ISR-M4X8-A4-PA	1148.2652.00	12		
17	VS 7985/ISR-M4X6-A4-PA	1148.2646.00	5		
18	VS DIN433-4.3-A4	0082.4586.00	17		
19	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	4		
100	ZE NETWORK CONTROLLER	1145.3635.02	1	A140	x
105	ZE NETWORK CONTROLLER	1145.3635.02	1	A130	
110	EE SYNTHESIZER	1300.1112.02	1	A160	x
111	EE SYNTHESIZER	1300.1112.04	1	A160	x
115	EE SYNTHESIZER	1300.1112.03	1	A150	x
120	EE FREQ. REFERENCE	1145.3835.04	1	A100	x
125	ED LO DIVIDER	1300.2002.02	1	A600	x
126	MZ PLATE LO-DIV ZVB	1300.2025.00	1		
127	VS 6900/ISR-M2.5X6-A2	1148.3059.00	6		
128	VS HVC/ISR-M2.5X16-A2	0048.8218.00	2		
140	MZ MOTHERB. RAIL 1 ZVB	1145.1926.00	1		
141	MZ MOTHERB. RAIL ZVB	1145.1932.00	1		

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
142	MZ MOTHERB. RAIL 4 ZVB	1145.2274.00	1		
143	VS 6900/ISR-M2.5X8-A2	0041.1653.00	2		
144	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	6		
145	MZ MB RAIL CONTACT	1300.0851.00	1		
146	MZ MB RAIL CONTACT	1300.0874.00	1		
151	VS 6900/ISR-M2.5X6-A2	1148.3059.00	4		
156	VS 6900/ISR-M2.5X6-A2	1148.3059.00	6		
157	ZM CABLE SET ZVB	1145.2545.09	1		
161	VS 6900/ISR-M2.5X6-A2	1148.3059.00	8		
164	ZM CABLE SET ZVB	1145.2545.11	1		
165	ZM RM UNIT ZVB 4/8 GHz	1145.3664.08	2	A510 A520	
166	ZM CABLE SET ZVB	1145.2545.18	1		
175	ZM RM UNIT ZVB 4/8 GHz	1145.3664.08	4	A510 A520 A530 A540	
176	VS 965/ISR-M2.5X8-A4-PA	1148.3294.00	4		
177	VS 965/ISR-M2.5X8-A4-PA	1148.3294.00	6		
178	VS 965/ISR-M2.5X8-A4-PA	1148.3294.00	8		
181	VS 965/ISR-M3X16-A4-PA	1300.0868.00	8		
186	VS 965/ISR-M3X16-A4-PA	1300.0868.00	12		
260	MZ REAR PLATE	1145.1903.00	1		
265	VS 6900/ISR-M2.5X6-A2	1148.3059.00	5		
270	2XRJ45 COUPLER JACK STRAIGHT	1093.9122.00	2	X241 X242	x
275	DG CABLE 2XRJ45 ST/ST 8P	1138.9677.00	2	W241 W242	
280	DY IEC/IEEE BUS CABLE W21	1129.7252.00	1	W21	
282	VS DIN125-A3.2-A4	0082.4670.00	2		
284	VS DIN137-A3-A2	0005.0296.00	2		
286	VS DIN934-M3-A4	0016.4398.00	2		
290	MP COVER 25-PIN SUB-D	1093.9000.00	1		
291	MP COVER FOR IEC/IEEE BUS	0852.0450.00	1		
294	MP CAP RD11.1/9.9	0009.9217.00	1		

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
296	MZ COVER ZVB	1145.1849.00	1		
297	MZ COVER BOTTOM ZVB	1145.1961.00	1		
298	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	33		
299	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	5		
300	KB FRONT COVER ZVB4 2-PORT	1145.1403.00	1		
303	KB FRONT COVER ZVB 4	1145.1426.00	1		
306	KB FRONT COVER ZVB4 4-PORT	1145.1410.00	1		
310	KB FRONT COVER ZVB8 2-PORT	1145.1455.00	1		
313	KB FRONT COVER ZVB 8	1145.1432.00	1		
316	KB FRONT COVER ZVB8 4-PORT	1145.1461.00	1		
390	KB COUNTERSUNK SCREW M1.6X3 LIGHT-GREY	0396.1070.00	1		
400	KR BW2 CASING 5E1/1T350N-ZV	1145.1826.00	1		
405	KR HOLDING HOOK	1096.4796.00	1		
410	KR BW2 FRONT HANDLE 5E	1096.1497.00	2		
420	VS SCREW M4X14-ISR	1096.4896.00	4		
430	KR BW2 INSTRUMENT FOOT	1096.2506.00	4		
440	KR BW2 MOUNTING FOOT	1096.2529.00	2		
450	KR BW2 SIDE CARRYING HANDLE T350	1096.2664.00	1		
452	KR BW2 SIDE COVER	1096.2558.00	2		
460	KR BW2 REAR PANEL FOOT 50MM	1096.2493.00	4		
470	OS BW2 LABEL REAR PANEL FOOT	1096.2435.00	1		
480	ZB ACCESS. ZVB	1145.1049.00	1		
DRAWING 1145.1290.01 (BASE UNIT)					
500	ZM METAL FRAME ZVB	1145.1332.00	1		
511	ED MOTHERBOARD	1145.3435.03	1	A10	The Motherboard is the passport of the instrument and unique for every unit. It does not make sense to order it for stock.
520	VS 6900/ISR-M2.5X6-A2	1148.3059.00	14		
530	FM LOCKING SCREW M3	0009.6501.00	2		

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
540	FM LOCKING SCREW H=4.5	1093.9180.00	2		
550	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	4		
555	MZ CASCADE PLATE	1145.4690.00	1		
580	GR FRONT MOD. CONTROLLER 6/5	1091.2908.00	1	A90	x
582	LITHIUM BATTERY CR2032	0858.2049.00	1		x
590	VS 6900/ISR-M2.5X6-A2	1148.3059.00	10		
595	DF CABLE 4X2 AND SCHIELDING 630	1145.5115.00	1	W12	
596	DZ FEED-THROUGH RD8XRD14X8	0062.1146.00	1		
597	DZ CABLE TIE RD 1 TO 25 B2	0015.9038.00	7		
600	ZM DISPLAY UNIT ZVB	1145.1384.08	1	A1	
601	ZM DISPLAY UNIT ZVB	1145.1384.09	1	A1	
610	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	4		
670	GP 3.5 FLOPPY DRIVE SLIM	0048.6638.00	1	A30	x
680	MZ FLOPPY MOUNT	1093.4620.00	1		
690	DF FLEX-STRIP CONNECTOR 26P.R=1	1091.2066.00	1	W300	
700	VS 6900/ISR-M2.5X6-A2	1148.3059.00	2		
702	VS 7985/ISR-M2.5X4-A4-PA	1148.2717.00	3		
704	VS DIN127-B2.5-A4	0082.4786.00	3		
710	ZE HD WITH FIRMWARE ZVAB	1145.1178.02	1	A60	x
715	DY CABLE W11	1091.0734.00	1	W11	x
720	MZ DISK MOUNT	1093.4837.00	1		

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
725	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	2		
730	VS 965/ISR-M3X5-A4-PA	1148.2775.00	4		
735	ED AC FUSE BOARD	1145.3906.02	1	A21	x
736	MZ PROTECTION COVER	1300.0845.00	1		
737	VS 7985/ISR-M3X10-A4-PA	1148.2623.00	1		
738	OS LABEL 25MM HIGH-VOLTAGE FLASH	0042.5169.00	1		
740	DY CABLE FOR ZVBA POWER SUPPLY	1145.5544.00	1	W22	x

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
745	DX POWER SUPPLY CABLE 6P	1145.5515.00	1	W23	
750	DX POWER SUPPLY CABLE 8P	1145.5521.00	1	W24	
755	DX POWER SUPPLY CABLE 10P	1145.5538.00	1	W25	
756	VS DIN137-A3-A2	0005.0296.00	8		
757	VS DIN137-A4-A2	0005.0315.00	4		
760	FN POWERFILTER WITH SWITCH	1145.5067.00	1	X200	x
765	VS 965/ISR-M3X8-A4-PA	1148.2798.00	2		
770	ZE POWER UNIT ZVAB	1145.3893.00	1	Z20	
771	DZ GROMMET 7X12X16	0099.3520.00	1		
772	VS 965/ISR-M3X8-A4-PA	1148.2798.00	2		
773	VS DIN125-A3.2-A4	0082.4670.00	2		
774	VS DIN934-M3-A4	0016.4398.00	2		
775	DX PE CABLE	1090.3881.00	1	W201	
778	OS LABEL RD11 EARTH SYMBOL	0042.5330.00	2		
780	VS 965/ISR-M4X10-A4-PA	1148.2823.00	2		
782	VS DIN6797-A4.3-A2	0016.2837.00	2		
784	FV FLAT CONNECTOR GR 6.3	0432.4311.00	1		
785	FV FLAT CONNECTOR GR.6.3	0438.0453.00	1		
786	VS DIN137-A4-A2	0005.0315.00	2		
787	VS DIN934-M4-A4	0016.4400.00	2		
788	OS LABEL 25MM HIGH-VOLTAGE FLASH	0042.5169.00	1		
789	MZ PROTECTION COVER	1145.3235.00	1		
790	GJ SWITCHING POWER SUPPLY	1145.5238.00	1	A20	
791	MZ POWER SUPPLY PLATE	1145.2468.00	1		
792	VS DIN433-4.3-A4	0082.4586.00	4		
793	VS 7985/ISR-M4X6-A4-PA	1148.2646.00	4		
795	VS 6900/ISR-M2.5X6-A2	1148.3059.00	8		
796	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	2		
797	HS IMAGE SOFTWARE	0048.7540.00	1		

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
798	HS WINDOWS XP EMBEDDED	1099.8570.00	1		
799	OS BARCODE LABEL FOR PCB	0071.7714.00	1		
DRAWING 1145.1384..01 (DISPLAY UNIT)					
800	ZM MOUNTING TROUGH ZVB 3Tor	1145.2516.00	1		
801	ZM MOUNTING TROUGH ZVB 4-PORT	1145.2500.00	1		
810	OP SCREENED FILTER GLASS UPL/UPD	1069.2144.00	1		
820	MZ RF SPRING (177)	1069.3011.00	2		
830	MZ RF CLIP (137)	1069.3105.00	2		
840	MB DISK HOLDER	0852.0850.00	4		
850	VS 965/ISR-M2.5X5-A4-PA	1148.2752.00	4		
855	MM PROTECTIVE COLLAR 9.6X13.9	0852.1234.00	1		
860	FLEXIBLE SWITCH BOARD	1145.1990.00	1	A16	x
870	SB KEY PAD 68T ZVB	1145.2000.00	1	A15	x
875	SB KEY PAD 4-PORT ZVB	1145.2439.00	1	A15	x
880	ZM SUPPORT PLATE ZVB 3T	1145.2522.00	1		
885	ZM SUPPORT PLATE ZVB 4T	1145.2539.00	1		
890	VS 965/ISR-M2.5X5-A4-PA	1148.2752.00	10		
905	MZ DUST PROOFING	1145.1632.00	1		
910	BP TFT 800X600X3 8.4INCH	0048.8599.00	1	A70	x
920	VS 6900/ISR-M2.5X6-A2	1148.3059.00	4		
930	BP VNR-08C351-INV	0048.8760.00	1	T10	x
940	VS 6900/ISR-M2.5X6-A2	1148.3059.00	2		
950	DF CONVERTER CABLE L=310 10PIN	1091.2650.00	1	W100	x
960	EM ROTARY PULSE GENERATOR 1 (WITH KEY)	0852.2701.00	1	B10	
970	VS SCREW FOR PLASTIC 1.8X4.4	1066.2066.00	1		
980	EM COLLAR	0852.1105.00	1		
990	OK RD28 AXIS RD6	0852.1086.00	1		
1000	MZ HOLDING BRACKET FOR PCB	1145.2039.00	2		
1010	VS 965/ISR-M2.5X5-A4-PA	1148.2752.00	2		

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
1020	GR DISPL. CONNECTOR FMR6-TOSHIB	1091.2637.00	1		x
1030	DF DISPL. CABLE TOSHIBA	1091.2666.00	1		x
1040	VS 6900/ISR-M2.5X6-A2	1148.3059.00	2		
1050	ED USB BOARD	1145.3206.02	1	A40	x
1060	VS 965/ISR-M2.5X5-A4-PA	1148.2752.00	2		
DRAWING 1145.3664.01 (REFLECTOMETER 4/8 GHz UNIT)					
100	ZE RM8 BR UNIT	1145.3593.02	1	A505	x
110	ED RM8 GENERATOR	1145.4754.02	1	A504	
120	ED RM8 RECEIVER	1145.4731.04	1	A503	
125	ED RM8 RECEIVER	1145.4731.08	1	A503	
130	MN COVER B-SIDE GEN 8GHZ	1145.3670.00	1		
140	MN COVER A-SIDE GEN 8GHZ	1145.3687.00	1		
150	MN COVER B-SIDE REC 8GHZ	1145.3693.00	1		
160	VS 965/ISR-M2.5X8-A4-PA	1148.3294.00	4		
170	MB INTAKE FUNNEL RM8GHZ	1145.4583.00	1		
180	VS 6900/ISR-M2.5X6-A2	1148.3059.00	2		
190	ZE FAN 40x40x10	1145.4590.00	1	E500	x
192	VS-DIN433-3.2-A4	0082.4570.00	4		
193	VS DIN128-A3-A2	0005.2499.00	4		
194	VS 7985/ISR-M3X16-A4	1145.5021.00	4		
200	MZ RM MOUNT ZVB	1145.2145.00	1		
210	VS 6900/ISR-M2.5X6-A2	1148.3059.00	4		
230	MZ HOLDING EXT. ZVB	1145.2251.00	1		
240	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	2		
250	OS LABEL RM8	1145.4548.00	1		
300	DW CABLE W514 GEN	1145.2616.00	1	W514	
310	DW CABLE W515 MEAS	1145.2622.00	1	W515	
320	DW CABLE W518 REF	1145.3012.00	1	W518	
330	FJ LOAD 50OHM SMA	0249.7823.00	1		

Position.	Designation	Stock No.	Number	Electrical Designation	Recommended spare parts
400	OS BARCODE LABEL FOR PCB	0071.7714.00	1		
500	ZM RM SUBUNIT ZVAB 4/8GHz	1145.4025.04	1		X
510	ZM RM SUBUNIT ZVAB 4/8GHz	1145.4025.08	1		x
DRAWING 1145.3593.01 SHEET 3 (BR UNIT)					
100	MB N OUTER CONDUCTOR	1045.8888.00	1		
110	ZM INNER CONDUCTOR Unit	1300.1393.00	1		x
DRAWING 1164.1770.00 (OPTION ZVAB-B4 1164.1757.02)					
120	EE FREQ. REFERENCE	1145.3835.05	1	A100	x
296	MZ INSTRUMENT COVER ZVB	1145.1849.00	1		
298	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00	33		
400	KR BW2 CASING 5E1/1T350N-ZV	1145.1826.00	1		x
405	KR CASING HOLDING HOOK	1096.4796.00	1		
460	KR BW2 REAR PANEL FOOT 50MM	1096.2493.00	4		

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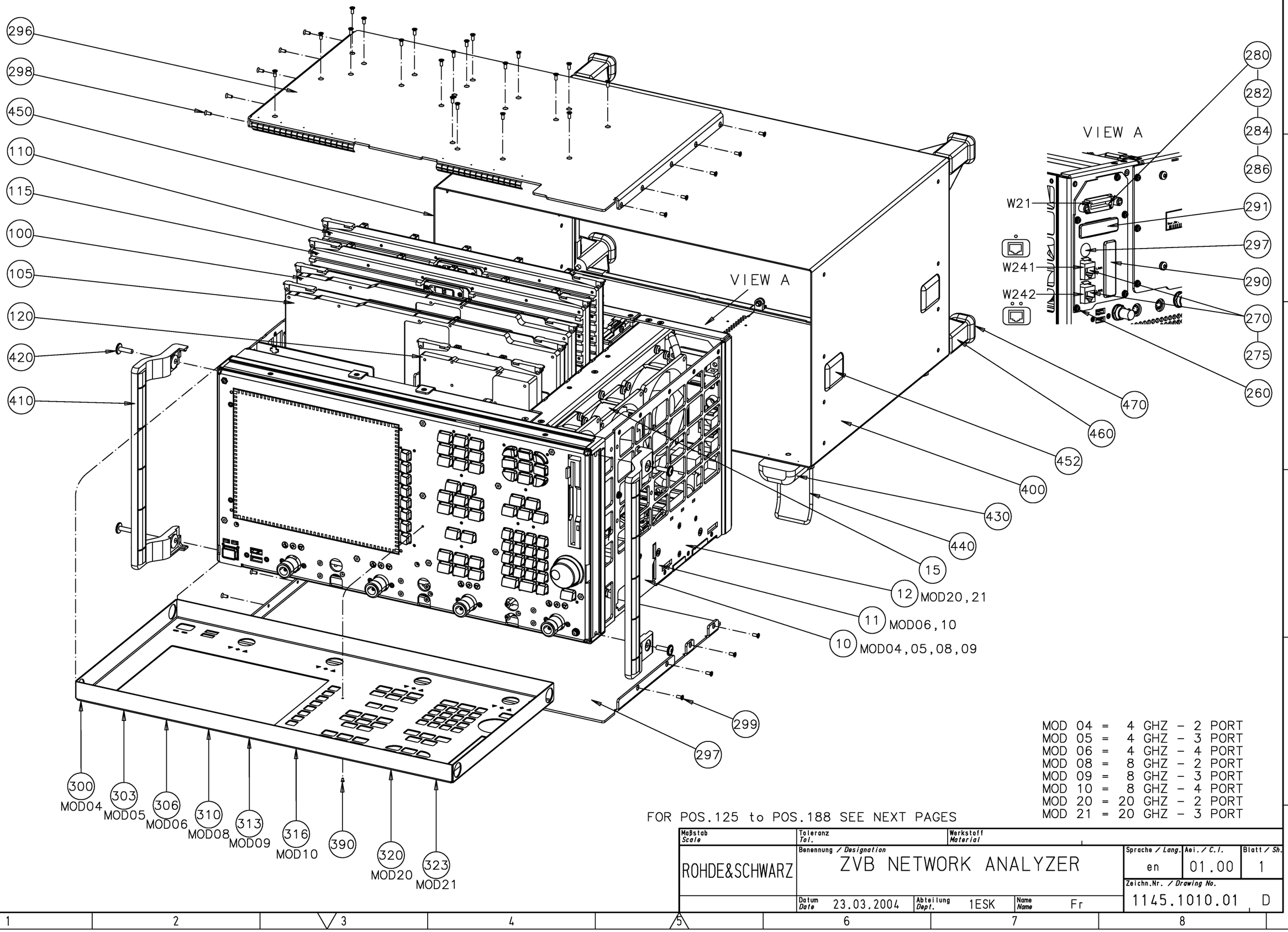
Block Circuit Diagram

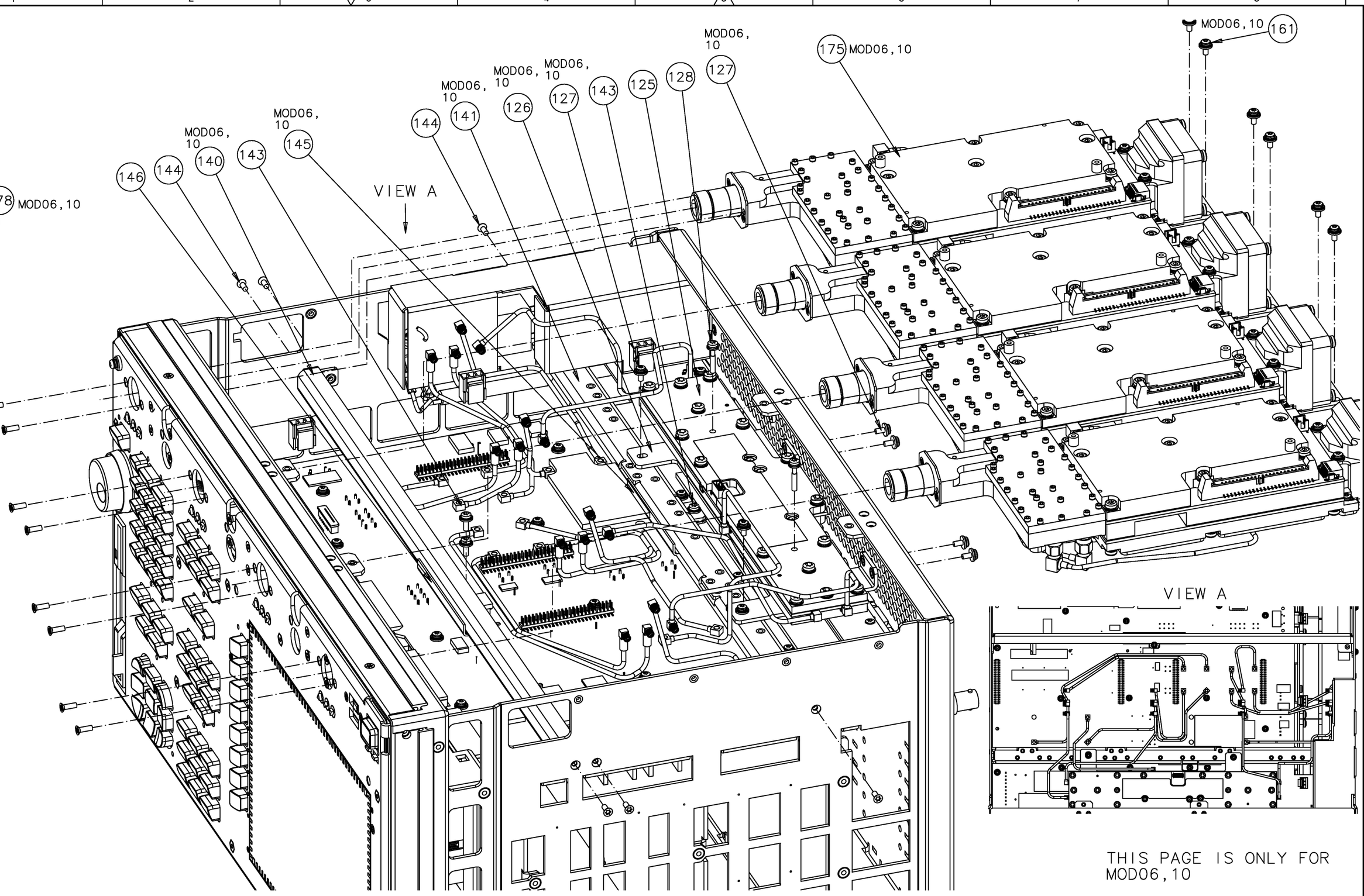


MOD 04 = 4 GHZ – 2 PORT
MOD 05 = 4 GHZ – 3 PORT
MOD 06 = 4 GHZ – 4 PORT
MOD 08 = 8 GHZ – 2 PORT
MOD 09 = 8 GHZ – 3 PORT
MOD 10 = 8 GHZ – 4 PORT
MOD 20 = 20 GHZ – 2 PORT
MOD 21 = 20 GHZ – 3 PORT

FOR POS.125 to POS.188 SEE NEXT PAGES

Projektions-methode
Projection Method

Maßstab / Scale	Toleranz / Tol.	Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: ZVB NETWORK ANALYZER		Sprache / Lang.: en	Aei. / C.I.: 01.00	Blatt / Sh.: 1
	Datum / Date: 23.03.2004	Abteilung / Dept.: 1ESK	Name / Name: Fr	Zeichn.Nr. / Drawing No.: 1145.1010.01 D	



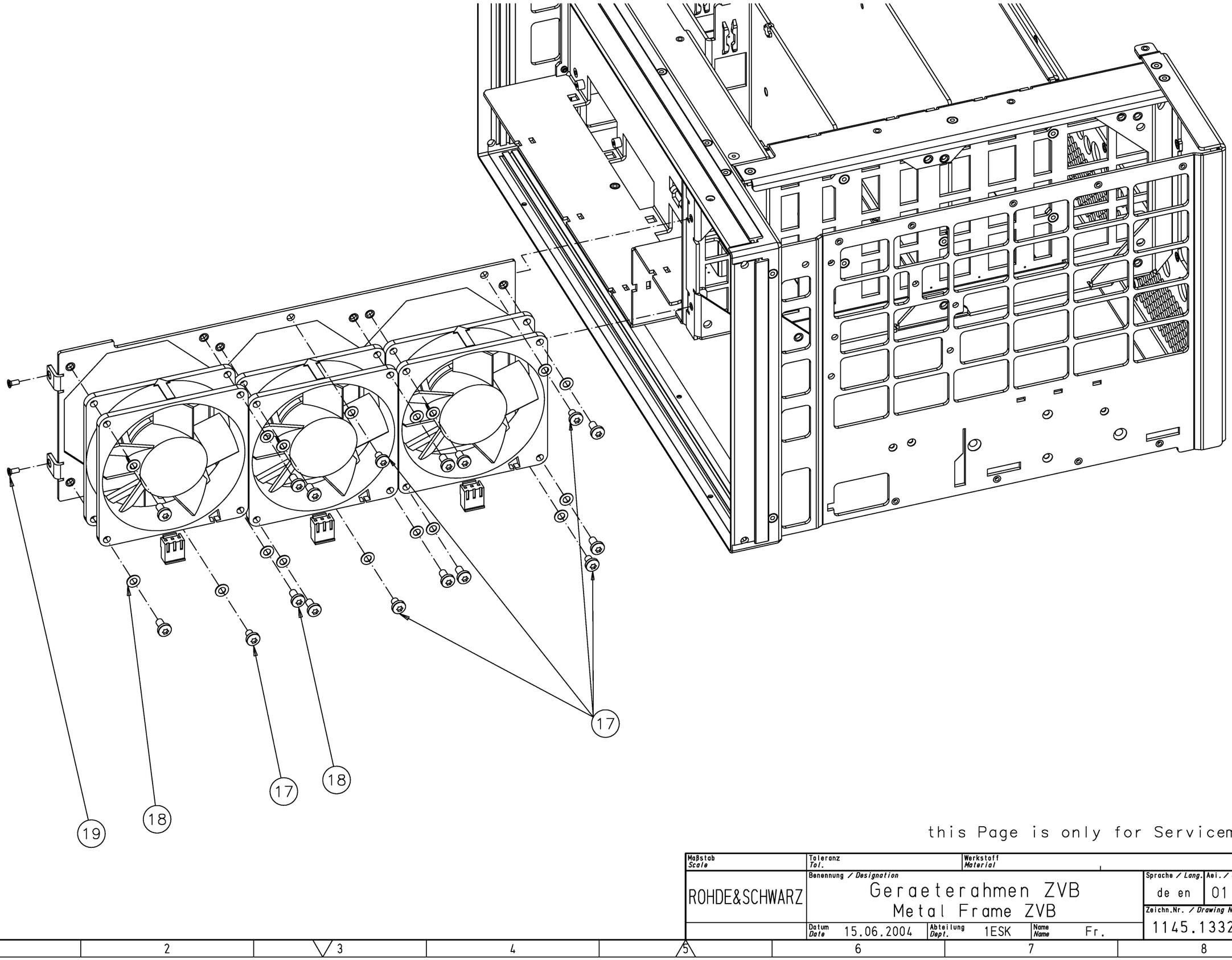
VIEW A

THIS PAGE IS ONLY FOR MOD06,10

Projektions-methode
Projection Method

(164) MOD06,10 see connector designation of cables and motherboard for cable mounting

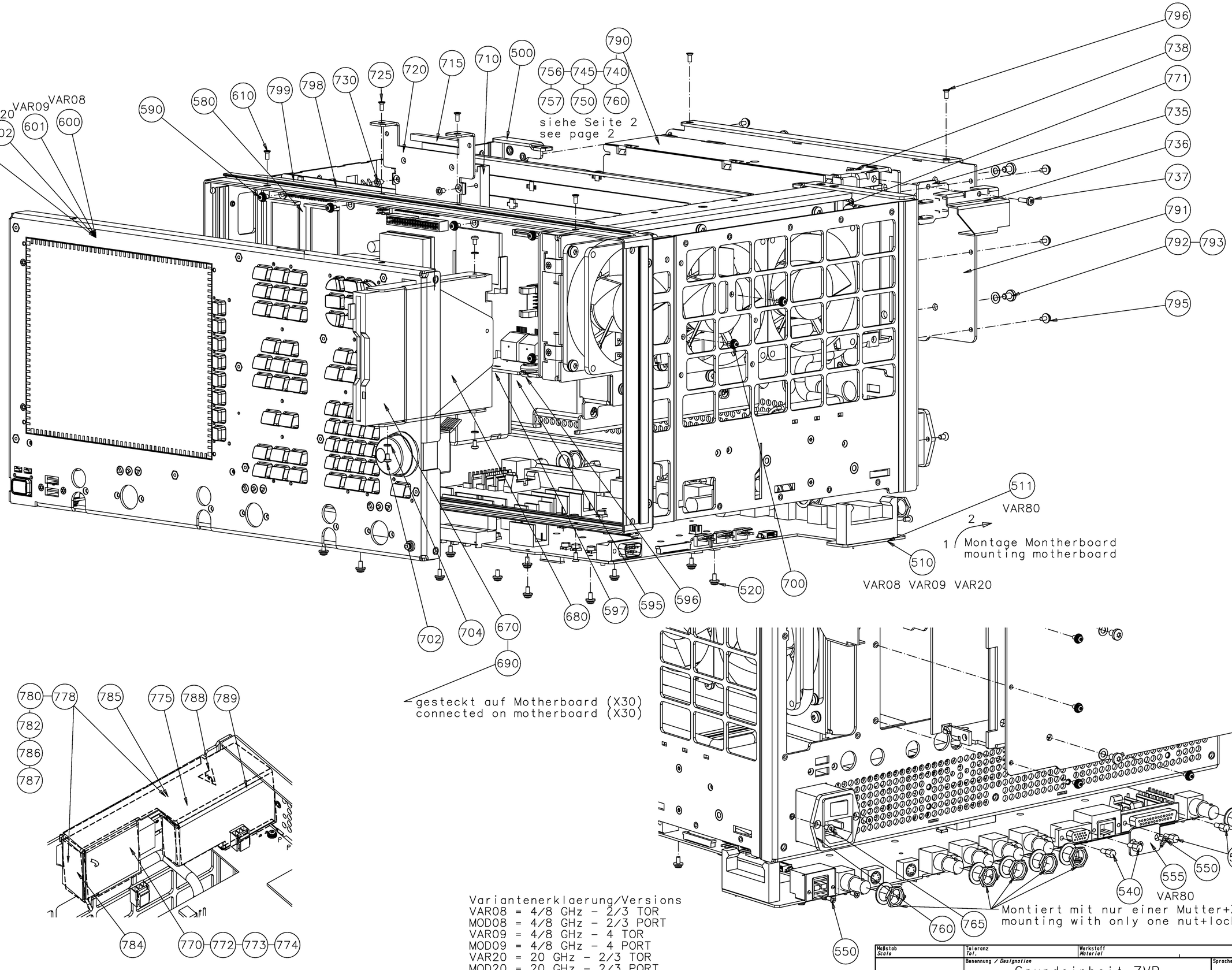
Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*		
ROHDE&SCHWARZ	Benennung / *Designation* ZVB NETWORK ANALYZER		Sprache / *Lang.* en	Aei. / *C.I.* 01.00 / Blatt / *Sh.* 2
	Datum *Date* 29.03.2004	Abteilung *Dept.* 1ESK	Name *Name* FR	Zeichn.Nr. / *Drawing No.* 1145.1010.01 D



Projektions-methode
Projection Method

this Page is only for Servicemanual

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*		
ROHDE&SCHWARZ	Benennung / *Designation* Geraeterahmen ZVB Metal Frame ZVB		Sprache / *Lang.*: de en Aei. / *C.I.*: 01.00 Blatt / *Sh.*: 2	
	Datum *Date*: 15.06.2004	Abteilung *Dept.*: 1ESK	Name *Name*: Fr.	Zeichn.Nr. / *Drawing No.*: 1145.1332.00 D



Variantenerklaerung/Versions
VAR08 = 4/8 GHz - 2/3 TOR
MOD08 = 4/8 GHz - 2/3 PORT
VAR09 = 4/8 GHz - 4 TOR
MOD09 = 4/8 GHz - 4 PORT
VAR20 = 20 GHz - 2/3 TOR
MOD20 = 20 GHz - 2/3 PORT
VAR80 = ZVI
MOD80 = ZVI

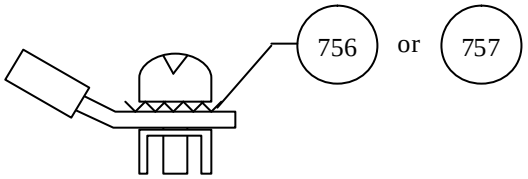
Projektions-methode
Projection Method

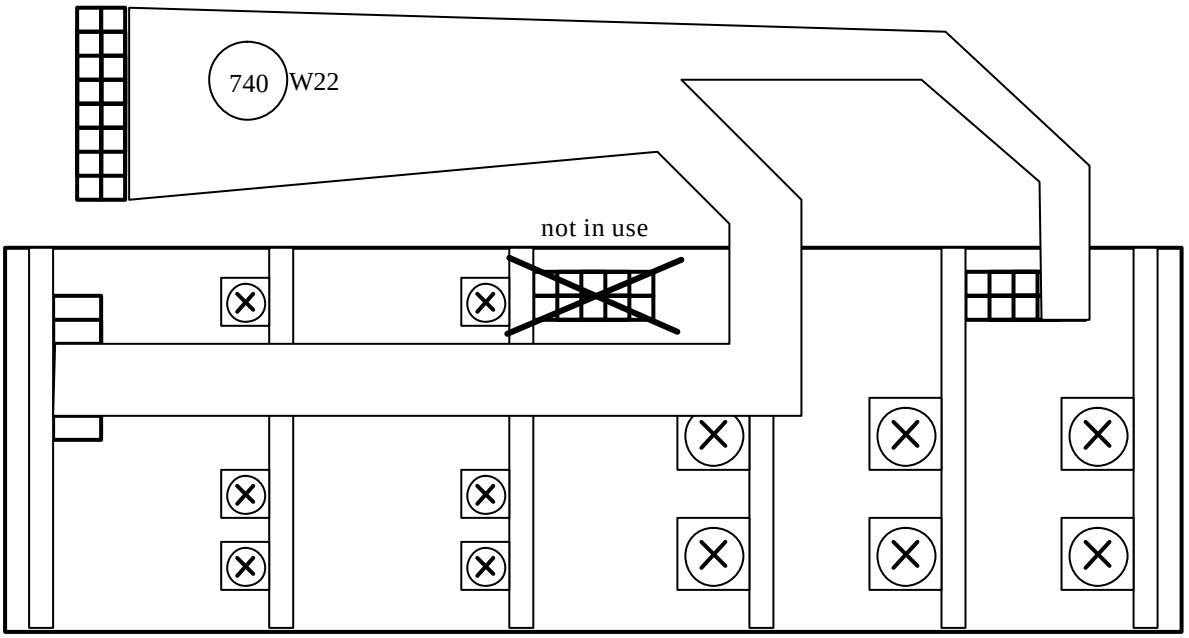
MaBstab / Scale	Toleranz / Tol.	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: Grundeinheit ZVB / Fundamental Unit		Sprache / Lang.: de en	Ael. / C.I.: 03.00	Blatt / Sh.: 1
	Datum / Date: 15.04.2003	Abteilung / Dept.: 1ESK	Name / Name: Fr	Zeichn.Nr. / Drawing No.: 1145.1290.01	D

Verdrahtungsplan Netzteil
wire connections for power supply

Pos. 755		Pos. 755		Pos. 750		Pos. 745		Pos. 750	
W25 (Cable 10p)		W25 (Cable 10p)		W24 (Cable 8p)		W23 (Cable 6p)		W24 (Cable 8p)	
12V		6,5V		8V		3,6V		5,2V	
+	+12V (red)	+	+6V (orange)						
-	GND(+12V) (black)	-	GND(+6V) (black)						
+	GND(-12V) (black)	+	GND(-6V) (black)	+	+8V (orange)	+	+3,3V (red)	+	+5V (red)
-	-12V (blue)	-	-6V (violet)	-	GND(+8V) (black)	-	GND(+3,3V) (black)	-	GND(+5V) (black)

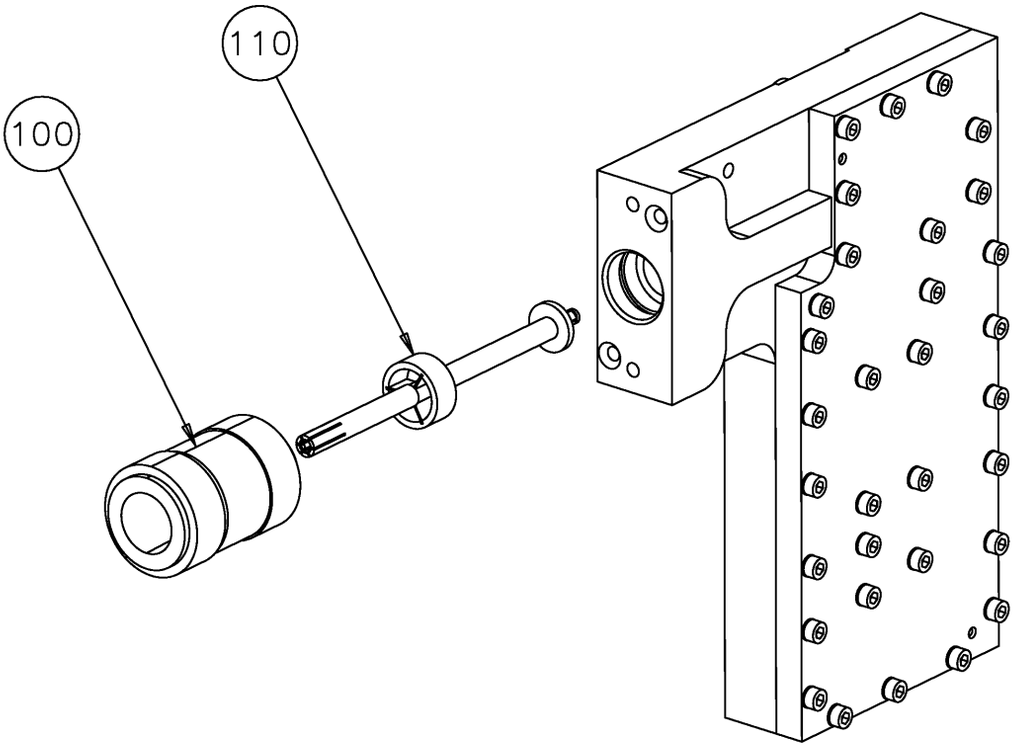
Connection for upper table:





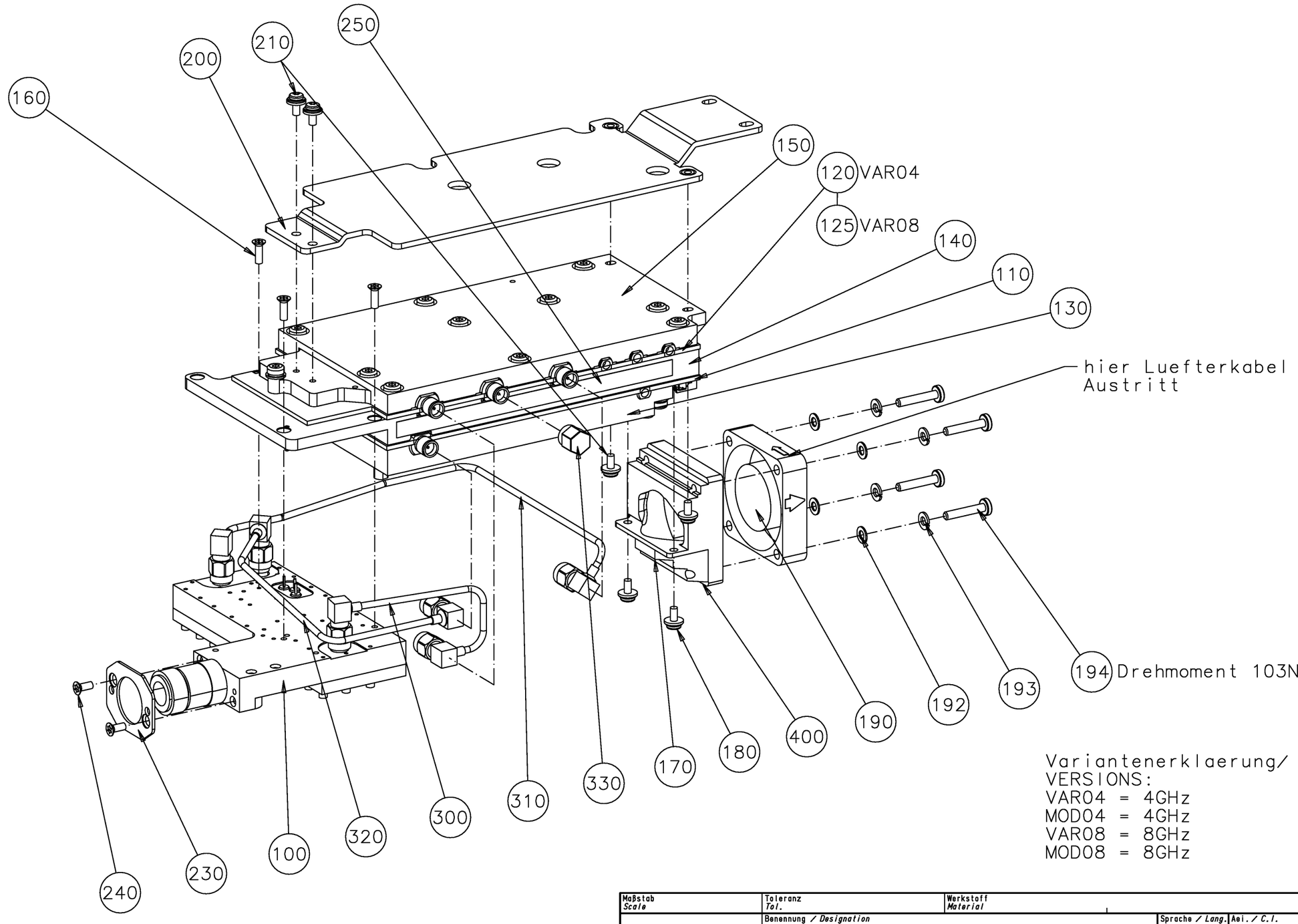
Maßstab: / *Scale:*	Toleranz: / *Tol.:*	Rauht.: /*Roughn.:*	Kanten: / *Edges:*	Werkstoff: / *Material:*	Werknormen: / *Company Standards:*

ROHDE&SCHWARZ	Benennung: *Designation:* Grundeinheit ZVB Fundamental Unit			Sprache: / *Lang.:* de	Aei: / *C.I.:* 02.00	Blatt: / *Sh.:* 2
Typ: *Type:* ZVB	Datum: *Date:* 16.01.04	Abteilung: *Dept.:* 1ESK	Name: *Name:* Fr	Zeichn. Nr.: / *Drawing Nr.:* **1145.1290.01**		
1. Z.: *used in:*						



Projektions-methode
Projection Method

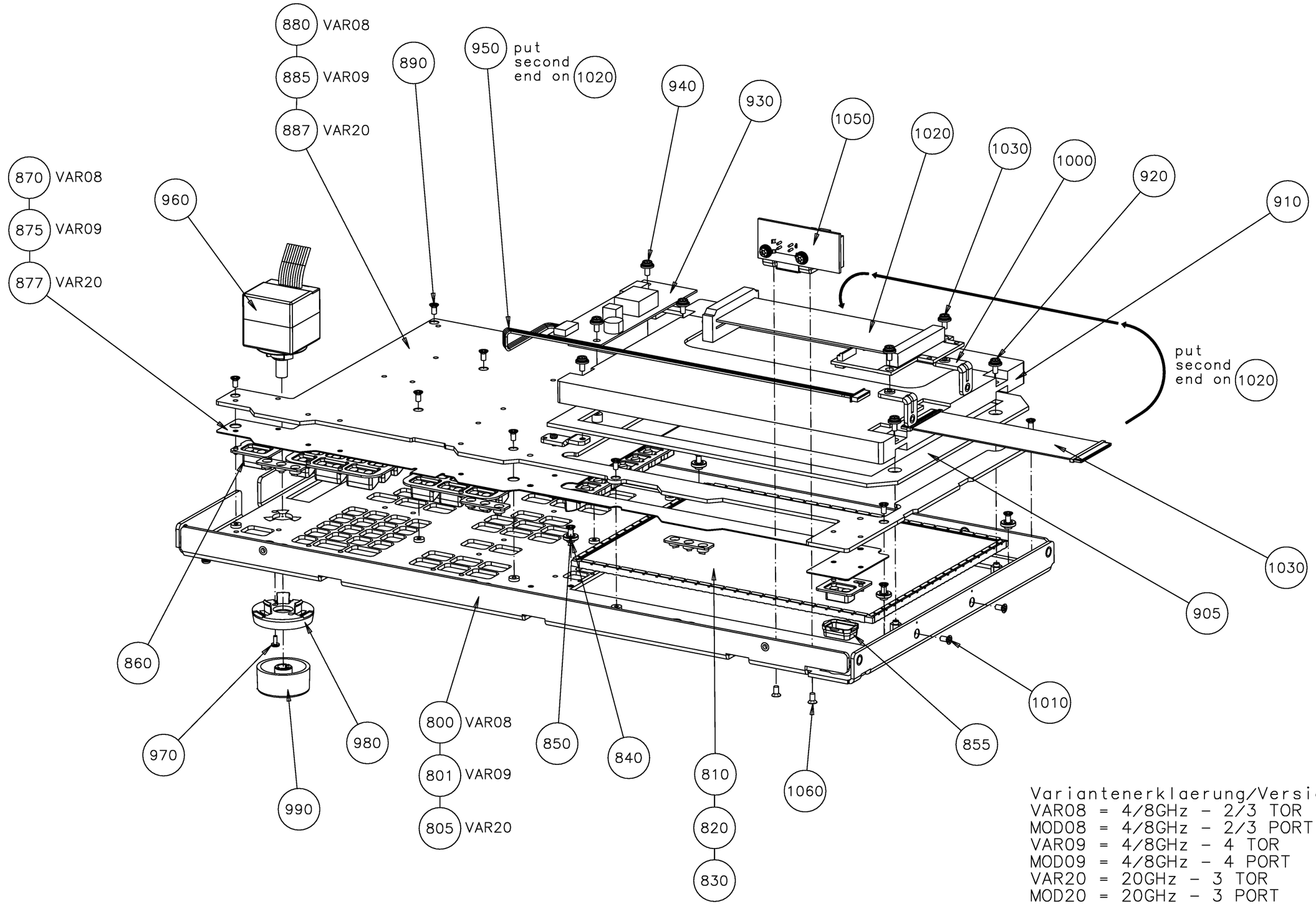
Maßstab *Scale* 1:1	Toleranz *Tol.*	Werkstoff *Material*	
ROHDE&SCHWARZ	Benennung / *Designation* RM8 BR UNIT RM8 BR UNIT	Sprache / *Lang.* de en	Aei. / *C.I.* 02.00 / Blatt / *Sh.* 3
	Datum *Date* 08.07.2004 / Abteilung *Dept.* 1ESK / Name *Name* Wn	Zeichn.Nr. / *Drawing No.* 1145.3593.01 D	



Variantenerklaerung/
VERSIONS:
VAR04 = 4GHz
MOD04 = 4GHz
VAR08 = 8GHz
MOD08 = 8GHz

Projektions-methode
Projection Method

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*		
ROHDE&SCHWARZ	Benennung / *Designation*: RM UNIT ZVB 4/8 GHz RM UNIT ZVA 4/8 GHz		Sprache / *Lang.*: de en	Aei. / *C.I.*: 02.00
	Datum *Date*: 19.03.2004	Abteilung *Dept.*: 1ESK	Name *Name*: Fr	Blatt / *Sh.*: 1
			Zeichn.Nr. / *Drawing No.*: 1145.3664.01	D

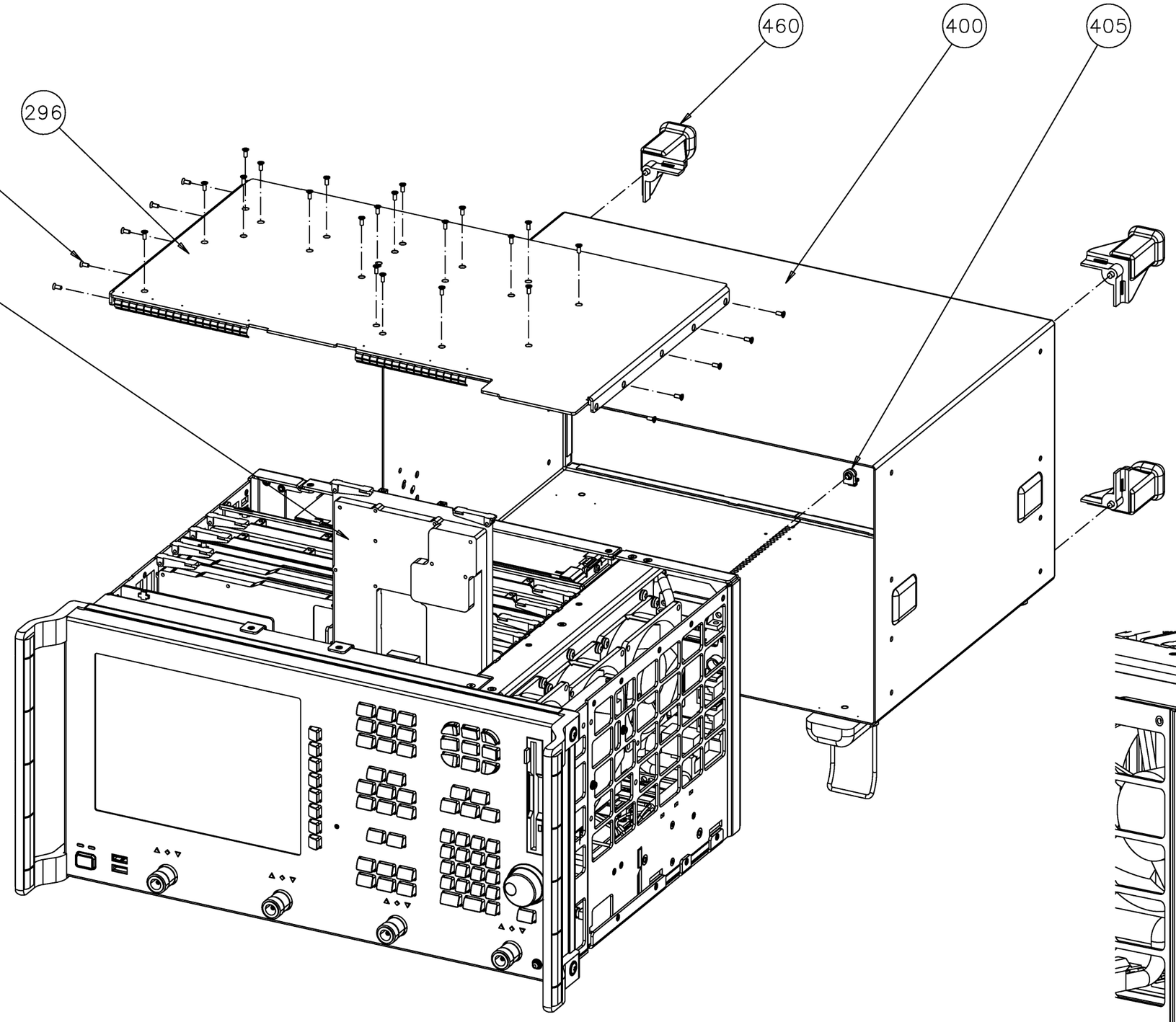


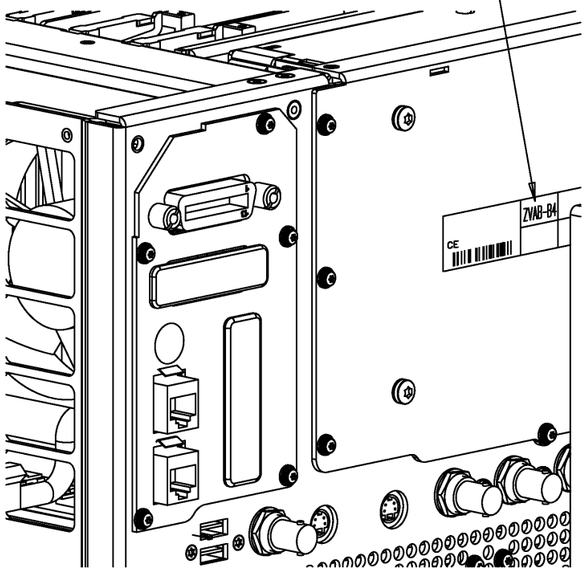
Variantenerklaerung/Versions
VAR08 = 4/8GHz - 2/3 TOR
MOD08 = 4/8GHz - 2/3 PORT
VAR09 = 4/8GHz - 4 TOR
MOD09 = 4/8GHz - 4 PORT
VAR20 = 20GHz - 3 TOR
MOD20 = 20GHz - 3 PORT

Projektions-methode
Projection Method

Maßstab *Scale* 1:2	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* Displayeinheit ZVB / Display Unit ZVB			Sprache / *Lang.* de en	Aei. / *C.I.* 01.00	Blatt / *Sh.* 1
Typ *Type* ZVB				Zeichn.Nr. / *Drawing No.* 1145.1384.01 D	
I.Z. *used in* 1145.1290.01	Datum *Date* 03.02.2003	Abteilung *Dept.* 1ESK	Name *Name* Wn		

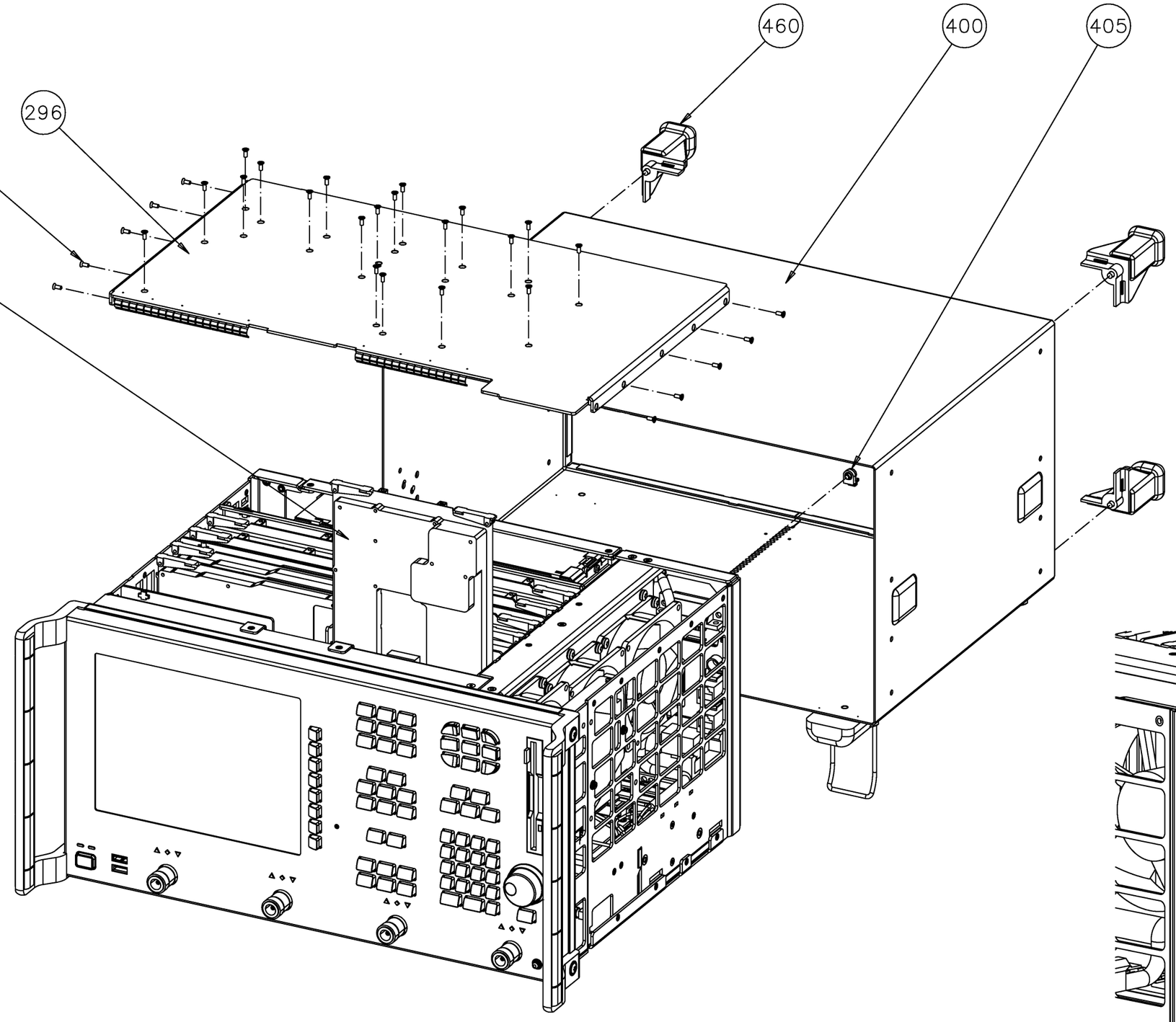
Projektions-methode
Projection Method

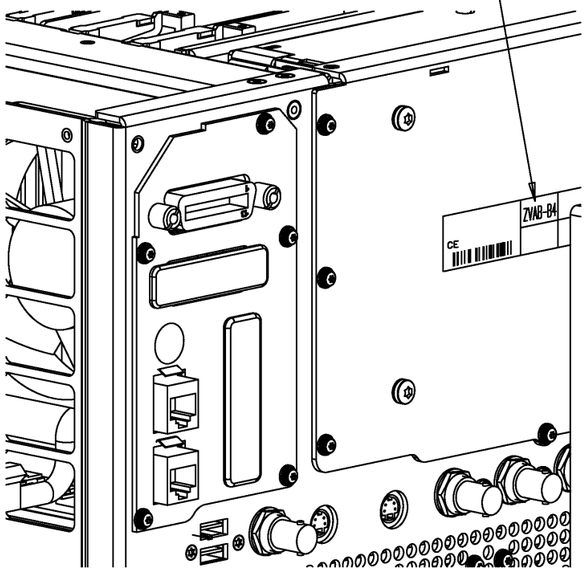




Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* Einbauanweisung ZVAB-B4 INSTALL.INSTR.ZVAB-B4			Sprache / *Lang.* en	Aei. / *C.I.* 01.00	Blatt / *Sh.* 1
	Datum *Date* 04.05.2004	Abteilung *Dept.* 1ESK	Name *Name* FR	Zeichn.Nr. / *Drawing No.* 1164.1770.00		D

Projektions-methode
Projection Method





Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* Einbauanweisung ZVAB-B4 INSTALL.INSTR.ZVAB-B4			Sprache / *Lang.* en	Aei. / *C.I.* 01.00	Blatt / *Sh.* 1
	Datum *Date* 04.05.2004	Abteilung *Dept.* 1ESK	Name *Name* FR	Zeichn.Nr. / *Drawing No.* 1164.1770.00		D

ROHDE&SCHWARZ

Circuit diagrams

A1 DISPLAY UNIT ZVB
A70 & DISPLAY TFT–LCD
T10 & INVERTER DC–AC
B10 & ROT PULS
A19 & DISPL. CONNECT FMR6–TOSHIBA
W100 &
A60 HARD DISK
W11
&W70
A100 FREQUENCY REFERENCE
MOD .02 .04 without –B4
MOD .03 .05 with –B4
OPTION ZVAB–B4 OVENQUARZ
OPTION A110 COMPACT PCI
OPTION A120 STANDARD PCI
for 3/4 Port Models only
A130 NETWORK CONTROLLER (2)
A141 NETCON DIGITAL
A142 NETCON ANALOG
A140 NETWORK CONTROLLER (1)
A150 SYNTHESIZER (2) MOD .03
A160 SYNTHESIZER (1) MOD .02
(A1) (FPGA)
Z20 (W200) (Z22)
X200 LINE IN 100..240V 47...63 Hz 450 VA
W201
A21 AC FUSE BOARD
GND
A20 POWER SUPPLY
REAR PANEL
A10 MOTHERBOARD
TEST X94
MBCON X5
A90 FRONT MODULE CONTROLLER
ISA X90
PCI X91
I/O X92
X93
& A16 FLEX. SWITCHBOARD
& A15 FLEX. SWITCH FOIL
A40 & USB
X219
W12
W241
W242
LAN1
LAN2
USB
RS232 (COM)
W640
A30 Floppy
W300
X (E1) X (E2) X (E3)
W510 W530 W540 W520
EXT TRIGGER X225
USER CONTROL X220
CASCADE X219
MONITOR X218
PORT BIAS
F6 X204 4
F3 X203 3
F4 X202 2
F5 X201 1
DC MEAS
DC MEAS –10V...+10V X212
DC MEAS –1V...+1V X211
10 MHz REF X210
X215 USB(2X)
OPTION IEC SYSTEM BUS X251
IEC BUS W21
OPTION X245
OPTION AUX X230
W245
W230
W242 X242 LAN2
W241 X241 LAN1

LO DIVIDER
A600 / X10 — W640 / 12
A600 / X3 — W156 LO–DIVIDER for 4Port Models only
A600 / X3 — W165 LO–DIV for 2Port Models only

W136 RM3_IF_MEAS — to A530 X8 X9
W137 RM3_IF_REF — to A530 X8 X9
to A530 / X16 — W530
to A530 / X11 — W165 PORT3 RM–SOURCE for 4Port Models only

W146 RM1_IF_MEAS — to A510 X8 X9
W147 RM1_IF_REF — to A510 X8 X9
to A510 / X16 — W510
to A510 / X11 — W166 PORT1 RM–SOURCE for 4Port Models only
to A510 / X11 — W168 PORT1 RM–SOURCE for 2Port Models only

W139 RM4_IF_MEAS — to A540 X8 X9
W138 RM4_IF_REF — to A540 X8 X9
to A540 / X16 — W540
to A540 / X11 — W168 PORT4 RM–SOURCE for 4Port Models only

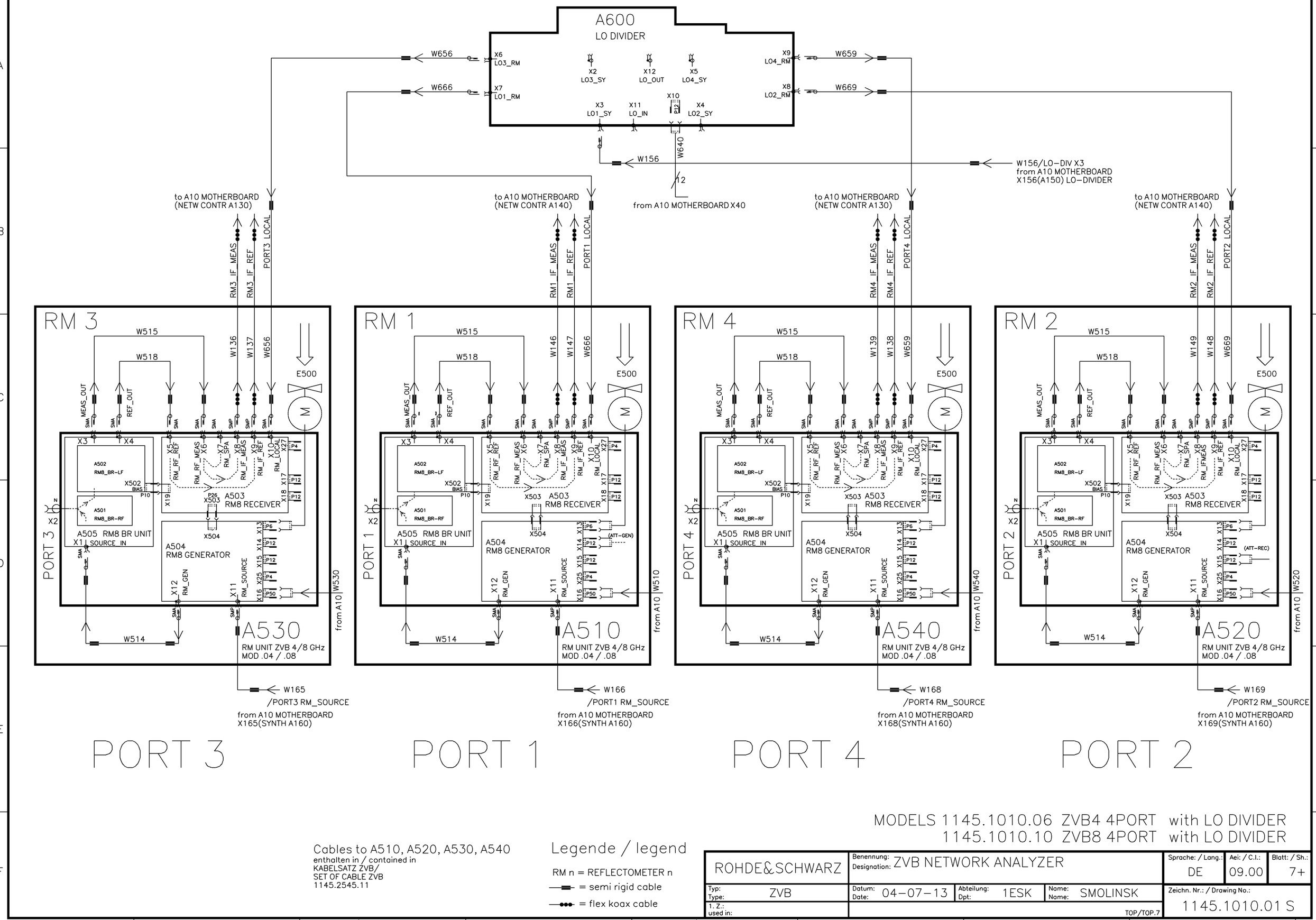
W149 RM2_IF_MEAS — to A520 X8 X9
W148 RM2_IF_REF — to A520 X8 X9
to A520 / X16 — W520
to A520 / X11 — W169 PORT2 RM–SOURCE

RM 3 PORT 3 for 3 Port Models only
RM 1 PORT 1
RM 4 PORT 4 for 4 Port Models only
RM 2 PORT 2

MODELS
1145.1010.04 ZVB4 2PORT with LO DIV
1145.1010.06 ZVB4 4PORT with LO DIV
1145.1010.08 ZVB8 2PORT with LO DIV
1145.1010.10 ZVB8 4PORT with LO DIV

Legende / legend
Cables to RM n
enthalten in / contained in KABELSATZ ZVB/ SET OF CABLE ZVB 1145.2545.01
RM n = REFLECTOMETER n
= semi rigid cable
= flex koax cable
* = enthalten in / contained in GRUNDEINHEIT ZVB / FUNDAMENTAL UNIT 1145.1290.01
& = enthalten in / contained in DISPLAYEINHEIT ZVB DISPLAY UNIT ZVB 1145.1384.01
X = E1, E2, E3 enthalten in / contained in GERAETERAHMEN/ DEVICE FRAME 1145.1355.00

ROHDE&SCHWARZ	Benennung: / Designation: ZVB NETWORK ANALYZER			Sprache: / Lang.: DE	Aei: / C.I.: 09.00	Blatt: / Sh.: 6+
Typ: / Type: ZVB	Datum: / Date: 04–07–13	Abteilung: / Dpt: 1ESK	Name: / Name: SMOLINSK	Zeichn. Nr.: / Drawing No.: 1145.1010.01 S		
1. Z.: used in:	TOP/TOP.6					



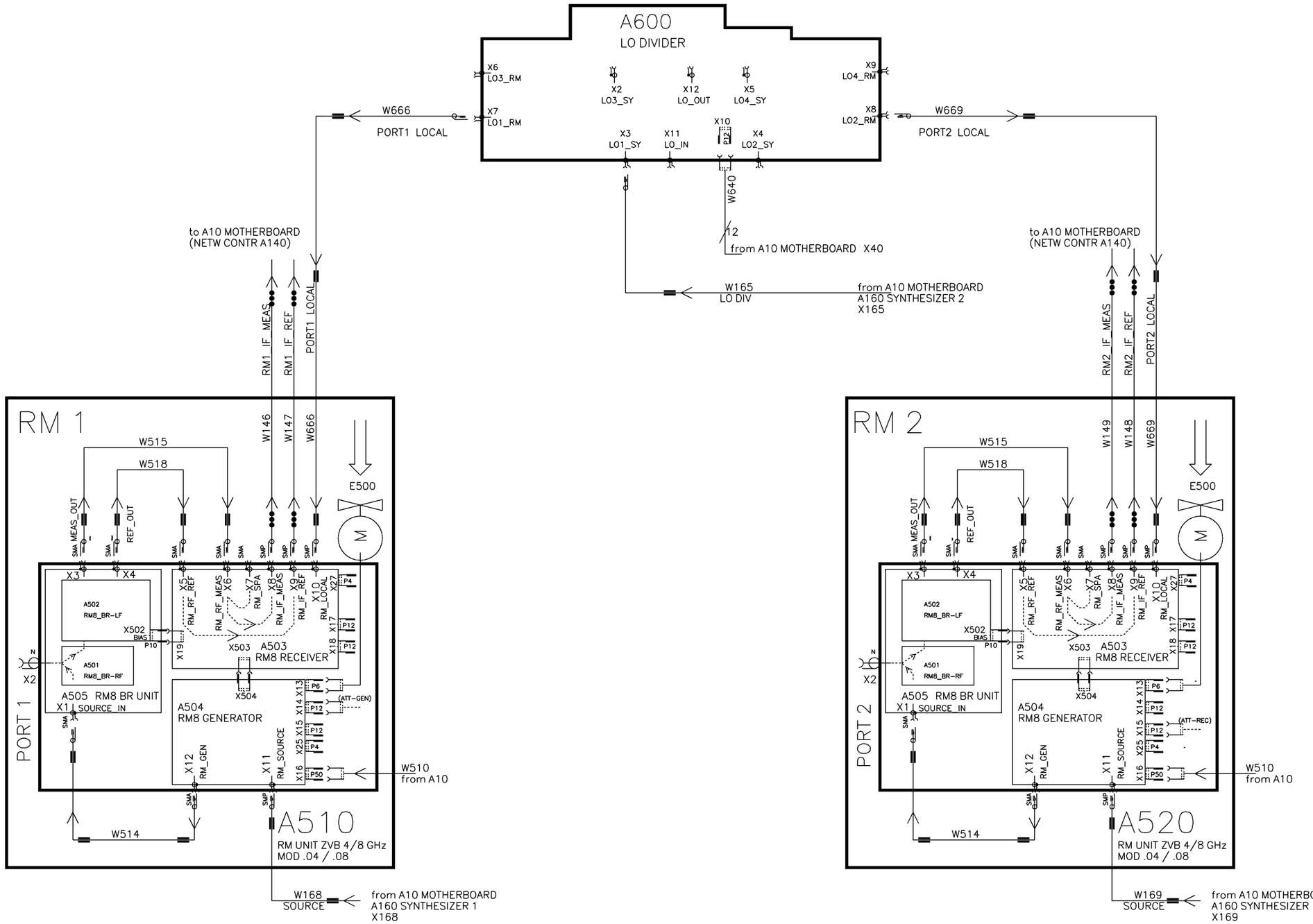
Cables to A510, A520, A530, A540
enthalten in / contained in
KABELSATZ ZVB/
SET OF CABLE ZVB
1145.2545.11

Legende / legend

RM n = REFLECTOMETER n
= semi rigid cable
= flex koax cable

MODELS 1145.1010.06 ZVB4 4PORT with LO DIVIDER
1145.1010.10 ZVB8 4PORT with LO DIVIDER

ROHDE&SCHWARZ	Benennung: / Designation: ZVB NETWORK ANALYZER				Sprache: / Lang.: DE	Aei: / C.I.: 09.00	Blatt: / Sh.: 7+
Typ: / Type: ZVB	Datum: / Date: 04-07-13	Abteilung: / Dpt: 1ESK	Name: / Name: SMOLINSK		Zeichn. Nr.: / Drawing No.: 1145.1010.01 S		
1. Z.: used in:	TOP/TOP.7						



Ext Cables to A510, A520
enthalten in / contained in
KABELSATZ ZVB/
SET OF CABLE ZVB
1145.2545.18

Legende / legend

RM n = REFLECTOMETER n

= semi rigid cable

= flex koax cable

MODELS
1145.1010.04 ZVB4 2PORT with LO DIVIDER
1145.1010.08 ZVB8 2PORT with LO DIVIDER

ROHDE&SCHWARZ	Benennung: / Designation: ZVB NETWORK ANALYZER			Sprache: / Lang.: DE	Aei: / C.I.: 09.00	Blatt: / Sh.: 9–
Typ: / Type: ZVB	Datum: / Date: 04–07–13	Abteilung: / Dpt: 1ESK	Name: / Name: SMOLINSK	Zeichn. Nr.: / Drawing No.: 1145.1010.01 S		
1. Z.: / used in:	TOP/TOP.9					