R&S®FSWP
Phase Noise Analyzer
Service Manual

1177.5627.02 – 10

Service Manual

ROHDE&SCHWARZ

The Service Manual describes the following R&S®FSWP models

- R&S®FSWP8 (1322.8003.08)
- R&S®FSWP26 (1322.8003.26)
- R&S®FSWP50 (1322.8003.50)

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1 Documentation Overview

This section provides an overview of the R&S FSWP user documentation. Unless specified otherwise, you find the documents on the R&S FSWP product page at: www.rohde-schwarz.com/manual/fswp

1.1 Getting Started Manual

Introduces the R&S FSWP and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc.

A printed version is delivered with the instrument. A PDF version is available for download on the Internet.

1.2 User Manuals and Help

Separate user manuals are provided for the base unit and the software options:

- Base unit manual
  Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.

- Manuals for (optional) firmware applications
  Contains the description of the specific functions of an option. Basic information on operating the R&S FSWP is not included.
  The contents of the user manuals are available as help in the R&S FSWP. The help offers quick, context-sensitive access to the complete information for the base unit and the software options.
  All user manuals are also available for download or for immediate display on the Internet.

1.3 Service Manual

Describes the performance test for checking the rated specifications, module replacement and repair, firmware update, troubleshooting and fault elimination, and contains mechanical drawings and spare part lists.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS): https://gloris.rohde-schwarz.com

1.4 Instrument Security Procedures

Deals with security issues when working with the R&S FSWP in secure areas. It is available for download on the Internet.

1.5 Basic Safety Instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

1.6 Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S FSWP. It also lists the options and their order numbers, and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/fswp

1.7 Release Notes and Open Source Acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The open source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/fswp

1.8 Application Notes, Application Cards, White Papers, etc.

These documents deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/fswp

2 Performance Test

2.1 Test Equipment

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
1	Signal generator	R&S FSWP 8: 10 kHz to 8 GHz R&S FSWP 26: 10 kHz to 26.5 GHz R&S FSWP 50: 10 kHz to 50 GHz Frequency Error < 1e-9	R&S SMA100B with options depending on frequency range and LF output	1419.8888.02	Reference frequency uncertainty Display linearity
2	Signal generator	R&S FSWP 8: 10 MHz to 8 GHz R&S FSWP 26: 10 MHz to 26 GHz R&S FSWP 50: 10 MHz to 50 GHz For all models: generator output level > +10 dBm	R&S SMA100B with high power option	1419.8888.02	Immunity to interference Nonlinearities Frequency response
4	Power splitter* 2-resistor design *or* Power combiner** 3-resistor design	R&S FSWP 8: 10 MHz to 8 GHz R&S FSWP 26: 10 MHz to 26 GHz R&S FSWP 50: 10 MHz to 50 GHz level imbalance 10 MHz to 26.5 GHz: ≤ 0.3dB 26.5 GHz to 50 GHz: ≤ 0.5 dB 50 GHz to 67 GHz: ≤ 1.8 dB equivalent output SWR 10 MHz to 3.6 GHz: ≤ 1.1 3.6 GHz to 26.5 GHz:≤ 1.3 26.5 GHz to 50 GHz: ≤ 1.7 50 GHz to 67 GHz: ≤ 3.11	Keysight 11667A Weinschel 1870A *or* Keysight 11636A Keysight 11667B Weinschel WA1534 *or* Keysight 11636B Keysight 11667C *or* Keysight 11636C		Frequency response* Third order intercept**
5	50-Ohm termination	Frequency Range from DC to the maximum Frequency of the FSWP	Anritsu 28N50-2 (N/m, 18 GHz) Anritsu 28SF50-1 (3.5 mm/f, 26 GHz) Anritsu 28VF50D (1.85 mm/f, 70 GHz)		Noise display

6	Power meter	−30 dBm to +10 dBm	R&S NRX	1424.7005.02	Frequency response, LO output power
7	Power sensor	9 kHz to 7 GHz −30 dBm to 0 dBm	R&S NRP18T	1424.6115.02	Frequency response
8	Power sensor	R&S FSWP 8/26 DC to 33 GHz −30 dBm to 0 dBm R&S FSWP 50 DC to 50 GHz	R&S NRP33T R&S NRP50T	1424.6138.02 1424.6137.02	Frequency response, R&S FSWP-B21 LO output power
9	Step attenuator	variable attenuation 0 dB to 100 dB, 1-dB steps attenuation uncertainty < 0.1 dB (f = 128 MHz)	R&S RSG with special calibration R&S RSC	1009.4505.02 0859.4822.00 1313.8004.03	Display linearity RF attenuator Reference level switching
10	Fixed Attenuator	fixed attenuation 10 dB	Anritsu 43KC-10		LO output power R&S FSWP-B21
11	Network analyzer	R&S FSWP 8: 20 MHz to 8 GHz R&S FSWP26: 20 MHz to 26.5 GHz R&S FSWP50: 20 MHz to 40 GHz	R&S ZVA or R&S ZNB	1145.1110.10 1145.1110.24 1145.1110.40	VSWR
12	AC Voltmeter	2 Hz to 9 kHz	R&S URE2	0350.5315.02	Troubleshooting tests
13	50 Ω termination	BNC, 50 Ω ± 0.1 %	RAD 50	0844.9352.02	frequency response
15	DC multimeter	Voltage max. ±30 V voltage accuracy < ±0.01 mV current max. 2000 mA current accuracy < ±0.3 mA	Keysight 34401A or Keysight 34461A		Troubleshooting tests
16	Signal Source 1GHz or 640 MHz	< −105 dBc/Hz @ 100 Hz < −130 dBc/Hz @ 1 kHz < −140 dBc/Hz @ 10 kHz < −150 dBc/Hz @ 100 kHz < −150 dBc/Hz @ 1 MHz	R&S SMA100B incl. option SMAB-B711	1419.8888.02 1420.8020.02	Phase Noise of spectrum analyzer option R&S FSWP-B1
23	Low Phase Noise Reference 100 MHz Output Level ≥ +13 dBm	Phase Noise @1 Hz < −80 dBc(Hz) @10 Hz < −110 dBc(Hz) @100 Hz < −138 dBc(Hz) @1 kHz < −160 dBc(Hz) @10 kHz < −176 dBc(Hz) @100 kHz < −180 dBc(Hz) @1 MHz < −180 dBc(Hz)	R&S LPNR100	5026.6520.03	Phase Noise Sensitivity Test

24	Low pass filter set	9 MHz 21 MHz, 106 MHz, 274 MHz, 450 MHz, 700 MHz, 1 GHz, 1.5 GHz, 1.75 GHz, 3.5 GHz			2nd order harmonic distortion
25	Vector signal generator	Signal frequency 100 MHz; including ARB baseband generator	R&S SMBV100B +SMBVB-B103 or R&S SMW200A +SMW-B10	1423.1003.02 1423.6270.02 or 1412.0000.02 1413.1200.02	Phase noise measurement uncertainty test

2.2 Performance Test R&S FSWP

2.2.1 Checking the Return Loss at the RF Input

Test equipment: Network analyzer (Section "Test Equipment", item 11)

Test setup: ► Connect the test port of the network analyzer to the RF input of the R&S FSWP.

Remarks:

- Connect reference input of R&S FSWP to the master reference signal.
- For R&S ZVA models, adjust bandwidth to 500 Hz.
- For R&S ZNB models adjust bandwidth to 1 kHz.

R&S FSWP settings:

R&S FSWP8 without option R&S FSWP-B1 :

- No measurement since VSWR value is nominal in the data sheet.

R&S FSWP26/50 or R&S FSWP8 with option R&S FSWP-B1 :

- [PRESET]

- [Mode : Phase Noise]

- [AMPT : RF ATTEN MANUAL : {Att_{FSWP}}]

Measurement: ► See operating manual of the network analyzer for detailed information about S_{11} measurement. The R&S FSWP has to be set to the test frequency.

R&S FSWP26/ 50 or R&S FSWP8 with option R&S FSWP-B1 :

► Determine S_{11} of the R&S FSWP input with the following setting of the RF attenuator and input set to DC coupling:

Att_{FSWP} = 5 dB, 10 dB, 20 dB, 40 dB

► Determine S_{11} of the R&S FSWP input with the following setting of the RF attenuator and input set to AC coupling:

Att_{FSWP} = 10 dB

Test frequencies F_{in} = 10 MHz to 8 GHz >101 points,

R&S FSWP26: additional from Fin = 8 GHz to 26.5 GHz >201 points,

R&S FSWP50: additional from Fin = 8 GHz to 40 GHz >201 points,

Test limits according to data sheet.

2.2.2 Checking the RF Attenuator Uncertainty – PN Mode

This test has only to be performed for the instruments FSWP26 and FSWP50 *without* option FSWP-B1!

Test equipment: Signal generator (Section "Test Equipment", item 1)

Frequency 128 MHz

Maximum level ≥ +10 dBm

Step attenuator (Section "Test Equipment", item 9)

Frequency 128 MHz

Attenuation 0 to 80 dB in 5 dB steps

Attenuation uncertainty < 0.1 dB

Test setup:

- Connect RF output of the signal generator to RF input of the step attenuator
- Connect RF output of the step attenuator to RF input of the R&S FSWP

Signal generator settings:

- Frequency 128.1 MHz
- Level +10 dBm

R&S®FSWP settings:

- [**PRESET**]
- [Password „894129“]
- [**MODE** : IQ Analyzer]
- [**FREQ** : CENTER : **128.1 MHz**]
- [**MEAS CONFIG** : Data Acquisition : Sample Rate : **10.0 kHz**]
- [**MEAS CONFIG** : Data Acquisition : Analysis Bandwidth (ABW) : **8.0 kHz**]
- [**MEAS CONFIG** : Data Acquisition : Meas Time : **100 ms**]
- [**MEAS CONFIG** : Data Acquisition : Record Length : **1000**]
- [**TRACE** : DETECTOR : RMS]
- [**TRACE** : MODE : AVERAGE]
- [**SWEEP** : SWEEP COUNT : 10]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : Ref Level : +1**0 dBm**]

Step attenuator settings:

- Attenuation $\boldsymbol{ATT}_{\mathrm{STEP}} = 80\ \mathrm{dB} - \boldsymbol{ATT}_{\mathrm{FSWP}}$

where $\boldsymbol{ATT}_{\mathrm{STEP}}$ is the attenuation of the step attenuator and $\boldsymbol{ATT}_{\mathrm{FSWP}}$ is the attenuation of the R&S FSWP instrument ranging from 0 dB to 70 dB in steps of 5 dB.

Reference measurement:

- Step attenuator $\boldsymbol{ATT}_{step}$ = 70 dB and RF ATTEN MANUAL $\boldsymbol{ATT}_{FSWP}$ = 10 dB.
- before Run single: wait 20 sec. then Run single and read Marker value.

---> reference value @ RF ATTEN MANUAL $\boldsymbol{ATT}_{FSWP}$ = 10 dB:
REF10DB = (Marker Reading)@10dB

R&S®FSWP settings:

- [**AMPT** : RF ATTEN MANUAL : {$\boldsymbol{ATT}_{FSWP}$}]
- [**MKR** ⇒ : PEAK]

See table below for values of $\boldsymbol{ATT}_{FSWP}$.

Evaluation:

error/dB = (Marker Reading)@$\boldsymbol{ATT}_{FSWP}$ – *REF10DB* – $\boldsymbol{ATT}_{FSWP}$ + 10

Note: For R&S FSWP instruments without option B1 (spectrum analysis) there are no specifications for the RF attenuator uncertainty in the instruments data sheet. Therefore, the evaluation result is simply a PASS or FAIL.

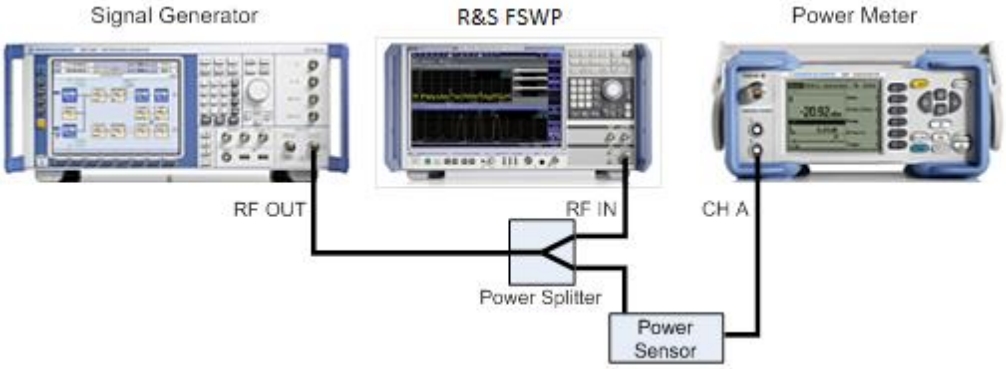
Test limits:

a_{FSWP}	Limits for ***error***/dB
0 dB	± 0.3 dB
5 dB	± 0.3 dB
10 dB	± 0.3 dB (*reference*)
15 dB	± 0.3 dB
20 dB	± 0.3 dB
25 dB	± 0.3 dB
30 dB	± 0.3 dB
35 dB	± 0.3 dB
40 dB	± 0.3 dB
45 dB	± 0.3 dB
50 dB	± 0.3 dB
55 dB	± 0.3 dB
60 dB	± 0.3 dB
65 dB	± 0.3 dB
70 dB	± 0.3 dB

2.2.3 Frequency Measurement Test

Test setup:

- ► Standardize the Power Meter and Power Sensor (item 6, 7, 8).
- ► Use Power Splitter/Combiner (item 4) and connect equipment as shown below.
- ► Connect the power splitter directly to the R&S FSWP RF input.
- ► Connect reference input of R&S FSWP to the master reference signal.



Important Note:
Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:

- Level see setting table
- Frequency {center}

R&S FSWP settings:

- [PRESET]
- [Internal Reference]
- [Password „894129“]
- [MODE IQ Analyzer]
- [Meas Config : Signal Source State : ON] // ← this command is only for instruments with option FSWP-B1

// If firmware version 1.60 or lower is installed:

- [Data Acquisition: Sample Rate 10 kHz, Record Length 2001]
- [Sweep Config: Sweep Points : 2001]
- [SWEEP : SINGLE]

// If firmware version 1.70 or higher is installed:

//Turn on UDC processing to enable higher marker resolution
- [INP:SSA:UDC:STAT 1]

//Set data acquisition and advanced Fourier transformation parameters:

For input frequencies ≤ 1 GHz:
- [Sample Rate: 100 Hz; Record Length: 100; FFT Length = Sweep Points: 65536]

For 1 GHz < input frequencies ≤ 8 GHz
- [Sample Rate: 1 kHz; Record Length: 1000; FFT Length = Sweep Points: 65536]

For input frequencies > 8 GHz
- [Sample Rate: 10 kHz; Record Length: 10000; FFT Length = Sweep Points: 65536]

- [SWEEP : SINGLE]

Measurement:
- ► Set the generator frequency according to the table below.
- ► Adjust the signal generator output level until the Power Meter shows the level according to the setting table.
- ► Switch Signal Source HwChannel to 1
- ► Start a Sweep of the R&S FSWP
- ► Read out the signal frequency of the R&S FSWP

Evaluation: Calculate the frequency deviation according to the following formula for HwChannel 1:

Frequency Deviation = Generator Frequency − R&S FSWP Frequency Reading

Setting table:

	Signal Level	Input frequency
R&S FSWP8/26/50	−20 dBm ± 0.5 dB	10 MHz
		100 MHz
		1 GHz
		2 GHz
		3 GHz
		4 GHz
		5 GHz
		6 GHz
		7 GHz
		7.999 GHz
R&S FSWP26/50	−20 dBm ± 1 dB	8.001 MHz
		16 GHz
		26 GHz
R&S FSWP50	−20 dBm ± 1 dB	32 GHz
		34 GHz
		50 GHz

Testlimits : Standard: ± (10 Hz + 0.1 ppm of signal frequency)

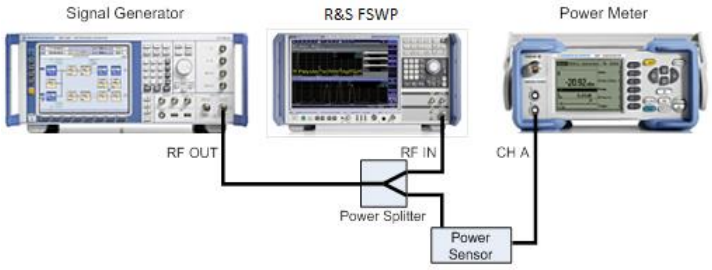
With option R&S FSWP-B4 or
option R&S FSWP-B61: ± (10 Hz + 0.05 ppm of signal frequency)

For specification: see data sheet

2.2.4 Power Measurement Uncertainty Test

Test setup:

- ► Standardize the Power Meter and Power Sensor (item 6, 7, 8).
- ► Use Power Splitter/Combiner (item 4) and connect equipment as shown below.
- ► Connect the power splitter directly to the R&S FSWP RF input.
- ► Connect reference input of R&S FSWP to the master reference signal.



Important Note
Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:

- Level see setting table
- Frequency {center}

R&S FSWP settings:

- [PRESET]
- [Internal Reference]
- [Password „894129“]
- [MODE IQ Analyzer]
- [Meas Config : Signal Source State: ON]
- [SETUP : MORE : SERVICE : SERVICE FUNCTION : 2.26.1.6.1.5]
- [SETUP : MORE : SERVICE : SERVICE FUNCTION : 2.3.16.20.3]

(With the above Service Functions the synthesizer is switched to the proper mode. The functions shall be reset after the test sequence with “2.0.0”.)

- [Data Acquisition: Sample Rate 10 kHz, Record Length 2001]
- [Sweep Config: Sweep Points : 2001]
- [AMPT : RF Atten : 10 dB]
- [SWEEP : SINGLE]

Measurement:

- ► Set the generator frequency according to the table below
- Adjust the signal generator output level until the power meter reading is
  −10 dBm ± 0.5 dB
- ► Switch Signal Source HwChannel to 1
- ► Start a Sweep of the R&S FSWP
- ► Read out the signal power of the R&S FSWP

Evaluation: Calculate the test result by using the following formula for HwChannel 1:

Test result (dB) = R&S FSWP Power Reading – Power Meter Reading

Setting table:		Signal Level	Input frequency
	R&S FSWP8/26/50	−10 dBm ± 2 dB	10 MHz
			20 MHz
			30 MHz
			50 MHz
			100 MHz
			200 MHz
			300 MHz
			500 MHz
			1 GHz
			2 GHz
			4 GHz
			5 GHz
			6 GHz
			7 GHz
			8 GHz
	R&S FSWP26/50	−10 dBm ± 2 dB	8.1 GHz
			10 GHz
			12 GHz
			14 GHz
			16 GHz
			18 GHz
			20 GHz
			22 GHz
			24 GHz
			26.4 GHz
	R&S FSWP50	−10 dBm ± 2 dB	28 GHz
			30 GHz
			35 GHz
			40 GHz
			45 GHz
			49.9 GHz
Testlimits:	+20°C to +30°C: according to data sheet		

2.2.5 Phase Noise Measurement Uncertainty Test

Test equipment: Generator with IQ modulator (see “Test Equipment”, item 25)

Signal frequency 100 MHz

Signal generator settings:
- Level 0 dBm
- Frequency 100 MHz
- Load the file “`PhaseNoise.wv`” into the ARB Waveform Generator
- With the SMW200A: switch the I/Q Modulator Optimization Mode to “Fast”
- Switch the ARB on

Remark: Connect reference input of R&S FSWP to the master reference signal.

Due to the digital modulation and the high resolution of the ARB, the output signal of the signal generator has a very accurate phase noise spectrum.

R&S FSWP settings:
- [PRESET]
- [MODE Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [Signal Frequency : 100 MHz]
- [Start Offset : 100 Hz]
- [Stop Offset : 3 MHz]
- [Spur suppression : ON]
- [Smoothing : 1%]
- [RBW : 10%]
- [Xcorr Factor : 500]
- [SETUP : MORE : SERVICE : PASSWORD : 894129]
- [SETUP : MORE : SERVICE : SERVICE FUNCTION : 2.27.4.4.1]

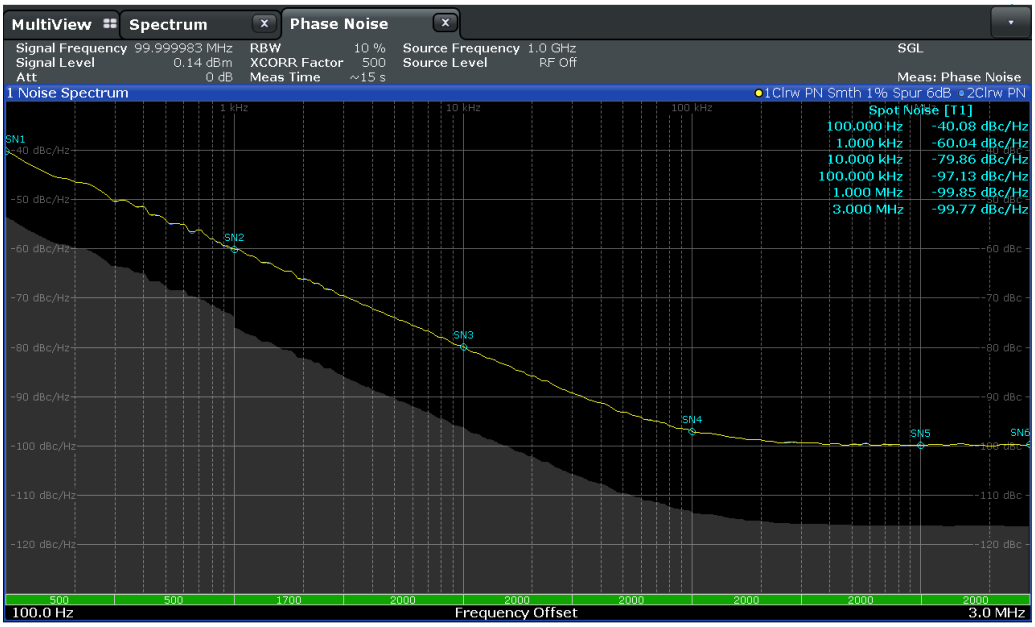
With the Service Function the frequency search function is disabled. The function shall be reset after the test sequence with “2.27.4.4.0”.

Measurement:
► Adjust the signal generator output level until the Power Meter reading is 0 dBm ± 1 dB

► Start the Measurement of the R&S FSWP
► Read out the Phase Noise Values for frequency offsets in the following table:

Test limits:	Frequency offset	Test limit	Measurement uncertainty
	100 Hz	−40 dBc(Hz) ±1.5 dB	±0.5 dB
	1 kHz	−60 dBc(Hz) ±1.5 dB	±0.5 dB
	10 kHz	−80 dBc(Hz) ±1.5 dB	±0.5 dB
	100 kHz	−97 dBc(Hz) ±1.5 dB	±0.5 dB
	1 MHz	−100 dBc(Hz) ±1.5 dB	±0.5 dB
	3 MHz	−100 dBc(Hz) ±1.5 dB	±0.5 dB

Screenshot of R&S FSWP measurement – example:



2.2.6 Checking the Phase Noise Sensitivity

This is a PASS/FAIL test that should be performed prior to testing the synthesizer phase noise in section 2.2.7.

Test equipment: Phase Noise Standard (refer to "Test Equipment", item 23)
Frequency 100 MHz
Signal Level at R&S FSWP input (14 ± 1.5) dBm

Specification of test equipment:

Frequency offset	Phase noise
1 kHz	< −160 dBc(Hz)
10 kHz	< −176 dBc(Hz)
100 kHz	< −180 dBc(Hz)
1 MHz	< −180 dBc(Hz)
10 MHz	< −180 dBc(Hz)

Remark: The specification of the test equipment is tighter than the test limits given in the tables below.

R&S FSWP settings:

- [**PRESET**]
- [MODE : Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [**AMPT** : RF ATTEN MANUAL : **5 dB**] // This adjustment ***not*** for FSWP8 ***without*** Option B1
- [Signal Frequency : 100 MHz]
- [Start Offset : 1 Hz]
- [Stop Offset : 10 MHz]
- [Trace 1: Smoothing : 5%]
- [RBW : 3%]
- [Xcorr Factor : 1]

Measurement:

- ► Start the Measurement of the R&S FSWP
- ► Read out the Phase Noise Values in Trace 1 for frequency offset in the following table.
- ► No additional Measurement uncertainty is needed as the result is the sum of the oscillator phase noise and the R&S FSWP.

Evaluation: This test is simply **PASS** if the measurement results satisfy the test limits below. In case the test limits in the tables below are not reached, the PN-Digitizer module can be checked according to Section 4.4.5.1.

Test limits:

Frequency offset	Test limit standard
10 Hz	< −102 dBc(Hz)
100 Hz	< −130 dBc(Hz)
1 kHz	< −155 dBc(Hz)
10 kHz	< −167 dBc(Hz)
100 kHz	< −170 dBc(Hz)
1 MHz	< −170 dBc(Hz)
3 MHz	< −170 dBc(Hz)

Frequency offset	Test limit with R&S FSWP-B60
10 kHz	< −170 dBc(Hz)
100 kHz	< −173 dBc(Hz)
1 MHz	< −175 dBc(Hz)
3 MHz	< −175 dBc(Hz)

Frequency offset	Test limit with R&S FSWP-B61
10 kHz	< −170 dBc(Hz)
100 kHz	< −173 dBc(Hz)
1 MHz	< −175 dBc(Hz)
3 MHz	< −175 dBc(Hz)

2.2.7 Checking the Synthesizer Phase Noise with option R&S FSWP-B60 or R&S FSWP-B61

This test measures the phase noise of the two R&S FSWP synthesizers.

In service mode the output of the 2nd synthesizer is switched to the input of the signal path. The 1st synthesizer is used for both channels as local oscillator as shown in the simplified block diagram below.

The result of the measurement is the sum of the phase noise of the two synthesizers. Since both synthesizers are not correlated, the phase noise of each synthesizer is 3 dB lower than the measurement result.

For this measurement, the cross correlations cancel only the noise of the signal chain but not the phase noise of the synthesizers. The following settings, especially the Xcorr factor = 5, ensure that the phase noise of the synthesizers are measured with a sufficient small measurement uncertainty within a reasonable measurement time.

Attention: This test is very sensitive to microphonic noise and hum. Please, make sure that the device-under-test FSWP is located isolated from noisy sources. Avoid stacking instruments on the FSWP.

R&S FSWP settings:

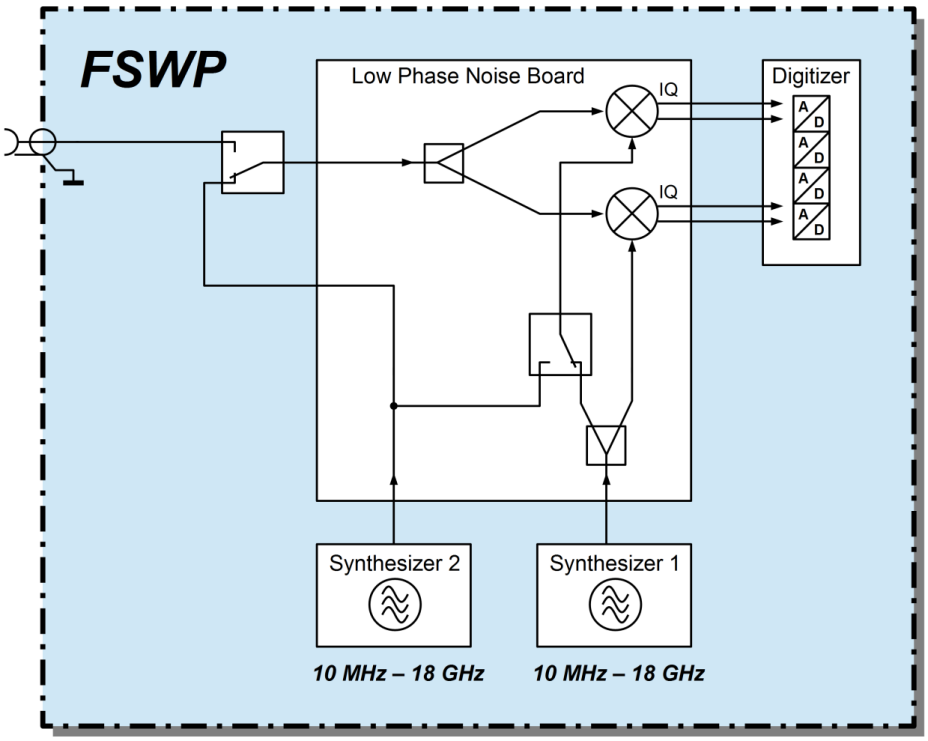
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [MODE : Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [Signal Frequency : Freq]
- [Start Offset : 1 Hz]
- [Stop Offset : 30 MHz]
- [Trace 1: Smoothing : 5%]
- [RBW : 3%]
- [Xcorr Factor : 5]
- [Calibration Input Synthesizer Frequency {Freq}]
- [Internal Reference : Loop BW : 30 Hz]

Measurement:

► Start the Measurement of the R&S FSWP for each of the following test frequencies.

► Read out the phase noise values of Trace 1 for the offset frequencies 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz and 30 MHz.

Simplified block diagram:



The phase noise sensitivity is derived from the measurements of the synthesizers phase noise.

As the improvement of the phase noise sensitivity due to the number of cross correlations *XCORR* is known, the phase noise sensitivity of the R&S FSWP can be calculated with the result of this synthesizers phase noise measurement:

$$\text{Phase Noise Sensitivity} = \text{PN Result Synthesizers} - 3\ \text{dB} - 0.5\ \text{dB} - 5 * \text{LOG}_{10}(XCORR)$$

Since both synthesizers are identical with respect to their phase noise and are not correlated the term “PN Result Synthesizers” must be corrected by −3 dB.

The additional value of −0.5 dB takes into account that the measurement against two independent synthesizers in cross correlation mode improves the result by a factor of $\sqrt{\pi/4}$ with one measurement.

The phase noise sensitivity of the R&S FSWP is specified with a start offset of 1 Hz. The following table shows the numbers of cross correlations for this setting and the calculated correction factors:

Frequency offset	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	30 MHz
Cross correlation number at frequency offset	1	10	130	1300	13000	100000	100000	100000	100000
Improvement due to cross correlation number	0 dB	5 dB	10.5 dB	15.5 dB	20.5 dB	25 dB	25 dB	25 dB	25 dB
Offset between PN Result & PN Sensitivity	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB	3.5 dB
Sum of corrections (Correction Factor)	3.5 dB	8.5 dB	14 dB	19 dB	24 dB	28.5 dB	28.5 dB	28.5 dB	28.5 dB

The measurement uncertainty in this test is derived from the test “Phase Noise Measurement Uncertainty” in section 2.2.5. Since the receiver part in this test is physically the ~~very~~ same as in the test in section 2.2.5 the phase noise measurement uncertainty given in the datasheet of the R&S FSWP is valid for this test.

Test limits with option R&S FSWP-B60

Freq = 100 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-76	3.5	-72.5	±1.5 dB
	10 Hz	-108	8.5	-99.5	±1.5 dB
	100 Hz	-136	14	-122.0	±1.5 dB
	1 kHz	-163	19	-144.0	±1.5 dB
	10 kHz	-170	24	-146.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-175	28.5	-146.5	±2 dB
	10 MHz	-175	28.5	-146.5	±2 dB

Freq = 1000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-56	3.5	-52.5	±1.5 dB
	10 Hz	-88	8.5	-79.5	±1.5 dB
	100 Hz	-116	14	-102.0	±1.5 dB
	1 kHz	-143	19	-124.0	±1.5 dB
	10 kHz	-166	24	-142.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-173	28.5	-144.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

Freq = 3000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-46	3.5	-42.5	±1.5 dB
	10 Hz	-78	8.5	-69.5	±1.5 dB
	100 Hz	-106	14	-92.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-156	24	-132.0	±1.5 dB
	100 kHz	-158	28.5	-129.5	±1.5 dB
	1 MHz	-163	28.5	-134.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Freq = 7000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-39	3.5	-35.5	±1.5 dB
	10 Hz	-71	8.5	-62.5	±1.5 dB
	100 Hz	-99	14	-85.0	±1.5 dB
	1 kHz	-130	19	-111.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-166	28.5	-137.5	±2 dB
	30 MHz	-166	28.5	-137.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 10 GHz	1 Hz	-36	3.5	-32.5	±1.5 dB
	10 Hz	-68	8.5	-59.5	±1.5 dB
	100 Hz	-96	14	-82.0	±1.5 dB
	1 kHz	-128	19	-109.0	±1.5 dB
	10 kHz	-147	24	-123.0	±1.5 dB
	100 kHz	-150	28.5	-121.5	±1.5 dB
	1 MHz	-155	28.5	-126.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 16 GHz	1 Hz	-32	3.5	-28.5	±1.5 dB
	10 Hz	-64	8.5	-55.5	±1.5 dB
	100 Hz	-92	14	-78.0	±1.5 dB
	1 kHz	-124	19	-105.0	±1.5 dB
	10 kHz	-143	24	-119.0	±1.5 dB
	100 kHz	-146	28.5	-117.5	±1.5 dB
	1 MHz	-151	28.5	-122.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Test limits with option R&S FSWP-B61 and OCXO model 05

Valid for R&S FSWP instruments with serial numbers lower than:

- R&S FSWP8: #101280
- R&S FSWP26: #101323
- R&S FSWP50: #101223

Freq = 100 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-92	3.5	-88.5	±1.5 dB
	10 Hz	-115	8.5	-106.5	±1.5 dB
	100 Hz	-140	14	-126.0	±1.5 dB
	1 kHz	-166	19	-147.0	±1.5 dB
	10 kHz	-170	24	-146.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-175	28.5	-146.5	±2 dB
	10 MHz	-175	28.5	-146.5	±2 dB

Freq = 1000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-72	3.5	-68.5	±1.5 dB
	10 Hz	-95	8.5	-86.5	±1.5 dB
	100 Hz	-120	14	-106.0	±1.5 dB
	1 kHz	-150	19	-131.0	±1.5 dB
	10 kHz	-166	24	-142.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-173	28.5	-144.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

Freq = 3000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-62	3.5	-58.5	±1.5 dB
	10 Hz	-85	8.5	-76.5	±1.5 dB
	100 Hz	-110	14	-96.0	±1.5 dB
	1 kHz	-140	19	-121.0	±1.5 dB
	10 kHz	-156	24	-132.0	±1.5 dB
	100 kHz	-158	28.5	-129.5	±1.5 dB
	1 MHz	-163	28.5	-134.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Freq = 7000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-55	3.5	-50.5	±1.5 dB
	10 Hz	-78	8.5	-68.5	±1.5 dB
	100 Hz	-103	14	-89.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-166	28.5	-137.5	±2 dB
	30 MHz	-166	28.5	-137.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 10 GHz	1 Hz	-52	3.5	-47.5	±1.5 dB
	10 Hz	-75	8.5	-65.5	±1.5 dB
	100 Hz	-100	14	-86.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-175	28.5	-146.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 16 GHz	1 Hz	-48	3.5	-43.5	±1.5 dB
	10 Hz	-71	8.5	-61.5	±1.5 dB
	100 Hz	-96	14	-82.0	±1.5 dB
	1 kHz	-129	19	-110.0	±1.5 dB
	10 kHz	-148	24	-124.0	±1.5 dB
	100 kHz	-149	28.5	-120.5	±1.5 dB
	1 MHz	-153	28.5	-124.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-171	28.5	-142.5	±2 dB

Test limits with option R&S FSWP-B61 and OCXO model 06

Valid for R&S FSWP instruments with serial numbers starting with:

- R&S FSWP8: #101280
- R&S FSWP26: #101323
- R&S FSWP50: #101223

Freq = 100 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-95	3.5	-91.5	±1.5 dB
	10 Hz	-117	8.5	-108.5	±1.5 dB
	100 Hz	-140	14	-126.0	±1.5 dB
	1 kHz	-166	19	-147.0	±1.5 dB
	10 kHz	-170	24	-146.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-175	28.5	-146.5	±2 dB
	10 MHz	-175	28.5	-146.5	±2 dB

Freq = 1000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-75	3.5	-71.5	±1.5 dB
	10 Hz	-97	8.5	-88.5	±1.5 dB
	100 Hz	-120	14	-106.0	±1.5 dB
	1 kHz	-150	19	-131.0	±1.5 dB
	10 kHz	-166	24	-142.0	±1.5 dB
	100 kHz	-173	28.5	-144.5	±1.5 dB
	1 MHz	-173	28.5	-144.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-173	28.5	-144.5	±2 dB

Freq = 3000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-65	3.5	-61.5	±1.5 dB
	10 Hz	-87	8.5	-78.5	±1.5 dB
	100 Hz	-110	14	-96.0	±1.5 dB
	1 kHz	-140	19	-121.0	±1.5 dB
	10 kHz	-156	24	-132.0	±1.5 dB
	100 kHz	-158	28.5	-129.5	±1.5 dB
	1 MHz	-163	28.5	-134.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-170	28.5	-141.5	±2 dB

Freq = 7000 MHz	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
	1 Hz	-58	3.5	-54.5	±1.5 dB
	10 Hz	-80	8.5	-71.5	±1.5 dB
	100 Hz	-103	14	-89.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-166	28.5	-137.5	±2 dB
	30 MHz	-166	28.5	-137.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 10 GHz	1 Hz	-55	3.5	-51.5	±1.5 dB
	10 Hz	-77	8.5	-68.5	±1.5 dB
	100 Hz	-100	14	-86.0	±1.5 dB
	1 kHz	-133	19	-114.0	±1.5 dB
	10 kHz	-152	24	-128.0	±1.5 dB
	100 kHz	-153	28.5	-124.5	±1.5 dB
	1 MHz	-157	28.5	-128.5	±2 dB
	10 MHz	-173	28.5	-144.5	±2 dB
	30 MHz	-175	28.5	-146.5	±2 dB

R&S FSWP26, R&S FSWP50	Frequency Offset	Specification [dBc(Hz)]	Correction Factor [dB]	Testlimit [dBc(Hz)]	Measurement Uncertainty
Freq = 16 GHz	1 Hz	-51	3.5	-47.5	±1.5 dB
	10 Hz	-73	8.5	-64.5	±1.5 dB
	100 Hz	-96	14	-82.0	±1.5 dB
	1 kHz	-129	19	-110.0	±1.5 dB
	10 kHz	-148	24	-124.0	±1.5 dB
	100 kHz	-149	28.5	-120.5	±1.5 dB
	1 MHz	-153	28.5	-124.5	±2 dB
	10 MHz	-170	28.5	-141.5	±2 dB
	30 MHz	-171	28.5	-142.5	±2 dB

Test of phase noise for offset frequencies below 1 Hz

(only with option R&S FSWP-B61 and with OCXO model 06)

R&S FSWP settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [MODE : Phase Noise]
- [SWEEP : SINGLE]
- [Auto Freq : Off]
- [Signal Frequency : Freq]
- [Start Offset : 0.01 Hz]
- [Stop Offset : 1 kHz]
- [Trace 1: Smoothing : 5%]
- [RBW : 30%]
- [Xcorr Factor : 5]
- [Calibration Input Synthesizer Frequency {Freq}]
- [Internal Reference : Loop BW : 30 Hz]

Measurement:

► Start the Measurement of the R&S FSWP for each of the following test frequencies

► Read out the Phase Noise Values for 0.01 Hz and 0.1 Hz offset frequency of Trace 1

Freq = 100 MHz:

Frequency Offset	Specification [dBc(1Hz)]	Correction Factor [dB]	Testlimit [dBc(1Hz)]	Measurement Uncertainty
0.01 Hz	- 20	3.5	- 16.5	±1.5 dB
0.1 Hz	- 66	8.5	- 57.5	±1.5 dB

2.3 Performance Test Option R&S FSWP-B1

2.3.1 Checking Immunity to Interference

Test equipment: Signal generator (Section "Test Equipment", item 2):

Frequency range

R&S FSWP8 : 10 MHz to 18 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50: 10 MHz to 40 GHz

Output level: −10 dBm minimum

Test setup: ► Connect RF output of the signal generator to RF input.

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : REF LEVEL : **−30 dBm**]
- [**SPAN** : **15 MHz**]
- [**BW** : RES BW MANUAL : **100 Hz**]

2.3.1.1 2nd IF Image Frequency Rejection

Additional signal generator settings:
- Frequency f_{in} + 2×1317 MHz
- Level: adjust the output level of signal generator for an RF-Input level of −10 dBm

R&S FSWP settings: - [**FREQ** : CENTER : {f_{in}}]

Test frequencies: R&S FSWP8 : f_{in} = 1 GHz

R&S FSWP26/50: f_{in} = 1 GHz, f_{in} = 9 GHz

Measurement: ► Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

Evaluation: The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}):

Image frequency rejection = −10 dB − L_{dis}

2.3.1.2 3rd IF Image Frequency Rejection

Additional signal generator settings:	- Frequency f_{in} + 2x37 MHz - Level: adjust the output level of signal generator for an RF-Input level of −10 dBm
Additional R&S FSWP settings:	- [**FREQ** : CENTER : {f_{in}}]
Test frequencies:	R&S FSWP8 : f_{in} = 63 MHz, 100 MHz, 900 MHz, 1100 MHz, 7990 MHz R&S FSWP26: f_{in} = 63 MHz, 100 MHz, 900 MHz, 1100 MHz, 7990 MHz
Measurement:	► Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): Image frequency rejection = −10 dBm − L_{dis}

2.3.1.3 2nd IF Rejection

Additional signal generator settings:	- Frequency 1317 MHz - Level: adjust the output level of the signal generator for a RF-Input level of −10 dBm
Additional R&S FSWP settings:	- [**FREQ** : CENTER : {f_{in}}]
Test frequencies	50 MHz, 200 MHz, 500 MHz, 900 MHz, 1100 MHz, 7990 MHz R&S FSWP26: additional at 9 GHz, 12 GHz, 25 GHz R&S FSWP50: additional at 9 GHz, 12 GHz, 25 GHz, 38 GHz
Measurement:	► Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): IF rejection = −10 dBm − L_{dis}

2.3.1.4 3rd IF Rejection

Additional signal generator settings:	- Frequency 37 MHz - Level: adjust the output level of the signal generator for a RF-Input level of −10 dBm
Additional R&S FSWP settings:	- [**FREQ** : CENTER : {f_{in}}]
Test frequencies	100 MHz, 200 MHz, 500 MHz, 900 MHz, 1100 MHz, 7990 MHz R&S FSWP26: additional at 9 GHz, 12 GHz, 25 GHz R&S FSWP50: additional at 9 GHz, 12 GHz, 25 GHz, 38 GHz
Measurement:	► Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): IF rejection = −10 dBm − L_{dis}

2.3.2 Checking Nonlinearities

2.3.2.1 Third-Order Intercept Point

Test equipment: 2 signal generators (Section "Test Equipment", item 2)

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50 10 MHz to 40 GHz

2 attenuators (Section "Test Equipment", item 10)

Attenuation a_{ATT} = 10 dB

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50 : 10 MHz to 40 GHz

Power splitter/combiner (Section "Test Equipment", item 4)

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50 : 10 MHz to 40 GHz

Test setup:

► Connect RF outputs of the signal generators via 10 dB attenuators to the inputs of the combiner.

► Connect output of the combiner to the RF input of the R&S FSWP.

Note: If the interference between the generators is sufficient low without attenuators, the generators may be connected directly to the power combiner.

Signal generator settings:

(both generators):

- Frequency:

generator 1 $f_{g1} = f_{in} - 500$ kHz

generator 2 $f_{g2} = f_{in} + 500$ kHz

► Adjust the output level of the signal generators for an input level at the R&S FSWP of –15 dBm ± 1 dB.

► Switch off the ALC of the generators to reduce the interference between the generators.

R&S FSWP settings:	- [**PRESET**]
	- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
	- [**AMPT** : **−5 dBm**]
	- [**SPAN** : **4 MHz**]
	- [**BW** : RES BW MANUAL : 2 kHz]
	- [**FREQ** : CENTER : {f_{in}}]
Test frequencies	Fin = 11 MHz, 20 MHz, 50 MHz, 100 MHz,
	190 MHz to 990 MHz in 200 MHz steps,
	1010 MHz, 1190 MHz to 2990 MHz in 200 MHz steps,
	3010 MHz, 3490 MHz to 7990 MHz in 500 MHz steps
	R&S FSWP26: additional 8.1 GHz to 26.1 GHz in 1 GHz steps R&S FSWP50: additional 8.1 GHz to 39.1 GHz in 1 GHz steps, and 39.9 GHz
Measurement:	- [MKR FCTN : TOI]
Evaluation:	The third order intercept point (T.O.I) referred to the input signal is displayed in the marker field by the reading [TOI].
Note:	If the input signal is exactly known, the level of the spurious products can alternatively be measured in a span of 20 kHz, for example. The TOI is then calculated from the average of the two spurious signals and the average of the two useful signals.

2.3.2.2 Second-Order Harmonic Distortion

Test equipment: Signal generator (Section "Test Equipment", item 2)

Frequency range: 9 MHz to 3.5 GHz

Recommended harmonic suppression:

10 MHz < f < 4 GHz: >80 dBc

f > 4 GHz : >90 dBc

In order to improve the harmonic suppression of the generator it is recommended to insert a lowpass filter with a suitable cut-off frequency (Section "Test Equipment", item 24) after the generator.

Test setup: Connect RF output of signal generator to the input of the lowpass filter

Connect the output of the lowpass filter to the RF input of the R&S FSWP

Note: The RF output of the generator can be connected directly to the RF input of the R&S FSWP in this case.

Signal generator settings:
- Level: −5 dBm at the input of the R&S FSWP
- Frequency: f_{in}

R&S FSWP settings:
- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : −10 dBm]
- [SPAN : 500 kHz]
- [BW : RES BW MANUAL : 30 Hz]
- [BW : VIDEO BW MANUAL : 10 Hz]
- [FREQ : CENTER : { fin }]

Test frequencies f_{in} = 9 MHz, 21 MHz, 106 MHz, 274 MHz, 449.9 MHz, 699.9 MHz, 999.9 MHz, 1499.9 MHz 1749.9 MHz, 2699.9 MHz, 3449.9 MHz

Test limits according to datasheet

With option R&S FSWP-B13: switch on the high pass filter and repeat the measurement with 699.9 MHz and 1499 MHz. Test limits according to data sheet.

Measurement: Set marker to peak of signal

- [MKR ⇒ : PEAK]

The level of the input signal Lin is displayed by the marker reading for marker 1.

Set center frequency of the R&S FSWP to the frequency of the 2nd harmonic

- [FREQ : CENTER : {2 x f_{in}}]

Measurement: Set marker to peak of the 2nd harmonic

- [MKR ⇒ : PEAK]

The level of the harmonic signal LK2 is displayed by the marker reading for marker 1

Evaluation: The second order harmonic distortion can be calculated as:

IPk2 / dBm = (Lin − L K2) + Lin

2.3.3 Checking IF Filters

Test equipment: Signal generator (Section "Test Equipment", item 1):

Frequency 64 MHz

Level ≥ 0 dBm

Test setup: ► Connect RF output of the signal generator to the RF input of the R&S FSWP.

2.3.3.1 Checking the bandwidth switching level uncertainty

Reference measurement (RBW 10 kHz)

Signal generator settings:
- Frequency: 64 MHz
- Level: −20 dBm

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : **−10 dBm**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**FREQ** : CENTER : **64 MHz**]
- [**SPAN** : **100 kHz**]
- [**BW** : RBW MANUAL : **10 kHz**]
- [**BW** : VBW MANUAL : **100 kHz**]
- [**BW** : SWEEP TIME MANUAL : 100 ms]
- [**TRACE** : DETECTOR : RMS]

Reference measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

► Set reference to peak of signal
- [**MKR** : REFERENCE FIXED]

Checking the level uncertainty:

R&S FSWP settings:
- [**SPAN** : {10 x RBW}] for RBW ≤ 10 MHz or
- [**SPAN** : ZERO] for RBW > 10 MHz
- [**BW** : RBW MANUAL : {RBW} : **ENTER**]
- [**BW** : VBW MANUAL : {10 x RBW} : **ENTER**]

Measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Test points — Check the following resolution filters :

RBW = 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz

Evaluation: The level difference is displayed in the marker field by the reading ´Delta [T1 FXD] {xxx} dB´.

2.3.3.2 Checking the bandwidth switching level uncertainty with option R&S FSWP-B8 or with option R&S FSWP-B8E

Reference measurement (RBW 10 kHz)

Signal generator settings:
- Frequency: 64 MHz
- Level: −20 dBm

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : **−10 dBm**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**FREQ** : CENTER : **64 MHz**]
- [**SPAN** : **100 kHz**]
- [**BW** : RBW MANUAL : **10 kHz**]
- [**BW** : VBW MANUAL : **100 Hz**]
- [**BW** : SWEEP TIME MANUAL : 100 ms]
- [**TRACE** : DETECTOR : RMS]

Reference measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

► Set reference to peak of signal
- [**MKR** : REFERENCE FIXED]

Checking the level uncertainty:

R&S FSWP settings:
- [**SPAN** : ZERO]
- [**BW** : RBW MANUAL : {RBW} : **ENTER**]
- [**BW** : VBW MANUAL : {0.01 x RBW} : **ENTER**]

If RBW < 100 Hz then use VBW = 1 Hz

Measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Test points Check the following resolution filters :

R&S FSWP-B8: RBW = 20 MHz, 28 MHz, 50 MHz, 80 MHz
R&S FSWP-B8E: RBW = 20 MHz, 28 MHz, 40 MHz

Evaluation: The level difference is displayed in the marker field by the reading ´Delta [T1 FXD] {xxx} dB´.

2.3.4 Checking Spurious Response

Test equipment: 50 Ω termination (Section "Test Equipment", item 5)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26 DC to 26.5 GHz

R&S FSWP50: DC to 50 GHz

Test setup: ► Terminate the RF input of the R&S FSWP with 50 Ohm

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : **−50 dBm**]
- [**FREQ** : START : **1 MHz**]
- [**FREQ** : STOP : **8900 MHz**] // 8000 MHz with R&S FSWP8
- [**BW** : RES BW MANUAL : **200 Hz**]

Measurement: Start a Sweep and set the Marker to peak. The level should be below −110 dBm.

R&S FSWP settings: R&S FSWP26, R&S FSWP50:
- [**FREQ** : START : **8900 MHz**]
- [**FREQ** : STOP : 26500 MHz]
- [**BW** : RES BW MANUAL : **1 kHz**]

Measurement: Start a Sweep and set the Marker to peak. The level should be below −100 dBm.

2.3.5 Checking Noise Display

Test equipment: 50 Ω termination (Section "Test Equipment", item 5)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26: DC to 26.5 GHz

R&S FSWP50: DC to 50 GHz

► Terminate the RF input of the R&S FSWP with 50 Ω

R&S FSWP settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : **−60 dBm**]
- [**INPUT**:COUPLING:DC]
- [**SPAN** : 0 Hz]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : {SWPCNT} **ENTER**]
- [**MEAS** : TIME DOMAIN POWER : MEAN]
- [**FREQ** : CENTER : {f_n}]
- [**BW** : RBW MANUAL : {RBW}]
- [**BW** : VBW MANUAL : 1Hz]

Measurement:

► Read out the mean marker and correct the measurement value by −10 x log (RBW / 1 Hz):

- RBW = 1 Hz corresponds with 0 dB correction
- RBW = 10 Hz corresponds with −10 dB correction
- RBW = 100 Hz corresponds with −20 dB correction
- RBW = 1 kHz corresponds with −30 dB correction

Test frequencies: RBW = 3 Hz; SWPCNT = 20; f_n = 10 Hz

RBW = 10 Hz; SWPCNT = 5; f_n = 30 Hz, 90 Hz,

RBW = 100 Hz; SWPCNT = 5; f_n = 300 Hz, 980 Hz

RBW = 1 kHz; SWPCNT = 1; f_n = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz, 99 MHz to 7999 MHz in 100 MHz steps

8500 MHz to the maximum Frequency of the instrument in 500 MHz steps.

Test limits according to data sheet.

Additional test frequencies with Option R&S FSWP-B24	Set the RF preamplifier to 30 dB gain and check with RBW = 1 kHz and SWPCNT = 1 the noise display with the following test frequencies: 50 MHz, 99 MHz to 7999 MHz in 100 MHz steps. For instruments with a maximum frequency above 8 GHz additional: 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps. Test limits according to data sheet.
Additional test frequencies with Option R&S FSWP-B13	Activate the high pass (preamp off) and check the following test frequencies: 1051 MHz to 2850 MHz in 200 MHz steps and 2950 MHz. Test limits according to data sheet.
YIG Filter Bypass	Activate the YIG Filter Bypass and check the following test frequencies:
For instruments with a maximum frequency > 8 GHz	8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps. Test limits according to data sheet.

2.3.6 Checking the Level uncertainty and the Frequency Response

Test equipment: Signal Generator (Section "Test Equipment", item 1)

Frequency range: 9 kHz to 1 GHz

Maximum level: ≥ 0 dBm

Signal Generator (Section "Test Equipment", item 2)

Frequency range:

R&S FSWP8: 10 MHz to 8 GHz

R&S FSWP26: 10 MHz to 26.5 GHz

R&S FSWP50: 10 MHz to 50.0 GHz

Maximum level: ≥ −10 dBm

Signal Generator with frequency doubler, driver amplifier and waveguide highpassfilter for frequency generation > 43.5 GHz (Section "Test Equipment", item 2 plus item 17 to 19)

Frequency range:

R&S FSWP 50: 43.5 GHz to 50 GHz

Maximum level: ≥ −10 dBm

Power meter (Section "Test Equipment", item 6)

Power range: −30 to 0 dBm

Instrumentation uncertainty: <0.5%

Uncertainty of power reference: <1.2%

VSWR of power reference: <1.10

Power Sensor (Section "Test Equipment", item 7)

Frequency range: 9 kHz to 7 GHz

Power range: −30 to 0 dBm

Cal factor uncertainty:

1 MHz to 3.6 GHz: <1.6 %

3.6 GHz to 7 GHz: <2 %

VSWR:

1 MHz to 7 GHz <1.15

50 MHz to 128 MHz <1.10

Power Sensor (Section "Test Equipment", item 8)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26: DC to 26.5 GHz

R&S FSWP50: DC to 50 GHz

Power range: −30 to 0 dBm

Cal factor uncertainty:

50 to 128 MHz	<1.6 %
3.6 to 8 GHz	<2 %
8 to 22 GHz	<2.5 %
22 to 26.5 GHz	<3 %

VSWR:

50 to 128 MHz	<1.15
3.6 to 8 GHz	<1.15
8 to 22 GHz	<1.25
22 to 26.5 GHz	<1.35
26.5 to 50 GHz	<1.30

6 dB Power Splitter (Section "Test Equipment", item 4)

Frequency range:	DC to 3.6 GHz
Level imbalance:	
10 MHz to 3.6 GHz	<0.1 dB
Equivalent output VSWR:	
10 MHz to 3.6 GHz	≤ 1.1

6 dB Power Splitter (Section "Test Equipment", item 4)

Frequency range:

R&S FSWP8: DC to 8 GHz

R&S FSWP26: DC to 26.5 GHz

R&S FSWP50: DC to 50.0 GHz

Level imbalance:

3.6 to 7 GHz	≤ 0.3 dB
7 to 22 GHz	≤ 0.4 dB
22 to 26.5 GHz	≤ 0.5 dB
26.5 to 43 GHz	≤ 0.8 dB

Equivalent output VSWR:

3.6 to 7 GHz	≤ 1.3
7 to 22 GHz	≤ 1.4
22 to 26.5 GHz	≤ 1.5
26.5 to 43 GHz	≤ 2

2.3.6.1 Absolute level uncertainty at 64 MHz

Test setup:
- ► Standardize the power meter and power sensor (item 6, 7).
- ► Set the power meter Cal Factor to the appropriate value for the power sensor for 64 MHz.
- ► Connect power sensor through a cable to RF output of Signal Generator.

Signal generator settings:
- Frequency: 64 MHz
- Level: −10 dBm

Measurement:
- ► Adjust level to −10 dBm ± 0.1 dB as viewed on the power meter.
- ► Record the power meter indication.
- ► Disconnect power sensor from the cable.

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **−10 dBm**]
- [**SWEEP** : SWEEP TIME : **10 ms**]
- [**SPAN** : **30 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **64 MHz**]
- ► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Evaluation:
The difference between the signal levels measured with the power meter and the R&S FSWP (level reading of marker 1) reflects the absolute level uncertainty of the R&S FSWP. It can be calculated as:

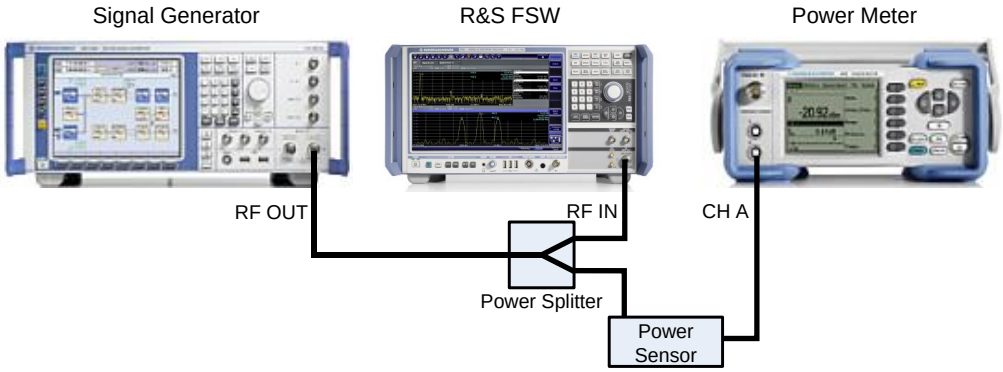
$$\text{Level uncertainty}_{64MHz} = L_{FSWP} - L_{powermeter}$$

2.3.6.2 Frequency response

Checking the frequency response

Note: If a power splitter with higher level imbalance is used, correction of the measured frequency response is recommended.

Test setup:
- ► Standardize the Power Meter and Power Sensor (items 6, 7, 8).
- ► Use Power Splitter/Combiner (item 3) and connect equipment as shown below.
- ► Connect the power splitter directly to the RF input of the R&S FSWP.



Important Note

Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:
- Level 0 dBm
- Frequency 64 MHz

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF INPUT {coupling}]
- [**AMPT** : RF ATTEN MANUAL : **{a_{FSWP}}**]
- [**AMPT** : **0 dBm**]
- [**SPAN : 100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**FREQ** : CENTER : **64 MHz**]
- [**MKR ⇒** : MORE : EXCLUDE LO]

Reference measurement:
- ► Determine signal level $L_{powermeter}$.
- ► Set marker to peak of signal
- [**MKR ⇒** : PEAK]
- ► Read level indication from R&S FSWP (reading of marker 1): L_{FSWP}

Power Meter:
- ► Read level indication from power meter : $L_{powermeter}$

Evaluation:	► Calculate
	ΔRef / dB = L_{FSWP} / dBm – $L_{powermeter}$ / dBm
	Record ΔRef / dB
Signal generator settings:	Set the signal generator to the test frequency
R&S FSWP settings:	- [**SPAN : zero**]
	- [**FREQ** : CENTER : {f_{fresp}}]
	- [**BW** : RES BW MANUAL : **{RBW}**]
	For f < 100 kHz use a RBW = Fin / 10, use a RBW of 10 kHz for other frequencies.
	► Set marker to peak of signal
	- [**MKR** ⇒ : PEAK]
	► Read level indication from R&S FSWP (reading of marker 1): L_{FSWP}
Power Meter:	► Read level indication from Power Meter : $L_{powermeter}$
Evaluation:	► The frequency response can be calculated as:
	Freq. response / dB = L_{FSWP} – $L_{powermeter}$ − ΔRef / dB
Attenuator Setting	Repeat the measurement for RF attenuation of 0 dB, 5 dB, 10 dB, 20 dB, 40 dB
Test frequencies	With RF attenuation = 10 dB, DC coupling:
	Fin = 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3MHz
	With RF attenuation 0 dB, 5 dB, 10 dB, 20 dB, 40 dB, AC coupling :
	Fin = 10 MHz, 50 MHz, 100 MHz 200 MHz, 500 MHz to 8 GHz in 500 MHz steps
	8500 MHz to the maximum Frequency of the instrument in 500 MHz steps
	Test limits according to datasheet.
YIG Filter Bypass	Repeat the measurement for RF attenuation of 10 dB and YIG Filter Bypass, test frequencies: 8001 MHz, 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps.
Instruments with option B24	With option B24 RF Preamplifier switch the RF preamplifier to 30 dB gain, RF-Attenuation 10 dB, DC coupling, reference level = −20 dBm and signal level −25dBm.
	Check the level uncertainty with the following test frequencies:
	10 MHz, 50 MHz to 7999 MHz in 100 MHz steps
	8500 MHz to the maximum frequency of the instrument in 500 MHz steps
	Test limits according to data sheet.

2.3.7 Checking the Display Nonlinearity

Test equipment: Signal generator (Section "Test Equipment", item 1)

Frequency: 128 MHz

Maximum level: ≥ +10 dBm

Step attenuator (Section "Test Equipment", item 9)

Frequency: 128 MHz

Attenuation: 0 to 100 dB in 1 dB steps

Attenuation uncertainty: < 0.1 dB

Test setup:
► Connect RF output of the signal generator to RF input of the step attenuator
► Connect RF output of the step attenuator to RF input of the R&S FSWP

Signal generator settings:
- Frequency: 128.1 MHz
- Level: +10 dBm

Step attenuator settings:
- attenuation: 20 dB

R&S FSWP settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**FREQ** :CENTER : **128.1 MHz**]
- [**SPAN** : **0 Hz**]
- [**TRACE** : DETECTOR : AV]
- [**BW** : RES BW MANUAL : **1kHz**]
- [**SWEEP** : SWEEP TIME MANUAL : **{sweep time}**]
- [**MEAS** : TIME DOMAIN POWER : MEAN]

Wait 30 seconds to ensure that there is no thermal drift.

See table below for values of sweep time.

Reference measurement:
► Read out the mean marker value (= L_{Ref})

Measurement:

Step attenuator settings:
- attenuation: {a_{ATT}}

See table of performance test report for values of a_{ATT}.

Evaluation:
► Read out the mean marker value. The difference between the level of the input signal of the R&S FSWP and the reference L_{Ref} (about 10 dB below the reference level) can be calculated as :

$$\Delta L = L_{FSWP} - L_{Ref}$$

Test points: Check linearity from 0 to −70 dB in 2 dB steps

from −70 dB to −90 dB in 5 dB steps

Note: A frequency between 5 MHz and 1 GHz may be used. It is recommended to use correction values for the uncertainty of the attenuator.

a_{ATT}	10 dB to 50 dB	50 dB to 80 dB	80 dB to 100 dB
Sweep time	200 ms	600 ms	1000 ms

2.3.8 Checking the RF Attenuator uncertainty

Test equipment: Signal generator (Section "Test Equipment", item 1)

Frequency: 128 MHz

Maximum level: ≥ +10 dBm

Step attenuator (Section "Test Equipment", item 9)

Frequency: 128 MHz

Attenuation: 0 to 80 dB in 5 dB steps

Attenuation uncertainty: < 0.1 dB

Test setup:
► Connect RF output of the signal generator to RF input of the step attenuator
► Connect RF output of the step attenuator to RF input of the R&S FSWP

Signal generator settings:
- Frequency: 128.1 MHz
- Level: +10 dBm

R&S FSWP settings:
- [**PRESET**]
- [**FREQ** : CENTER : **128.1 MHz**]
- [**SPAN** : **500 Hz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**BW** : VIDEO BW MANUAL : **100 Hz**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **−35 dBm**]

Reference measurement:
► Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
► Set reference to peak of signal
- [**MKR** : REFERENCE FIXED]

Measurement

Step attenuator settings:
- Attenuation { 80 dB − a_{FSWP}}

R&S FSWP settings:
- [**AMPT** : RF ATTEN MANUAL : { a_{FSWP}}]
- [**AMPT** : {−45 + a_{FSWP} } **dBm**]
- [**MKR** ⇒ : PEAK]

See table below for values of a_{FSWP}, a_{ATT} and reference level.

Evaluation: The difference between the level of the input signal of the R&S FSWP and the reference (at 10 dB RF-Attenuation) is displayed in the marker field by the reading Delta [T1 FXD].

a_{ATT}	70 dB	80 dB	75 dB	65 dB	60 dB	55 dB	50 dB	40dB	30 dB	20 dB	10 dB
a_{FSWP}	10 dB	0 dB	5 dB	15 dB	20 dB	25 dB	30 dB	40dB	50 dB	60 dB	70 dB
reference level	−35 dBm	−45 dBm	−40 dBm	−30 dBm	−25 dBm	−20 dBm	−15 dBm	−5 dBm	+5 dBm	+15 dBm	+25 dBm

2.3.9 Checking the Phase Noise

Test equipment: Signal generator (refer to "Test Equipment", item 16)

Frequency: 1000 MHz

Level: ≥ +5 dBm

Test setup: ► Connect RF output of the signal generator to RF input of the R&S FSWP.

Signal generator settings:
- Frequency: 1000 MHz
- Level: > +5 dBm

R&S FSWP settings:
- [**PRESET**]
- [**SETUP** : REFERENCE INT]
- [**FREQ** : CENTER : **1000 MHz**]
- [**AMPT** : ATTEN MANUAL**: 20 dB**]
- [**AMPT : 20 dBm**]
- [**SPAN** : **1 MHz**]
- [**SWEEP** : SINGLE]
- [**MKR FCTN** : SIGNAL COUNT]

► Set center frequency to counter frequency

- [**MKR FCTN** : PHASE NOISE]
- [**SPAN** : {span}]
- [**MKR** : {Offset}]

See table below for values of reference level, sweep time, sweep count and span.

Refer to "Performance Test Report" table for values of offset, reference level and RF attenuation.

Example: For a input power of +10 dBm the reference level shall be set to +10 dBm for offsets below or equal 1 kHz. The attenuation to 10 dB for a mixer level of 0 dBm.

With bigger offsets the broadband noise becomes critical therefore the reference level and the attenuation shall be decreased by 2 dB.

Evaluation: The phase noise is displayed in the marker field by the reading

´PHNOISE 2´.

Note: Please make sure not to measure on a spurious signal. The phase noise may be checked at 640 MHz instead of 1 GHz. In this case the test limits at frequency offsets less or equal 100 kHz are 1 dB better as with 1 GHz test frequency. At offsets above 100 kHz check for the same limit as with 1 GHz.

At 100 Hz offset the measurement is performed at 95 Hz to avoid interference with the line frequency f.e. in Europe.

Settings for phase noise measurement				
Offset	Span	RBW / VBW	Reference level	a_{FSWP}
100 Hz	220 Hz	1 Hz / 1 Hz Trace Average 5	= signal level	= signal level
1 kHz	2.2 kHz	100 Hz / 1 Hz	= signal level	= signal level
10 kHz	22 kHz	1 kHz / 1 Hz	signal level − 2 dB	signal level − 2 dB
100 kHz	220 kHz	10 kHz / 1 Hz	signal level − 2 dB	signal level − 2 dB
1 MHz	2.2 MHz	10 kHz / 1 Hz	signal level − 6 dB	signal level − 6 dB

2.4 Performance Test Option LO/IF ports for external mixers R&S FSW-B21

2.4.1 Checking LO-level

Test equipment: Power Meter (section "Test Equipment", item 6)

Power sensor (section "Measurement Equipment", item 8)

Frequency range 7.0 GHz to 17.45 GHz

Max. input power Pmax = +23 dBm

RSS ≤ 2.5% referred to measured power

Impedance Z = 50 Ohm

Fixed attenuator with 10 dB (Section "Measurement Equipment" item 10)

Power meter settings: Connect power sensor to the power meter and execute function ´ZERO´ when there is no signal applied to the power sensor

R&S FSWP settings:

- [PRESET]
- [SENS : MIX ON]
- [MIX : HARM : BAND USER]
- [MIX : HARM 2]
- [FREQ : SPAN 0HZ]
- [SETUP : MORE : SERVICE : PASSWORD : 30473035]

Fix IF2-Frequency to 1.58 GHz

- [DIAG : SERV : SFUN ‘2.3.16.1.4’]

Select LO-Power:

- [SENS:MIX:LOP {PLO}]

for P_{LO} = +15.5 dBm // measured at 15.5 dBm according to data sheet

Bias current set to zero:

- [SENS : MIX : BIAS 0.0]

Select upper sideband with service-function:

- [DIAG : SERV : SFUN ‘2.5.2.2.1’]
- [FREQ CENTER : {fCenter1}]

resulting LO-frequency fLO = (fCenter1 – 1580.0 MHz) / 2

Select lower sideband with service-function:

- [SETUP : SERVICE FUNCTIONS 2.5.2.2.0]

- [FREQ CENTER : {fCenter2}]

resulting LO-frequency fLO = (fCenter2 + 1580.0 MHz) / 2

Test setup: ► Connect power sensor via fixed attenuator to the output ‘LOout / IFin’

Measurement: Determine level of the LO-signal LLO,meas
To achieve higher uncertainty the frequency response of the power sensor must be compensated. For compensation frequency use fLO

Evaluation: The level of the LO-signal can be determined as LLO = LLO,meas + 10 dB

Test Frequencies Fcenter1 = 16880 MHz to 26880 MHz in 500 MHz Steps

Fcenter2 = 23820 MHz to 33320 MHz in 500 MHz Steps

2.4.2 Checking the Input LOout / IFin (2-Port-Mixers in Spectrum Mode R&S FSWP-B1)

Test equipment: Signal Generator (section " Test Equipment ", item 1)

Frequency 1330.0 MHz

Output power −20 dBm

R&S FSWP settings:

- [PRESET]
- [SENS : MIX ON]
- [SENS : MIX:HARM:BAND USER]
- [SENS : MIX:HARM 2]
- [SPAN : ZERO SPAN]
- [FREQ : CENT 18.00 GHz]
- [SENS : BAND 2KHz]
- [DET : FUNC RMS]
- [SETUP : MORE : SERVICE : PASSWORD : 30473035]

Fix IF2-Frequency to 1.33GHz:

- [DIAG : SERV : SFUN ‘2.3.16.1.2’]

Activate syncon mode of synthesizer

- [DIAG : SERV : SFUN ‘2.3.16.20.0’]

Force NCO sweep

- [DIAG : SERV : SFUN ‘2.3.16.49.1’]

Switch off LO with service function:

- [DIAG : SERV : SFUN ‘2.5.2.8.0’]

Bias current set to zero:

- [SENS : MIX : BIAS 0.0]

Select 2-port case:

- [SENS : MIX : PORT 2]

Conversion Loss set to 0dB

- [SENS : MIX : LOSS 0.0]

Signal generator settings:

- Frequency 1330.0 MHz
- Input Level DUT –30 dBm ± 0.1 dB

Test setup: Connect the generator to the connector LOout / IFin;

Measurement:

- [MKR-> : PEAK]

Read out the marker and test limit according to data sheet.

2.4.3 Checking the Input IF_{in} (3-Port-Mixers in Spectrum Mode R&S FSWP-B1)

Test equipment: Signal Generator (section "Test Equipment ", item 1)

Frequency 1330.0 MHz

Output power −20 dBm

R&S FSWP settings:

- [PRESET]
- [SENS : MIX ON]
- [SENS : MIX:HARM:BAND USER]
- [SENS : MIX:HARM 2]
- [SPAN : ZERO SPAN]
- [FREQ : CENT 18.00 GHz]
- [SENS : BAND 2KHz]
- [DET : FUNC RMS]
- [SETUP:MORE:SERVICE:PASSWORD: 30473035]

Fix IF2-Frequency to 1.33GHz:

- [DIAG:SERV:SFUN ‘2.3.16.1.2’]

Activate syncon mode of synthesizer

- [DIAG:SERV:SFUN ‘2.3.16.20.0’]

Force NCO sweep

- [DIAG:SERV:SFUN ‘2.3.16.49.1’]

Switch off LO with service function:

- [DIAG:SERV:SFUN ‘2.5.2.8.0’]

Bias current set to zero:

- [SENS:MIX:BIAS 0.0]

Select 2-port case:

- [SENS:MIX:PORT 3]

Conversion Loss set to 0 dB

- [SENS : MIX:LOSS 0.0]

Signal generator settings:

- Frequency 1330.0 MHz
- Input Level DUT −30 dBm ± 0.1 dB

Test setup: Connect the generator to the connector LOout / IFin;

Measurement:

- [MKR-> : PEAK]

Read out the marker and test limit according to datasheet

2.4.4 Checking the Input IF_{in} (3-Port-Mixers in Phase Noise Mode)

Test equipment: Signal Generator (section " Test Equipment ", item 1)

Frequency 26.0 MHz

Output power −20 dBm

R&S FSWP settings:

- [**MODE** : Phase Noise]

Set the R&S FSWP to external mixer

- INPUT/OUTPUT : Input Source Config : External Mixer : ON

Conversion Loss set to 0 dB
- [**SENS** : MIX:LOSS 0.0]

Deactivate signal tracking but keep leveling / fix IF to 26 MHz

- []

- FREQ : Auto Search : OFF

- [**DIAG**:SERV:SFUN '2.27.4.4.2']

- [**DIAG**:SERV:SFUN '2.26.1.6.26']

Signal generator settings:

- Frequency 26.0 MHz

- Input Level DUT −30 dBm ± 0.1 dB

Test setup:

► Connect the generator to the connector EXT MIX IF_{in};

Measurement:

► Read out the level
► Test limit according to datasheet

After finishing this test, set signal tracking back to AUTO: **2.27.4.4.0** and **2.0.0**

2.5 Signal Source R&S FSWP-B64

2.5.1 Checking Output Level

Test equipment: Power meter (Section "Test Equipment", item 6)

Power sensor (section "Test Equipment ", item 8)

Frequency range: 10 MHz to 18 GHz

Max. input power:

P_{max} = +23 dBm

RSS ≤ 2.5% referred to measured power

Impedance: Z = 50 Ohm

Power meter settings: ► Connect power sensor to the power meter and execute function ´ZERO´ when there is no signal applied to the power sensor

R&S FSWP settings:
- [**PRESET**]
- [Mode: Phase Noise]
- [Meas: Additive Noise]
- [Signal Source: On]
- [Signal Source : Level : “Lev”]
- [Signal Source : Frequency: “Freq”]

Test setup: ► Connect the power sensor directly to the output ‘SIGNAL SOURCE OUTPUT’.

Measurement: ► Determine level of the Signal Source Output.

To achieve lower uncertainty the frequency response of the power sensor shall be compensated.

Setting table		Signal level	Frequency
	R&S FSWP8/26/50	+ 10 dBm	10 MHz
		+ 10 dBm	20 MHz
		+ 10 dBm	50 MHz
		+ 10 dBm	100 MHz
		+ 10 dBm	200 MHz
		+ 10 dBm	500 MHz
		+ 10 dBm	1 GHz
		+ 10 dBm	2 GHz
		+ 10 dBm	4 GHz
		+ 10 dBm	8 GHz

	+ 10 dBm	12 GHz
	+ 10 dBm	16 GHz
	+ 10 dBm	18 GHz
Test 10 dB Att	0 dBm	100 MHz
Test 20 dB Att	- 10 dBm	100 MHz
Test 40 dB Att	- 30 dBm	100 MHz

Test limits according to datasheet.

3 Adjustment

NOTICE

Risk of erroneous measurement results

Adjustment must be carried out exclusively by qualified personnel since any change can considerably affect the instrument's measurement uncertainty.

3.1 Adjustment Tool

The frequency response, the reference frequency and the YIG filter of the R&S FSWP can be adjusted automatically by the R&S FSW service tool. The adjustment is required when connectors in the RF signal paths have been opened or when an RF board has been changed.

In the chapter "Repair" the required tasks after changing the hardware are described. The adjustment can be performed by R&S service representations.

3.2 Adjusting the Reference Oscillator

The reference oscillator (instruments with and without option R&S FSWP-B4) can be adjusted with the R&S FSW service tool as described in chapter 3.1 or by the sequence described here.

3.2.1 Measuring Equipment

Table 2-1: Measuring Equipment and Accessories for Manual Adjustment of the R&S FSWP Reference Oscillator

Item	Type of equipment	Recommended Specifications	Recommended Equipment	R&S Order No.	Use
1	Signal generator	Frequency: 1 GHz Output level: >-20 dBm Uncertainty of frequency:1x10^{-9}	R&S SMA100A with SMA-B106, SMA-B22	1400.0000.02 1405.0809.02 1405.1805.02	Frequency uncertainty of the reference oscillator

3.2.2 Adjustment Sequence

Test equipment: Signal generator (see “Test Equipment”, item 1):

- Frequency: 1000 MHz
- Level: −15 dBm
- Frequency uncertainty: <1x10^{-9}

If the frequency uncertainty of the generator is insufficient, the generator can be set to the correct frequency with the aid of the frequency counter prior to the measurement.

Test setup: Connect RF output of the signal generator to the RF input of the R&S FSWP.

R&S FSWP settings: - [SETUP : Service : Service Function : Password = 894129]

Warming up the reference oscillator

Before the following measurement, the R&S FSWP must be on for at least ten minutes with internal reference, so that the reference oscillator is warmed up.

Measurement: Use the frequency response correction software (refer to 3.2.5.2) to measure and adjust the OCXO frequency.

3.2.3 Troubleshooting

Checking the input signal:

The automatic adjustment routine checks the level of the input signal. The adjustment is aborted if the input level is not within the range from −10 dBm to −20 dBm.

The automatic adjustment is also aborted if the input signal is not within the nominal frequency range:

- Model without option R&S FSWP-B4: 1.0 GHz ± 100 Hz
- Model with option R&S FSWP-B4: 1.0 GHz ± 10 Hz

For verification proceed as follows:

R&S FSWP settings:

- [SETUP : REFERENCE : INT]

► Toggle to internal reference.

Signal generator settings:

Frequency: as above 1000 MHz

R&S FSWP settings:

- [PRESET]
- [FREQ : 1 GHz]
- [SPAN : 100 kHz]
- [BW : RES BW MANUAL: 10 kHz]
- [MKR FUNC : SIGNAL COUNT]

Measurement:

► Read out the power level of the marker and check whether the input level is within the range from −10 dBm to −20 dBm.

► Read out the frequency value (Count:) of the marker and check whether the input signal frequency is in the nominal frequency range as shown above.

Checking appropriate warm-up of the instrument:

The automatic adjustment routine checks the drift of the internal reference oscillator. If there is too much drift (warming up is not completed) the adjustment is aborted.

Checking the R&S FSWP-B4 option

Disconnect the instrument from all power supplies, remove option R&S FSWP-B4, connect the power again and perform the automatic adjustment as described above. If this works correctly, most likely the R&S FSWP-B4 option is defective.

4 Repair

The following chapter describes how to replace modules in the R&S FSWP. The general procedures to open and complete the instrument are described in the introduction. For all descriptions, the numbers in parenthesis refer to the elements indicated in the inserted graphics.

Explanation of symbols used in the following chapter:

Tip: The hint given in this way makes the action to be done easier to do for you

Note: There is possibly a problem to finish your work if you do not follow the description given here.

NOTICE! You must carefully perform the action described in this hint because of a possible danger to hurt yourself or to damage the instrument and/or the part you are replacing.

WARNING

Shock hazard

Before opening the casing, make sure that the instrument is switched off and disconnected from all power supplies.

Read all safety instructions at the beginning of this manual carefully!

4.1 Functional Description

The R&S FSWP is basically a single-conversion IQ-receiver called phase noise analyzer. The RF input signal is converted down to a baseband frequency of about 1.5 MHz.

The frequency range depends on the instrument model.

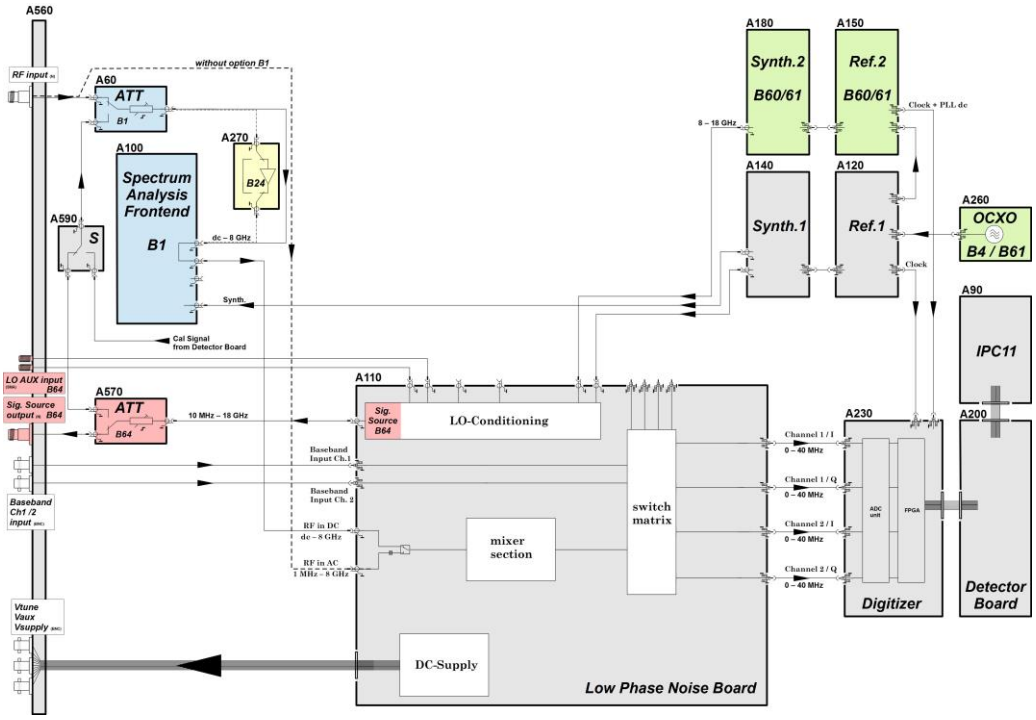
The input signal passes a mechanical attenuator or goes directly to the phase noise (PN) frontend board depending on the instrument model.

The synthesizer board and reference board generate the LO frequencies.

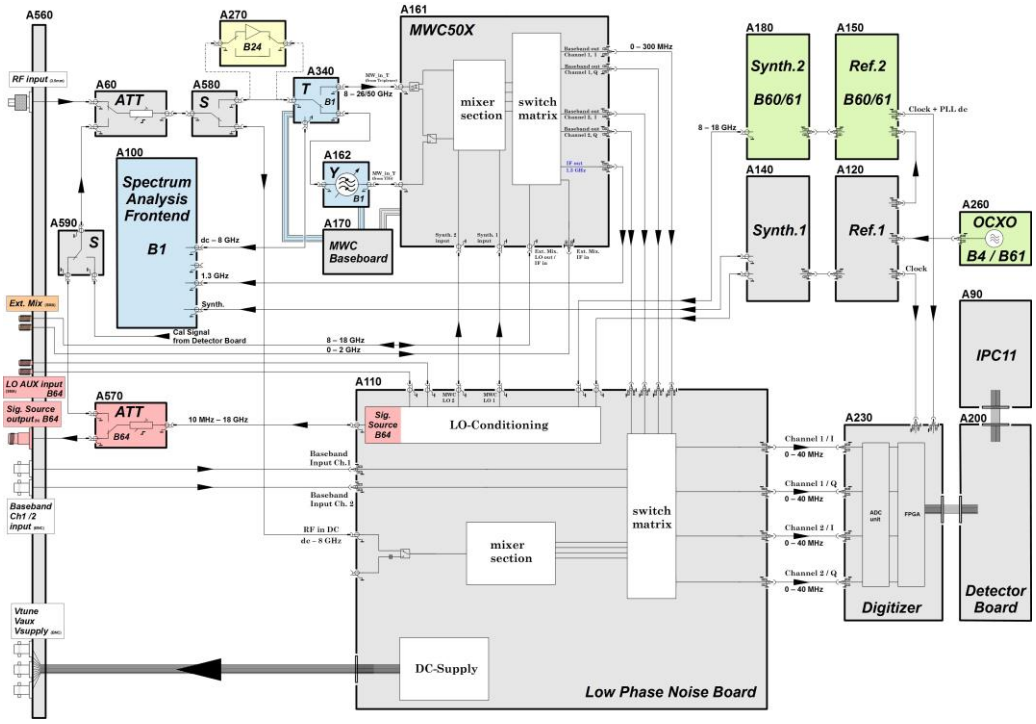
The analogue baseband signal is fed from the PN-frontend board to the PN-Digitizer board where sampling and digital signal processing is provided.

The remaining data are transferred to the host processor via a PCI express (PCIe) interface. The hardware settings are controlled via a serial interface on the detector board that is set from the host via the PCIe interface.

4.1.1 Block Diagram of Model R&S FSWP8



4.1.2 Block Diagram of Model R&S FSWP26 / 50

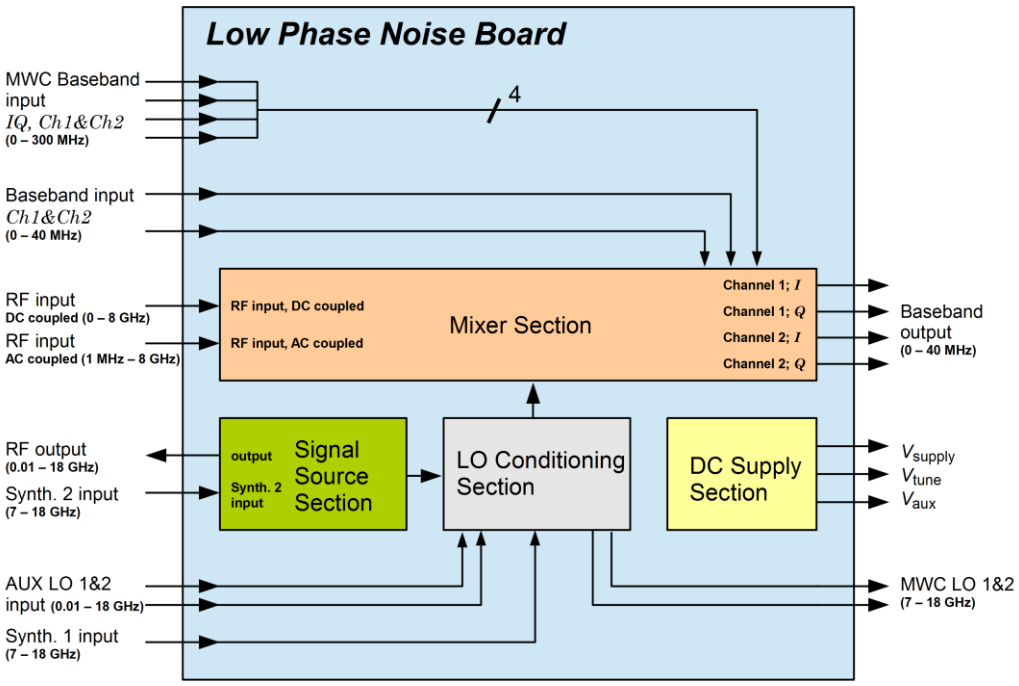


4.1.3 Attenuator – A60

The attenuator switches in 5 dB steps and has a maximum total attenuation of 75 dB, it contains an AC coupling that can be bypassed and a switch for the internal calibration sources to the input. This attenuator is obsolete for the basic model R&S FSWP 8 but is mandatory for the models R&S FSWP 26 and R&S FSWP 50.

4.1.4 Phase Noise Frontend Board – A110

The PN frontend board processes input signals in the range up to 8 GHz.



There are two types of the low phase noise board:

The LPNB which operates with all firmware versions, and
the LPNB2 which operates with firmware versions 1.80 or higher.

They only differ in the Signal Source Section functionality as briefly described in Section 4.1.4.3. Mechanically, they are identical.

4.1.4.1 Mixer Section

RF Input, DC coupled (0 – 8 GHz)

The RF input signal is directed to the corresponding signal path according to its signal frequency. Switched bandpass filters suppress the harmonics of the measured signal and therefore reduce measurement errors. In the some frequency bands an additional 10dB-amplifier can be activated to range the IQ-mixers to its optimum.

RF Input, AC coupled (1 MHz – 8 GHz)

This input is equivalent to the dc coupled RF input but with a coupling capacitor. It is used for the basic R&S FSWP 8 models without Attenuator A60.

Baseband Input (0 – 40 MHz)

Baseband signals (Channel 1 and Channel 2) which are connected to the baseband input jacks at the front panel (Baseband Input Ch1&Ch1) are directly switched to the four baseband outputs.

MWC Baseband Input (0 – 300 MHz)

The four baseband signals (I & Q, channels 1 & 2) which are provided by the microwave converter (only for models R&S FSWP 26) are directly switched to the four baseband outputs.

4.1.4.2 LO Conditioning Section

The LO Conditioning Section provides the LO signals for the Mixer Section of the PN frontend board and the LO signals for the microwave converter unit. These LO signals are conditioned from one or two input signals provided by the Synthesizer Boards A160 and/or A180. The input signals are Synth.1 input and Synth.2 input.

Furthermore, with Option R&S FSWP-B64 two external LO signals can be connected via SMA connectors LO AUX INPUT CH1 and CH2. The two LO signals can be used in additive phase noise measurements only.

4.1.4.3 Signal Source Section (Var.02/04 for Options R&S FSWP-B60/-B61/-B64)

For R&S FSWP models with options R&S FSWP-B60/-B64 the output of the second synthesizer board A180 is connected to the input of the Signal Source Section (*Synth.2 input*). The input frequency is between 7.5 GHz and 18 GHz and divided to output frequencies between 10 MHz and 18 GHz.

For LPNB: The RF level at the output of the Signal Source Section is adjusted to be fixed at +10 dBm.

For LNPB2: The RF level at the output of the Signal Source Section is adjustable between +3 dBm and +13 dBm in 0.1-dB-steps by means of the instruments firmware.

4.1.4.4 DC Supply Section

The DC Supply Section provides three voltage supplies available at the front panel of the R&S FSWP. The three voltage supplies are adjustable via DA-converters (software controlled). Voltages and Currents are measured by means of a self-test ADC on the PN frontend board.

Name	Voltage range	Current range
Vsupply	0 … +16 V	0 … 2 A
Vtune	-10 V … +28 V	0 … 20 mA
Vaux	-10 V … +10 V	0 … 100 mA

4.1.5 Phase Noise Digitizer Board – A230

The PN-digitizer board converts the analog IF provided by the PN-frontend board into digital data. An FPGA processes the digital data and transmits it to the host processor via a PCI express interface.

4.1.6 Spectrum Analysis Frontend Board – A100

The SA-frontend board processes input signals in the range up to 8 GHz by three different operating modes: The high band mode is a triple conversion receiver with the first IF > 8.97 GHz and the second IF >1.29 GHz. The exact IF depends on the input frequency and the selected bandwidth. In the low band mode input signals ≤ 1 GHz are directly converted to the second IF. For input frequencies up to 80 MHz the direct mode passes the input signal directly through the SA-frontend board without frequency conversion. Level detectors on the RF and the IFs allow overload detection and triggering.

4.1.7 Microwave Converter Unit (R&S FSWP26 / 50) – A161/A170

The R&S FSWP26 / 50 comprise a microwave converter consisting of two boards: The microwave converter base board A170 and the microwave converter frontend A161. A170 includes the power supply, the YIG current source and the digital control. A161 is connected by a ribbon cable with the base board A170.

The microwave converter frontend contains the microwave signal path: Relais A580 switches the RF input signal. In the phase noise analyzer mode <8 GHz the RF signal is switched to the PN-frontend board A110. In the phase noise analyzer mode >8 GHz the RF signal is switched (via the triplexer A340 → see Option B1) to the microwave converter A161.

In the spectrum analyzer mode (Option B1) the RF signal is switched via the triplexer A340 to the SA-frontend board A100 (<8 GHz) or via the triplexer and the YIG filter A162 to the microwave converter A161 (>8 GHz). The triplexer A340 couples the low frequency part up to 80 MHz of the input signal in the direct path.

The YIG filter A162 in front of the microwave mixer filters the input signals in the spectrum analyzer mode only. A bypass path allows bypassing the YIG filter to achieve large bandwidths in the spectrum analyzer mode. The microwave mixer converts the input signal down to the second IF >1.29 GHz. Amplifiers and variable attenuators control the gain of the IF signal before it is fed in the IF input of the SA-frontend board. The YIG filter is always bypassed in the phase noise analyzer mode.

4.1.8 Reference Board – A120

The reference board generates the reference signals for the R&S FSWP. The reference frequency is obtained by an OCXO at 10 MHz which can be replaced either by the option B4, an external reference frequency in the range 1 MHz to 20 MHz or by an external 100 MHz signal. A 128 MHz quartz oscillator (VCOCXO) is synchronized on the 10 MHz and is the central source for any other frequencies. The module provides the 128 MHz clock for FPGAs, the ADC clock at 400 MHz, a 640 MHz output, two 1280 MHz outputs for the frontend board and the synthesizer board and the LO2 at 7680 MHz and 8064 MHz. It also generates the internal level reference at 64 MHz and the comb signal for the self-alignment.

4.1.9 Synthesizer Board – A140

In the synthesizer board a YIG oscillator locks on the 1280 MHz signal from the reference board to generate the local oscillator signal for the mixers in the PN-frontend board, in the microwave converter, and in the SA-frontend board. There are two independent modes realized: The sweep mode is optimized for fast sweeps and allows continues output frequencies. In step mode only discrete output frequencies are possible and a very low phase noise level is achieved. A FPGA on the module controls the hardware.

4.1.10 Detector Board – A200

The detector board digitizes the IF or baseband signal provided by the frontend. The module contains the digital signal processing and the sequence control for the spectrum mode. The digital baseband input and output are located on this board as well as the trigger input, the GPIB bus, the instrument interconnect and the user port. The detector board is connected to the CPU Board via PCIe bus.

4.1.11 Digital Motherboard – A20

The digital motherboard provides the slots for the digital modules, the CPU Board, and the reference board. It contains signal connections and the power distribution as well as the converters for the analog module supply voltages. A FPGA, that contains the board EEPROM, controls the two main fans and the power up of the DC/DC converters.

4.1.12 Analog Motherboard – A10

This complete passive board provides the slots for the analog modules. It contains the interconnects for these boards and the interconnect to the front panel.

4.1.13 CPU Board – A90

The CPU Board contains all the necessary components on a board, including the processor, system memory (SO-DIMM modules), I/O devices (PCIe bus), lithium battery, LCD graphics controller, external DVI monitor graphics interface (monitor), controller for SATA hard drive and the USB interfaces.

4.1.14 Frontpanel

The frontpanel consists of the following components:

- Display with touch A70
- Frontconnector board A30
- Frontpanel-keyboard board A40
- Standby board (only available with the Frontpanel-keyboard board) A50
- Rotary pulse generator A42
- RF input plug X1
- RF connector board

All these components are mounted on the front bezel.

4.1.15 Power Supply – A80

The power supply unit provides the intermediate supply voltage for the whole instrument. It can be switched off by means of the power switch on the rear panel. The power supply unit is a primary clocked switching power supply. On the secondary side, it generates the following DC voltages: +12.2 V, and +12.2 V standby. A control signal controlled by the CPU Board (depending on the STANDBY/ON key on the front of the instrument frame) activates the power supply. In standby operation, it only supplies the 12.2 V-standby voltage for heating the OCXO, the LED STANDBY on the front panel and the power up control logic on the CPU Board.

4.1.16 Options

4.1.16.1 Spectrum Analyzer R&S FSWP-B1 – A100/A162*/A340*

The SA frontend board A100 processes input signals in the range up to 8 GHz by three different operating modes: The high band mode is a triple conversion receiver with the first IF > 8.97 GHz and the second IF >1.29 GHz. The exact IF depends on the input frequency and the selected bandwidth. In the low band mode input signals ≤ 1 GHz are directly converted to the second IF. For input frequencies up to 80 MHz the direct mode passes the input signal directly through the SA frontend board without frequency conversion. Level detectors on the RF and the IFs allow overload detection and triggering.

*For the models R&S FSWP 26 / 50 the following units are required in this option: Triplexer A340 and YIG filter A162.

4.1.16.2 High Stability OCXO R&S FSWP-B4 – A260

The R&S FSWP-B4 option contains a high performance oven-controlled crystal oscillator (OCXO). This OCXO generates a 10 MHz signal, which is routed to the reference board and used as a reference signal.

4.1.16.3 RBW>10MHz R&S FSWP-B8

The B8 provides resolution bandwidths greater than 10 MHz for the spectrum analyzer.

4.1.16.4 High Pass Filter R&S FSWP-B13

Provides additional high pass filters in the spectrum analyzer signal path for harmonic measurements.

4.1.16.5 Preamplifier R&S FSWP-B24

The option R&S FSWP-B24 provides an internal preamplifier which covers the whole frequency range of the instrument. This option is only available if Option B1 is installed and while the spectrum analysis mode is active! Option B24 is bypassed in the phase noise measurement mode.

4.1.16.6 Cross-Correlation R&S FSWP-B60

The option R&S FSWP-B60 provides a second synthesizer board A180 and a second reference board A150 Var.03. Additionally, the PN-frontend board must be of Var.02 or of Var.04.

The second synthesizer board is identical to the first synthesizer board A140. Synthesizer board A140 provides the LO signal for channel 1 and synthesizer board A180 provides the LO signal for channel 2 and the signal for the signal source option. The second reference board is locked onto the first reference board with a very low bandwidth of less than 0.1 Hz.

4.1.16.7 Cross-Correlation (low phase noise) R&S FSWP-B61

The option R&S FSWP-B61 provides a second synthesizer board A180 and a second reference board A150 Var.04. Additionally, the PN-frontend board must be of Var.02 or Var.04.

The second synthesizer board is identical to the first synthesizer board A140. Synthesizer board A140 provides the LO signal for channel 1 and synthesizer board A180 provides the LO signal for channel 2 and the signal for the signal source option. The second reference board is locked onto the first reference board with a very low bandwidth of less than 0.1 Hz.

This option also includes the option R&S FSWP-B4 which is a high performance oven-controlled crystal oscillator (OCXO). This OCXO generates a 10 MHz signal, which is routed to the reference board and used as a reference signal.

4.1.16.8 Signal Source R&S FSWP-B64

The option R&S FSWP-B64 requires option R&S FSWP-B60. Accordingly, the low phase noise board (LPNB) is of Var.02 respectively Var.04.

The signal source output of the PN-frontend board is connected to an RF Attenuator A570 which adjusts the RF output level in 10dB-steps.

The frequency range of the Signal Source is from 10 MHz up to 8 GHz for the R&S FSWP 8 model and from 10 MHz up to 18 GHz for the R&S FSWP 26 models.

Furthermore, two auxiliary LO inputs are available which can be used in additive phase noise measurements only. The two auxiliary LO inputs replace the internal synthesizer signals. The frequency range for this auxiliary LO inputs is from 10 MHz up to 18 GHz.

4.1.16.9 80MHz Analysis Bandwidth R&S FSWP-B80

The R&S FSWP-B80 extends the IQ analysis bandwidth in the spectrum analyzer signal path to 80 MHz.

4.1.16.10 Analysis Bandwidth Extension R&S FSWP-B320

The Analysis Bandwidth Extension options consist of a wideband ADC board and a Detector Extension Board. The option expands the analysis bandwidth of the R&S FSWP in the spectrum analyzer signal path to 320 MHz. It also contains a wideband IF output at the rear panel of the R&S FSWP.

4.2 Basic Steps and Information for Module Replacement

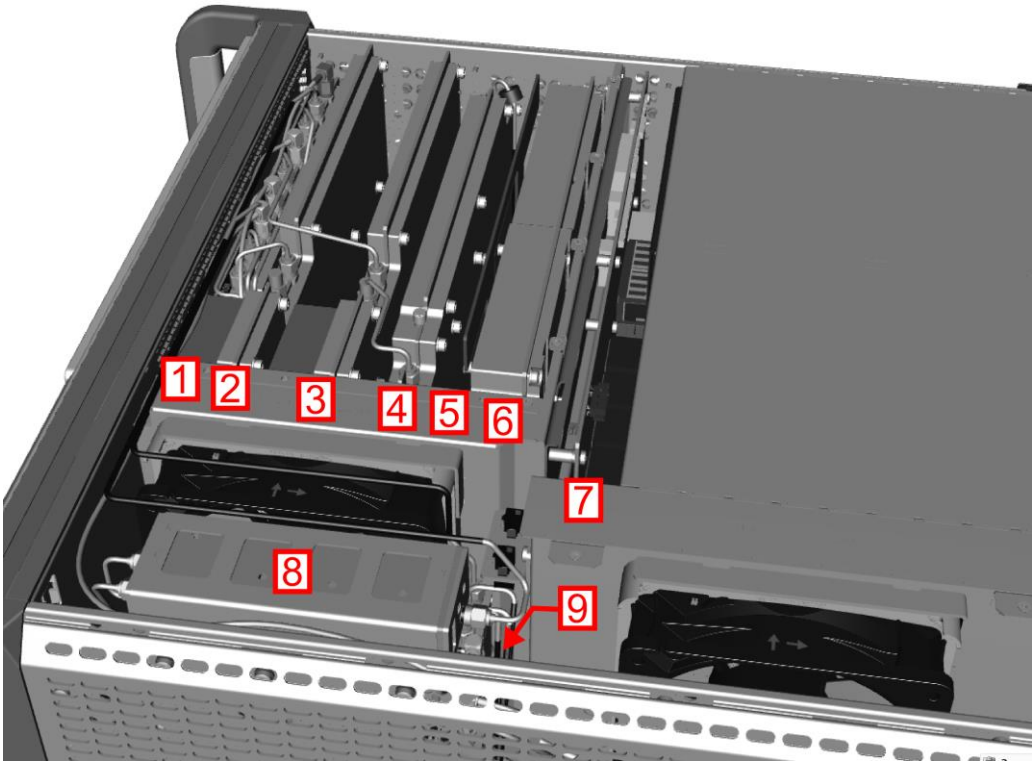
4.2.1 Location of the Modules

4.2.1.1 On the rear side of the instrument:

Figure 3-1: Instrument from the back side

Position	Module
1	CPU board A90 with hard disk drive A91
2	Power supply unit A80
3	Detector base board A220
4	Digitizer board A230
5	Option R&S FSWP-B4 A260
6	Reference board A120

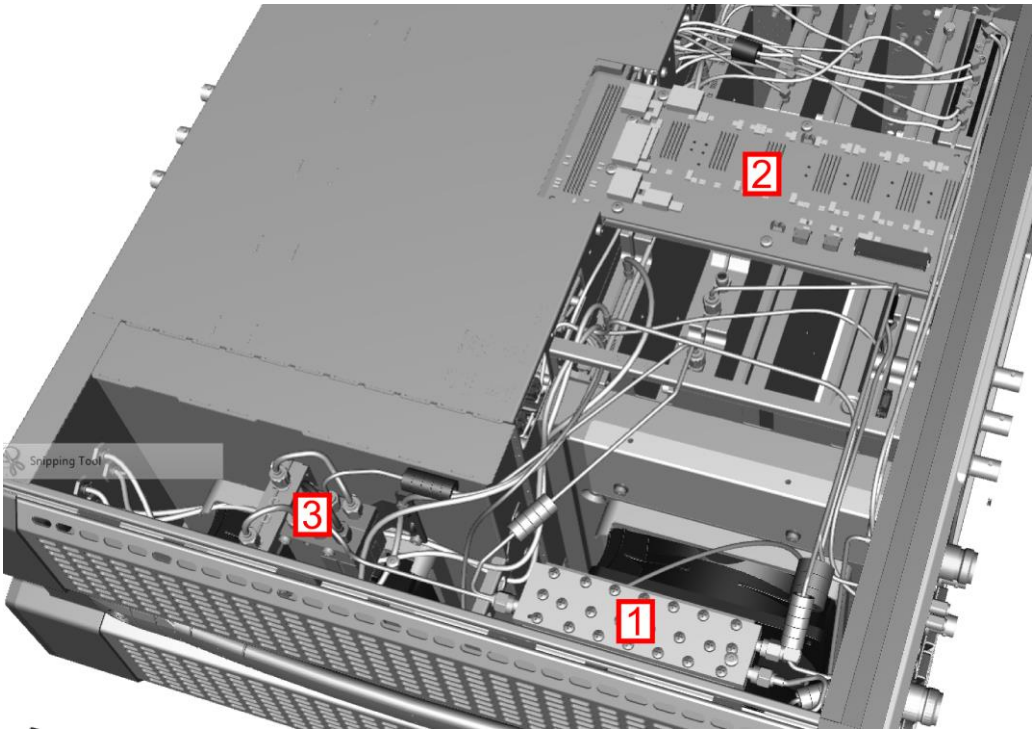
4.2.1.2 On the front side of the instrument



Position	Module
1	PN frontend board A110
2	Synthesizer 2 board A180 (only with option R&S FSWP-B60)
3	Synthesizer board A140
4	Frontend board A100 (only with option R&S FSWP-B1)
5	Microwave Converter Baseboard A170 (only R&S FSWP26 / 50)
6	Reference 2 board A150 (only with option R&S FSWP-B60)
7	Digital Motherboard A20
8	Attenuator Signal Source A570 (only with option R&S FSWP-B64)
9	Alignment signal Relay A590

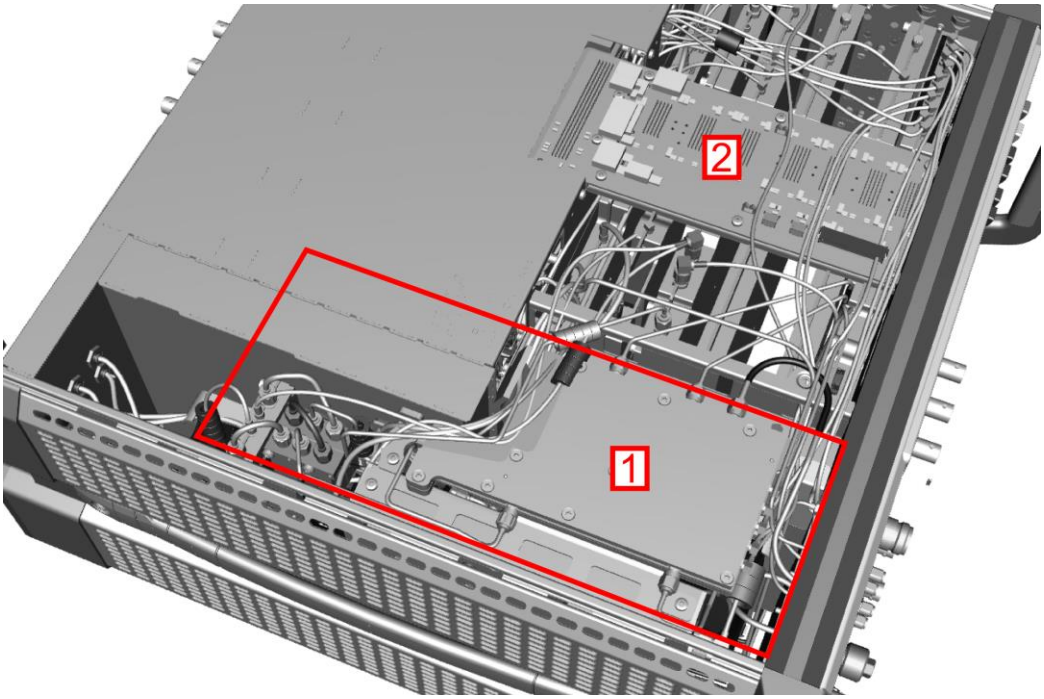
4.2.1.3 On the bottom side of the instrument

R&S FSWP8:



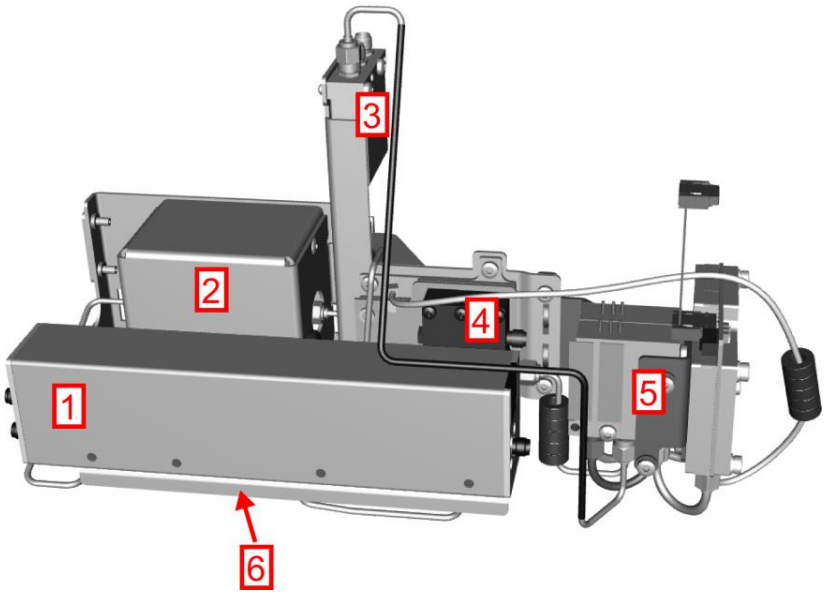
Position	Module
1	Step Attenuator A60
2	Analog Motherboard A10
3	Option R&S FSWP-B24

R&S FSWP26:



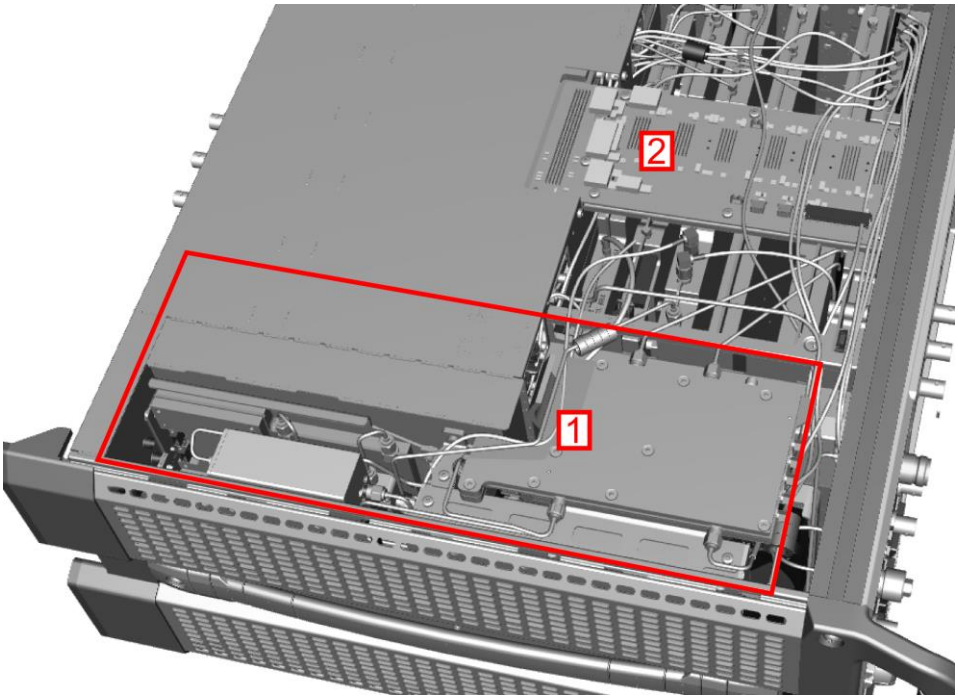
Position	Module
1	Microwave Converter Frontend Unit (for details see picture below)
2	Analog Motherboard A10

Microwave converter frontend Unit :



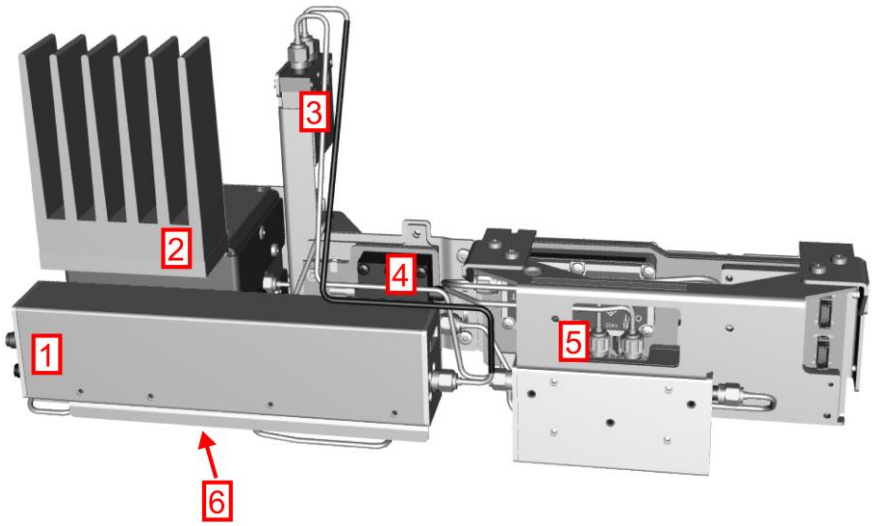
Position	Module
1	Step Attenuator A50
2	YIG filter A162
3	Signal Path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A240
6	Microwave converter frontend A161

R&S FSWP50:



Position	Module
1	Microwave Converter Frontend Unit (for details see picture below)
2	Analog Motherboard A10

Microwave converter frontend Unit :



Position	Module
1	Step Attenuator A50
2	YIG filter A162
3	Signal Path Relay A580
4	Triplexer module A340
5	Preamplifier Unit R&S FSWP-B24 A240
6	Microwave converter frontend A161

4.2.2 Connector types

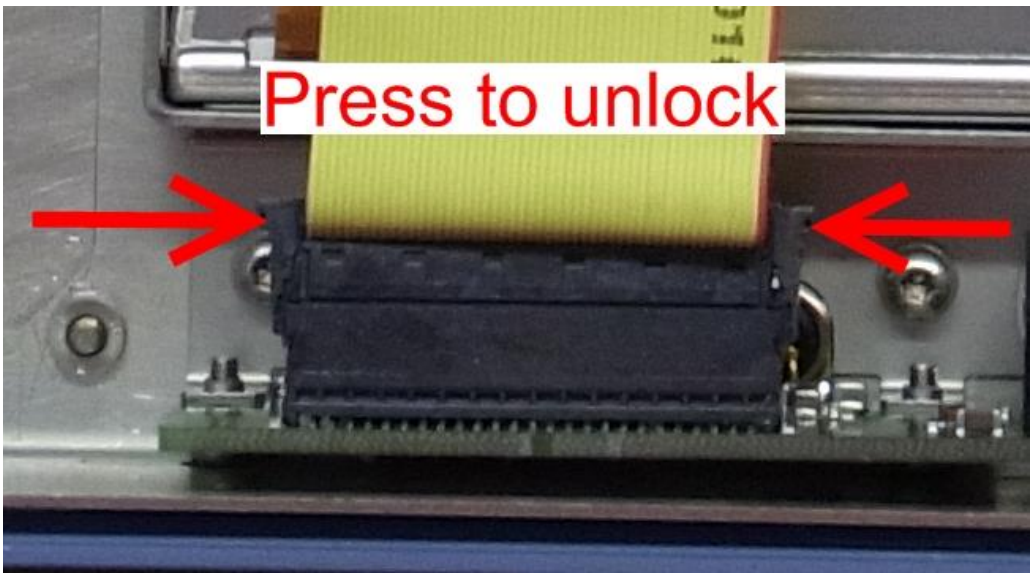
To connect the boards in the instrument different type of connectors are used. In the following releasing and plugging of the different types of connectors are described. The pictures illustrate the handling of the connectors in principle.

4.2.2.1 Flat Ribbon Cable Connector

This flat ribbon cable connector is used for the step attenuator, the preamplifier, the microwave converter frontend, the front panel and the front connector board. These connectors have different counts of contacts but the lock mechanism is the same.

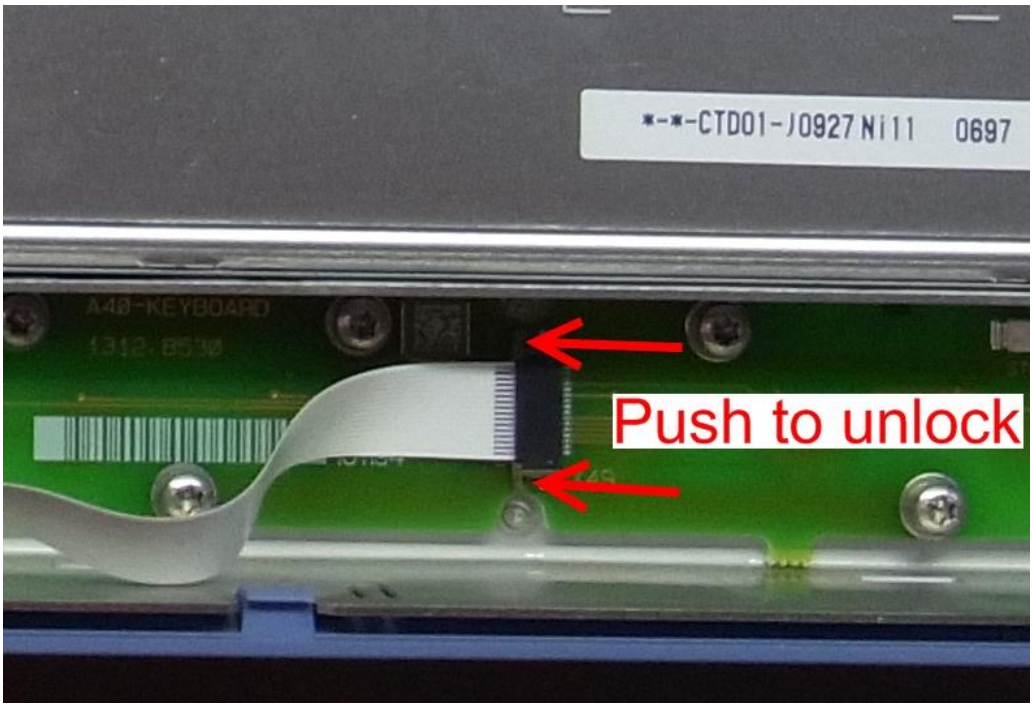
Be careful when unlocking and unplugging the connector. The connector can be damaged easily when it is not proper unlocked or not straight unplugged.

Be careful when reconnecting the connector. The pins can be destroyed when the connector is plugged in not straight ahead.



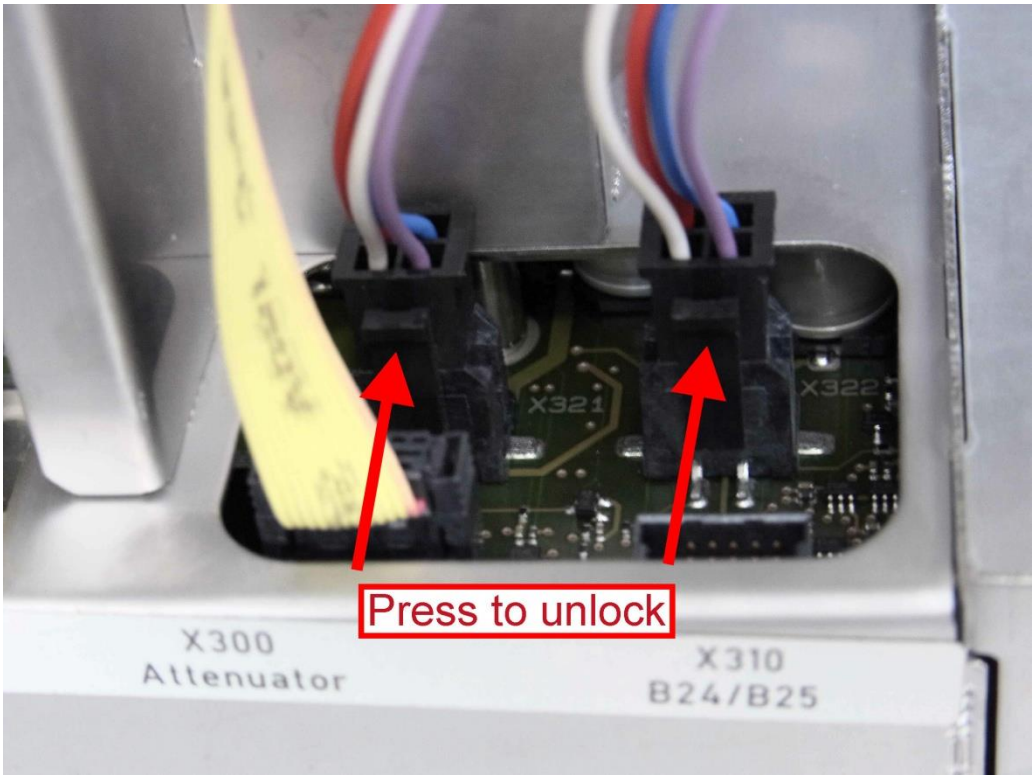
4.2.2.2 Foil Cable Connector

This connector is used at the front panel. The connector must be unlocked before unplugging the cable and must be locked after re-plugging the cable. The cable is contacted on the upper side of the cable. Be sure to plug in the cable properly otherwise some of the connections might be short-circuited.



4.2.2.3 Fan Connector

This type of connector is used to contact the fans. To unlock this connector when unplugging it press the small lever on the side of the connector and unplug it.

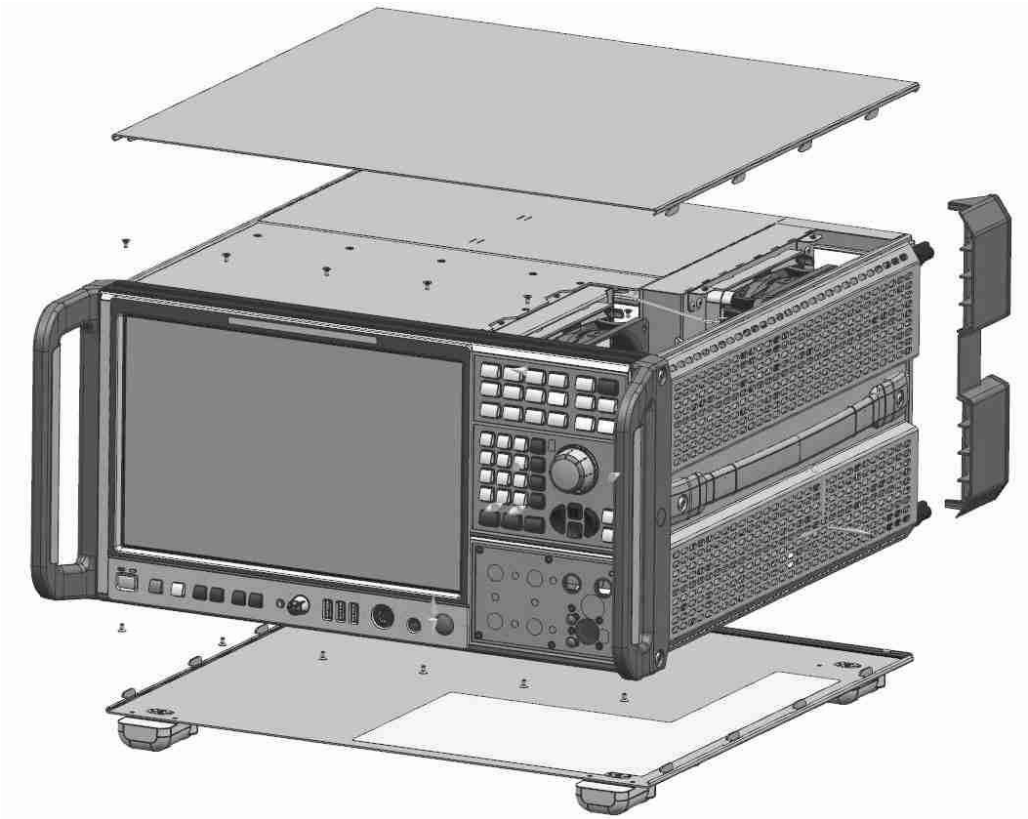


4.2.3 Disassembling the Instrument

Before changing any parts of the instrument you have to disassemble certain parts of the instrument. Refer to the following table first before disassembling too much.

Module or part of module to replace	Unmount upper cover	Unmount lower cover	Unmount inner lid 1or 2	Unmount right side cover	Unmount frontpanel
CPU Board A90	-	-	-	-	-
Frontpanel	X	X	1 + 2	X	X
Power supply A80	-	-	-	-	-
Frontend Board A100	X	X	1	-	-
Detector board A200	-	-	-	-	-
Attenuator A40	-	X	-	X	-
Digital motherboard A20	X	X	1 + 2	-	-
Analog motherboard A10	-	X	-	-	-
Microwave converter Baseboard A170	X	X	1	-	-
Microwave converter frontend unit parts A160 A161 A162, A580	X	X	2	X	-
PN Frontend Board A110	X	X	1	-	-
Synthesizer 2 Board A180	X	X	1	-	-
Reference 2 Board A150	X	X	1	-	-
Speaker, fans	X	X	2	-	-
OCXO R&S FSWP-B4 A250	-	-	-	-	-
Synthesizer board A140	X	X	1	-	-
Reference board A 120	-	X	-	-	-
Preamplifier A270 R&S FSWP-B24	-	X	2	X	-
Signal Source Attenuator A570	X	X	2	-	-
Alignment Signal Relay A590	X	X	2	-	-
Digitizer Board A230	-	-	-	-	-
Frontpanel RF connectors	-	-	-	-	X

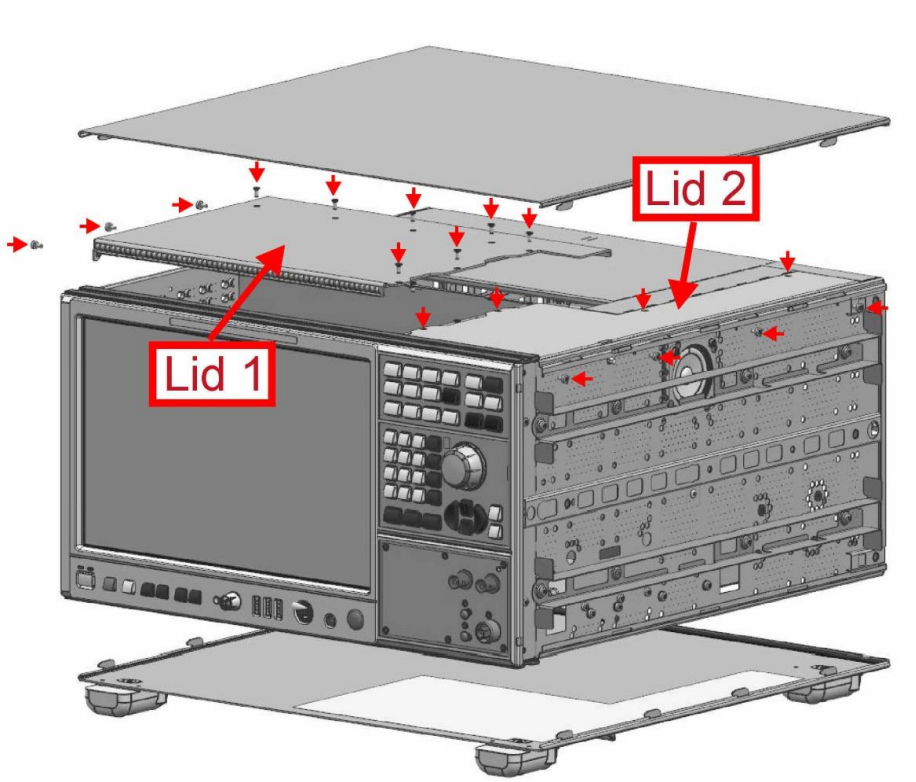
4.2.3.1 Unmounting the Upper and/or Lower Cover



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the label on the upper and lower metal bead.
4. Unscrew the six screws fastening the upper and lower metal bead.

   Tip: You do not need to remove the screws completely.
5. Remove the upper and/or the lower housing metal sheet by pushing it towards the back of the instrument.

4.2.3.2 Unmounting the Inner Lids 1 and 2



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the label on the upper and lower metal bead.
4. Loosen the four screws fastening the upper and lower metal bead.

   Tip: You do not need to remove the screws completely.
5. Remove the upper housing metal sheet by pushing it towards the back of the instrument.

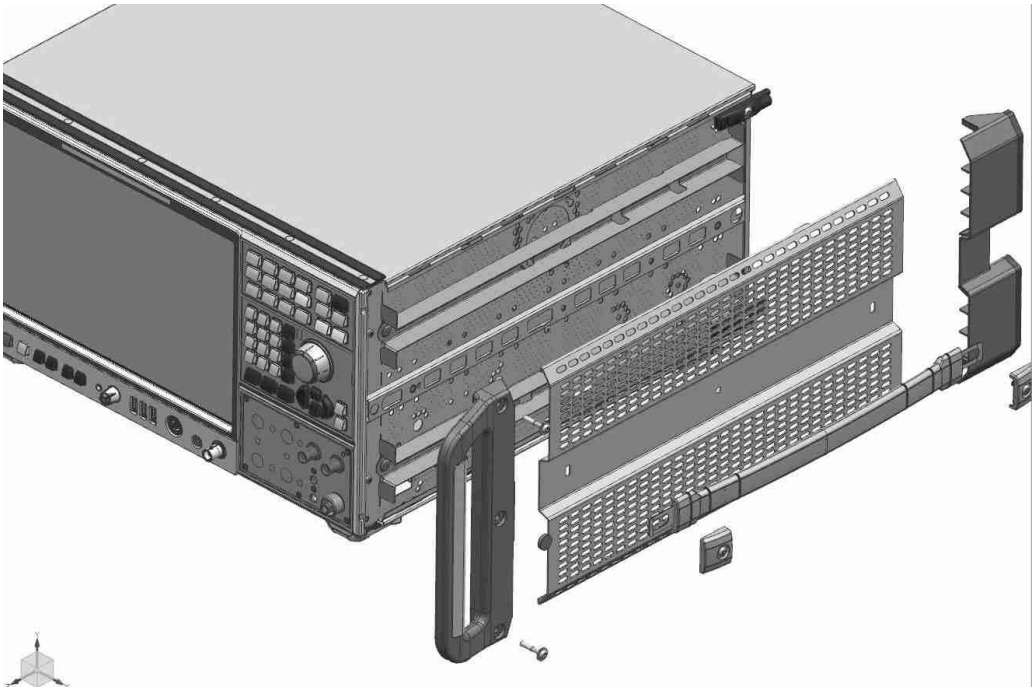
Unmounting lid 1:

a) Remove the left side cover as described in chapter 3.2.3.3
b) Unscrew the 7 screws on the top of the instrument and the three screws on the left side of the instrument.
c) Carefully remove the lid.
   NOTICE! Do not to damage the EMI shielding gaskets!

Unmounting lid 2:

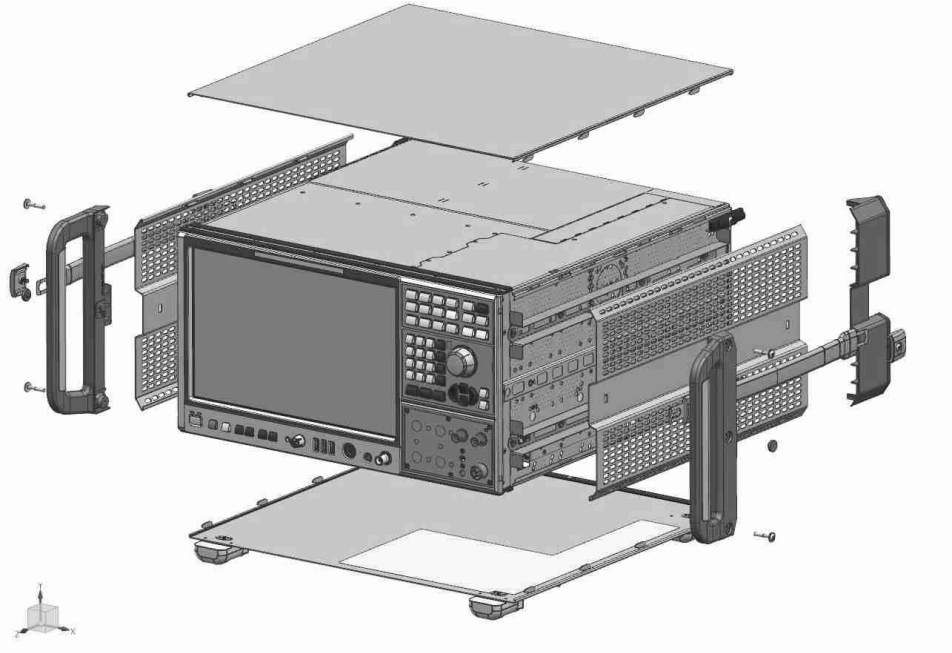
a) Remove the right side cover as described in chapter 3.2.3.3
b) Unscrew the four screws on the top of the instrument and the four screws on the right side of the instrument.
c) Carefully remove the lid

4.2.3.3 Unmounting the Side Cover



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two screws in the rear wall foot and remove the foot.
3. Unscrew the two screws fastening the flexible side handle and remove the flexible side handle.
4. Unscrew the two screws in the side handle and remove the handle.
5. Remove the side cover by pushing it towards the back of the instrument. After that remove the side covers completely.

4.2.3.4 Unmounting the Frontpanel



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the upper and the lower housing as described in chapter 3.2.3.1
4. Remove the right side cover as described in chapter 3.2.3.3
5. Unmount the inner lid 2 as described in chapter 3.2.3.2
6. Remove the two cable ties around the display cable, if installed.
7. Carefully unplug the display cable in the upper right corner of the front panel.

   Note: The connector is locked. To unplug it you have to press the silver lever, as shown in the picture below. While pressing the lever gently pull the plug towards the back of the instrument.

8. Unscrew the RF input cable and the cable for the signal source R&S FSWP-B64 if installed.

   Note: You can access the connector through the cutout at the right side of the instrument after unmounting the side stabilizing beads. The connector of the signal source can be reached from the bottom of the instrument.

If option R&S FSWP-B21 and/or R&S FSWP-B64 is installed:

► Remove the label on the RF input connector carrier board and unscrew the two/four screws fastening the two/four SMA connectors.

9. Remove the six screws fastening the upper and lower metal bead and remove the beads
10. Unscrew the four screws fastening the front panel on the left and right side of the instrument.
11. Carefully pull the front panel out of the instrument

    Note: The flat ribbon cable to the front panel is still connected! Gently remove the front panel and unplug the cable on the front panel.
12. Unplug the two flat ribbon cables at the front panel.

4.2.4 Assembling the Instrument

The instrument is assembled in the reverse order of disassembling it.

1. Plug the flat ribbon cables in its connector on the front panel.

If option R&S FSWP-B21 and/or R&S FSWP-B64 is installed:

► Carefully insert the two/four SMA connectors in its mounting holes on the RF input connector carrier board. Fix this connectors with the screws previously removed and install a new label on the RF input connector carrier board.

2. Reinstall the four screws previously removed at the right and left side of the instrument.
3. Mount the upper and lower metal bead if unmounted.
4. Reinstall the six screws in the upper and lower metal bead.

   Tip: Do not fasten the screws too much because the upper and lower instrument housing will be clamped by this screws after installation.
5. Connect the display cable.

   Note: Be sure the plug is locked! The connector is locked with an audible “CLICK” when plugged in.
6. Reinstall the two cable ties to the display cable.
7. Reconnect the RF input cable and the cable for the signal source if installed.
8. Mount the inner lid 2 and reinstall the nine screws previously removed.

   Note: Be sure to reinstall all EMI shielding gaskets!
9. Remount the side stabilizing beads if unmounted.
10. Remount the side cover.
11. Remount the front handles.
12. Remount the side handles by installing the two screws previously removed if unmounted.
13. Mount the top and/or bottom cover.

    Note: Be sure the cover fits to the metal beads at the front of the instrument. Maybe you have to press down the cover before pushing it towards the front of the instrument.
14. Remount the feet at the back of the instrument by fastening the two screws inside the feet.
15. Fasten the eight screws in the upper and lower metal bead. Install the label on the upper and lower metal bead covering the screws.
16. For the next steps to be carried out refer to 3.2.5.

4.2.5 Putting into Operation

After completely assembling the instrument the following steps need to be carried out depending on the replaced module. The additional tasks are described with the replacement procedure of the corresponding board. In addition to these tests it is recommended to perform a performance test according to chapter 1 to verify the functionality of the instrument.

Replaced Module	**Basic Instrument Checks (refer to 3.2.5.1)**	**Frequency response correction (refer to 3.2.5.2)**	**Additional Tests/Tasks (refer to corresponding chapter)**
CPU board A90	X	-	X
SATA HDD ADAPTOR A92	X	-	-
Lithium battery	X	-	-
Power supply A80	X	-	-
Detector board A200	X	X	-
PN Frontend Board A110	X	X	-
Digitizer Board A230	X	-	-
Reference board A120	X	X	-
Reference 2 Board A150 (R&S FSWP-B60)	X	X	-
Synthesizer board A140	X	X	-
Synthesizer 2 Board A180 (R&S FSWP-B60)	X	X	-
Microwave-converter baseboard A170	X	X	-
Microwave-converter frontend A161	X	X	X
YIG filter A162	X	X	X
Triplexer (R&S FSWP26/ 50only) A340	X	X	-
Frontend board A100	X	X	-
Display A70	X	X	X
Frontpanel keyboard board A40	X	X	X
Front connector board A30	X	X	-
Motherboard digital A20	X	X	X

Motherboard analog A10	X	X	-
Fan	X	-	-
Input Cable	X	X	-
Preamplifier Unit A270 (R&S FSWP8/26/50-B24)	X	X	X
OCXO R&S FSWP-B4 A260	X	Reference frequency adjustment only	-
Input connectors R&S FSWP-B21	X	X	-
Input connectors R&S FSWP-B64	X	X	-
Wideband ADC board A290 (R&S FSWP-B320)	X	-	-
Detector extension board A220 (R&S FSWP-B320)	X	-	-

4.2.5.1 Basic Instrument Checks

Checking the Hardware List

When a board has been changed check the hardware list by executing

[SETUP : SYSTEM CONFIG : HARDWARE INFO]

and verify if the corresponding board has been correctly detected and the serial number is updated.

Checking the System Massages

Next check the system messages by executing

[**SETUP** : SYSTEM CONFIG : SYSTEM MESSAGES]

to find errors in the hardware configuration.

Performing an instrument selftest

Next run the instrument selftest by executing

[**SETUP** : Service : Selftest : Start Selftest]

and check the results.

If the selftest fails enter the service password by entering

[**SETUP** : Service : Service Function : Password = 894129]

and repeat the selftest in service mode to get more information and the check results again.

Performing an Instrument Self-alignment

Run the instrument self-alignment by executing

[**SETUP** : Alignment : Start Self Alignment]

and check the results.

4.2.5.2 Performing a Frequency Response Correction

The frequency response correction is required only in the cases listed in the table above or when you have opened any connector in the RF signal path. Without the frequency response correction the instrument may not achieve the required performance. For details see chapter 2.

4.3 Module Replacement

WARNING

Danger of injury during module replacement

Any adjustments, replacement of parts, maintenance or repair must be carried out exclusively by technical personnel authorized by Rohde & Schwarz.

Observe the safety instructions for units with a removable casing.

Follow the step-by-step instructions for module replacement carefully to avoid injury and to help ensure safe operation.

WARNING

Shock hazard

Before opening the casing, make sure that the instrument is switched off and disconnected from all power supplies.

Read all safety instructions at the beginning of this manual carefully!

NOTICE

Risk of electrostatic discharge

Protect the work area against electrostatic discharge to avoid damage to electronic components in the modules. For details, refer to the safety instructions at the beginning of this manual.

NOTICE

Risk of damage to the instrument

When connecting cables or other equipment to the input connector of the instrument be sure to use the correct torque when tightening the connector!

Tools recommended for module replacement:

Tool	Part to replace
BW2010 TOOL (1174.0301.00)	all boards on the rear side of the instrument
USB Keyboard and USB Mouse	Front board, Display
SMP Connector removal Tool (e.g. Rosenberger extraction tool Order No. 11W101-000)	Digital Motherboard

4.3.1 CPU Board A90

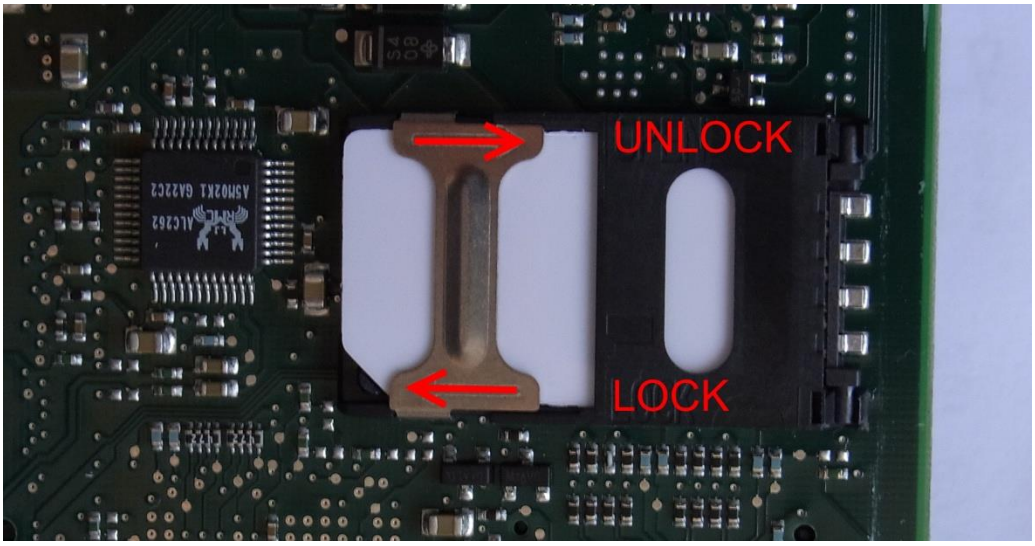
4.3.1.1 Replacing the CPU Board

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two knurled screws and remove the hard disk drive on the rear.
3. Unscrew six screws fastening the CPU board.

   Note: You can easily remove the CPU board using the BW2010 KEY tool. To remove the CPU board push the BW2010 KEY tool in the corresponding holes on the rear side of the module. The top side of the tool is marked with the sign “TOP”. After inserting the tool gently turn the tool on the right side of the module clockwise for 90° and the tool on the left side of the module counterclockwise for 90°. Now the module can be removed by gently pulling on the BW2010 KEY tools. The tools can be removed by turning them to the initial position with the “TOP” marked side up.
4. Gently pull the controller out of the instrument.

   Note: Be sure to pull out the controller straight ahead.
5. Remove the smart card from the controller. The smart card is located at the bottom side of the CPU board. Release the holder by gently pushing the silver lever towards the outline of the CPU board as shown in the picture below. Open the holder by pulling up the smart card at the left side and remove the smart card from the holder.

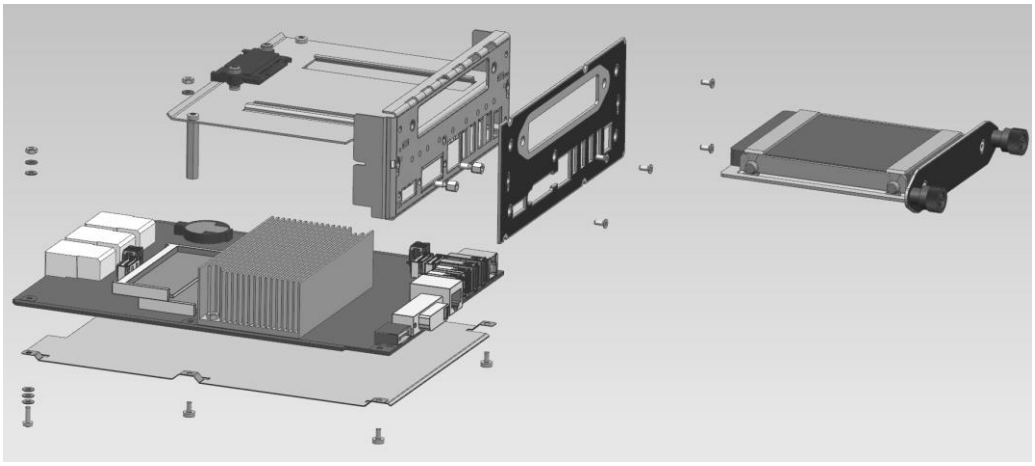
   NOTICE! Do not damage the smart card! Otherwise the instrument may be unusable.



6. Insert the smart card in the new controller board. First open the holder as described above and put in the smart card properly. Then close the holder and lock it.

   NOTICE! Risk of damage to the CPU board! Be careful when closing the smart card holder: if the smart card is not inserted properly the holder can break when closing it roughly.

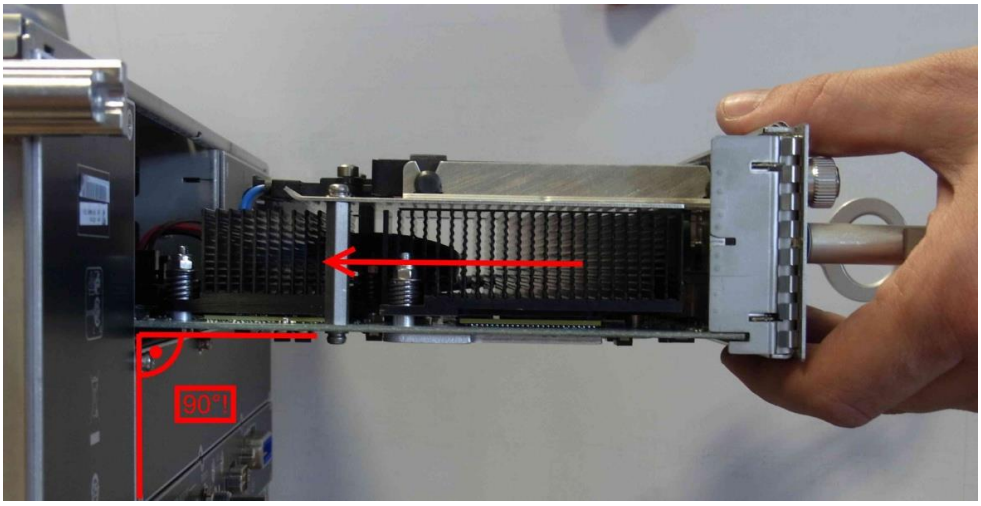
7. The new CPU board comes without backplane and hard disk holder. This parts must be unmounted from the old CPU board and reused with the new CPU board.



   a) Unplug the hard disk drive data cable and the power cable at the CPU board.
   b) Remove the two screws at the DVI port.
   c) Remove the four screws fastening the hard disk holder and remove it.
   d) Uninstall the screening shield on the bottom of the CPU board.
   e) Reinstall the parts formerly removed to the new CPU board.
   f) Reconnect the hard disk drive data cable and power cable.

8. Insert the new controller board in the instrument.

   NOTICE! Risk of damage to the CPU board! Be careful when inserting the controller! Push the controller with an angle of 90° towards the back of the instrument in its slot. Otherwise there is the risk of damaging components on the bottom side of the controller board.



9. Fasten the new CPU board by reinstalling the six screws formerly removed.
10. Reinstall the hard disk drive formerly removed.
11. Connect the instrument to the mains and switch on the power switch on the back of the instrument. The instrument is now in standby mode. Start the instrument by pressing the ON/OFF button on the front.
12. Wait for firmware to come up.
13. Perform a BIOS update.

NOTICE

Risk of causing instrument unusability

During the BIOS update, do not switch off the instrument.

If you terminate the update procedure before it is completed, the instrument will likely not boot again. In this case, contact your Rohde & Schwarz service center.

Note: To perform the bios update you need an USB flash drive and an USB keyboard.

a) Download the program archive for preparation of the USB flash drive from Gloris, section “Firmware/Software”. In Gloris select "FW by type" and choose "R&S FSW". Download the file `FSWBiosStick-x-x.xx_FSW.msi` for IPC11 CPU boards. This archive contains the program to prepare the stick, the bios files and the documentation how to update the bios.
b) Install the program archive on your computer.
c) Follow the instructions in the PDF file delivered with the program archive on how to create the bootable USB flash drive and to update the BIOS.

14. Perform the Basic Instrument Checks according to chapter 3.2.5.1

4.3.1.2 Replacing Lithium Battery on CPU Board

The lithium battery is located on the CPU Board.

WARNING

Risk of intoxication and explosion

Observe the safety regulations for batteries in the Grouped Safety Messages at the beginning of the manual.

1. Switch off the instrument and disconnect the power plug.
2. Remove the CPU board as described in chapter 3.3.1.1
3. Carefully push the contact springs of the battery holder and remove the battery.
4. Carefully push the contact springs of the battery holder and insert the battery into the holder beneath the springs.

   Note: The plus pole (+) of the battery points upwards.

   NOTICE! Risk of damage to the instrument. Do not short circuit the battery!
5. Reinstall the CPU board to the instrument (see chapter 3.3.1.1).

   NOTICE! Risk of damage to the controller board! Be careful when inserting the controller! Push the controller with an angle of 90 degree towards the back of the instrument in its slot. Otherwise there is the risk of damaging components on the bottom side of the controller board.
6. Reinstall the hard disk drive.
7. Connect the instrument to the mains and switch on the power switch on the back of the instrument. The instrument is now in standby mode. Start the instrument by pressing the ON/OFF button on the front.
8. Wait for firmware to come up.
9. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.1.3 Replacing SATA Hard Drive A91

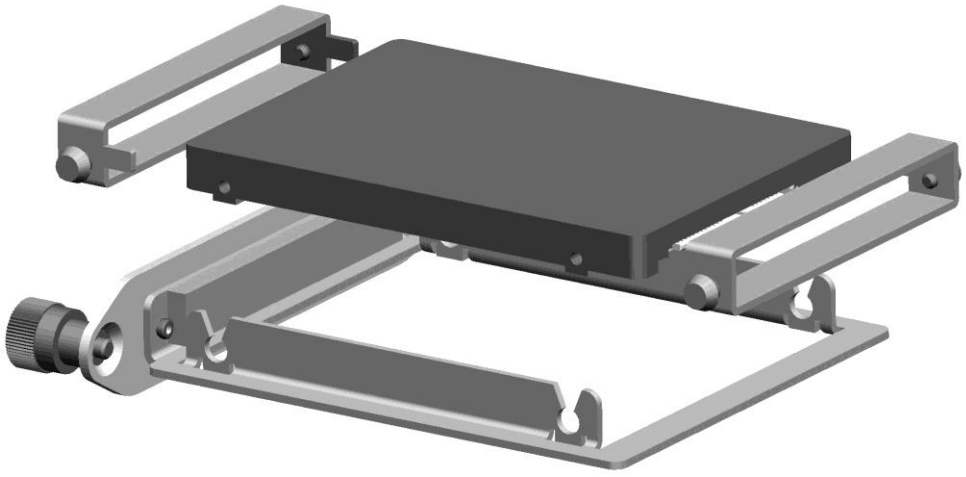
The spare part is already formatted for the R&S FSWP and contains the complete software.

NOTICE

Risk of losing important information

Important information about the type of instrument, installed hardware, options, etc., is stored on the motherboard, the hard drive and the smart card. This information is required in order to restore the instrument in case of errors. Thus, do not replace the motherboard, the hard drive and the smart card at the same time, as doing so will cause this information to be lost. If the instrument does not function after the hard drive has been replaced, do not replace the motherboard or the smart card. Instead, re-install the old hard drive and then replace the motherboard and/or smart card.

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two knurled screws and remove the hard disk drive on the rear.
3. Carefully remove the hard disk drive together with the two holders from the sheet-metal part.
4. Remove the two holders from the hard disk drive.



5. Push the new hard disk drive together with the two holders into the holes of the sheet-metal part.

   Note: Make sure that all parts are orientated as shown in the picture above and that they lock in place. The connectors have to be on the rear of the hard drive and the labels above.
6. Insert the hard disk drive and fasten the two knurled screws.

7. Connect the instrument to the mains and switch on the power switch on the back of the instrument. The instrument is now in standby mode. Start the instrument by pressing the ON/OFF button on the front.
8. Wait for firmware to come up.

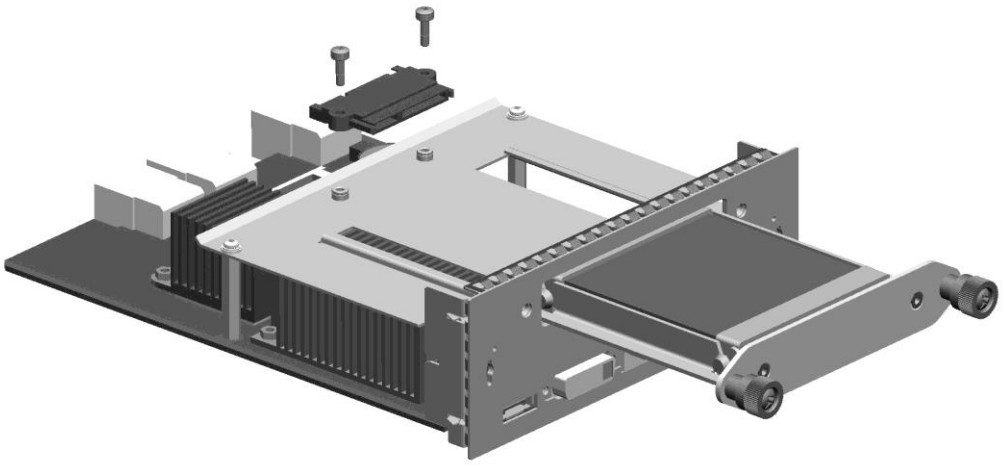
NOTICE

Blue screen after replacing a hard drive

If a blue screen appears after starting the instrument, make sure that the knurled screws are fixed properly and the hard disk drive has a contact to the SATA adaptor.

9. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
10. If needed, update the FW to the latest version.

4.3.1.4 Replacing the SATA Adaptor A92



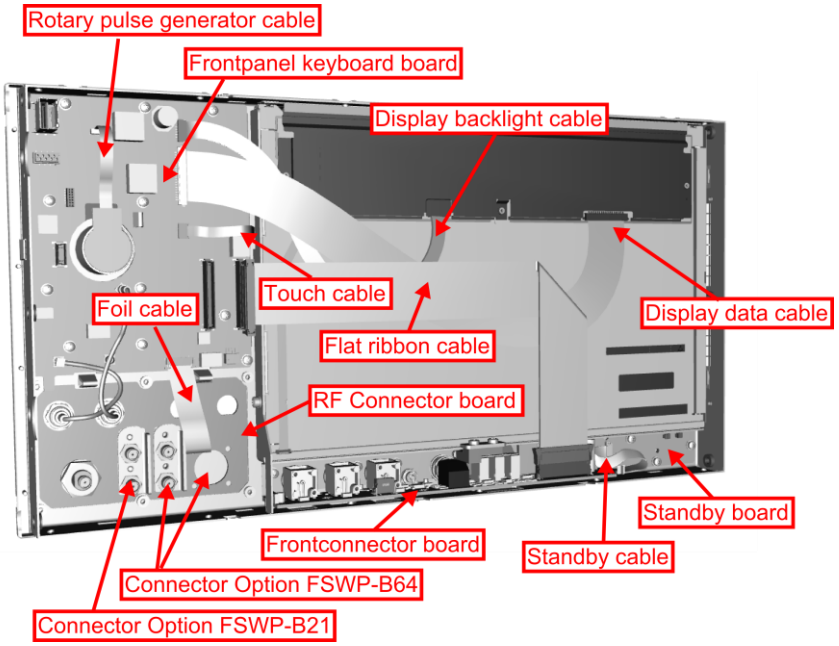
1. Switch off the instrument and disconnect the power plug.
2. Remove the CPU board as described in chapter 3.3.1.1.
3. Unplug the SATA data cable and the SATA power cable from the SATA adaptor.
4. Unscrew the two screws fastening the adaptor.
5. Fix the new adaptor with the two screws previously removed.

NOTICE

Blue screen after replacing a hard drive

if a blue screen appears after starting the instrument, make sure that the knurled screws are fixed properly and the hard drive has a contact to the SATA adaptor.

4.3.2 Front Unit



4.3.2.1 Replacing the Display with Touch Screen A70

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug the display data cable and display backlight cable at the plugs on the display.
3. Unplug touch cable.
4. Unplug flat ribbon cable and on both sides and remove it.
5. Loosen the four screws fastening the display on the left and the right side of the display.

   Tip: You can use a long screwdriver to access the screws through the holes at the left side of the frontpanel.
6. Remove the display from the frontpanel.

   Note: The display is connected to ground by EMI gaskets all the way round. To remove it, gently press from the front of the display.
7. Reinstall the new display.

   NOTICE: Risk of damage to the display! Be careful when inserting the display. Do not break the front glass by pushing it to the front bezel. Be sure to route the touch cable properly!
8. Reinstall the flat ribbon cable.
9. Plug in the display data cable and the display backlight cable.
10. Plug in the touch cable.
11. Mount the frontpanel to the instrument (refer to 3.2.4).
12. Mount the right side cover (refer to 3.2.4).
13. Mount the upper and lower cover (refer to 3.2.4).
14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
15. To calibrate the touch screen you need an USB mouse or an USB keyboard with a track ball. Connect it to an USB port and run the touch screen alignment tool using the keyboard:

    [SETUP : Alignment : Touch Screen Alignment],

    and follow the instructions on the screen.
16. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
17. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.2 Replacing the Frontpanel-Keyboard A40

The frontpanel keyboard comes with the standby board A50. Before you can install the boards you have to separate them. To do so just break the board at intended place by folding the board.

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
3. Unplug flat ribbon cable on frontpanel keyboard.
4. Unplug the two RF cables.
5. Unplug the foil cable on the frontpanel keyboard board.
6. Loosen the eight screws fastening the frontpanel keyboard and remove the board.
7. Reinstall the new frontpanel keyboard and fasten the eight screws previously removed.

   Note: Be sure the push-button board is inserted correctly in the front bezel.
8. Replug the display data cable and display backlight cable.
9. Replug the touch cable and rotary pulse generator cable.
10. Replug the flat ribbon cable.
11. Replug the two RF cables.

    NOTICE: Be sure to plug in the RF cables to the correct connector!
12. Replug the foil cable on the frontpanel keyboard board
13. Mount the frontpanel to the instrument (refer to 3.2.4).
14. Mount the right side cover (refer to 3.2.4).
15. Mount the upper and lower cover (refer to 3.2.4).
16. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
17. To calibrate the touch screen you need an USB mouse or an USB keyboard with a touch ball. Connect it to an USB port and run the touch screen alignment tool:

    [SETUP : Alignment : Touch Screen Alignment]

    and follow the instructions on the screen.
18. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
19. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
20. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
21. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.3 Replacing the Standby Board A50

The standby board can only be ordered with the frontpanel keyboard! The frontpanel keyboard comes with the standby board A50. Before you can install the boards you have to separate them. To do so just break the board at intended place by folding the board.

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug standby cable at the plug on the standby board.
3. Unscrew the five screws fastening the standby board.
4. Replace standby board by the new one.

   Note: Be sure the push button board is inserted properly.
5. Fasten the five screws previously removed.
6. Plug in standby cable.

   Note: The plug is contacting the cable on the top side!
7. Mount the frontpanel to the instrument (refer to 3.2.4).
8. Mount the right side cover (refer to 3.2.4).
9. Mount the upper and lower cover (refer to 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 3.2.5.1
12. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
13. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
14. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.4 Replacing the Front Connector Board A30

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug flat ribbon cable at the plug on the front connector board.
3. Unplug standby cable at the plug on the front connector board.
4. Unscrew the four screws fastening the front connector board.
5. Replace front connector board by the new one.
6. Fasten the four screws previously removed.
7. Plug in standby cable.

   Note: The plug is contacting the cable on the top side!
8. Plug in flat ribbon cable .
9. Mount the frontpanel to the instrument (refer to 3.2.4).
10. Mount the right side cover (refer to 3.2.4).
11. Mount the upper and lower cover (refer to 3.2.4).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
14. Start the key test program by

    [SETUP : Service : Enter Password = 894129]

    [SETUP : Service : Enter Service Function: 2.0.14.0]
15. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
16. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.5 Replacing the Rotary Pulse Generator A42

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug rotary pulse generator cable at the plug on the rotary pulse generator.
3. Remove knob from rotary pulse generator.
4. Unscrew the nut on the rotary pulse generator.
5. Replace rotary pulse generator by a new one.
6. Fasten the nut.
7. Plug in rotary pulse generator cable.

   Note: The plug is contacting the cable on the bottom side!
8. Reinstall the knob.
9. Mount the frontpanel to the instrument (refer to 3.2.4).
10. Mount the right side cover (refer to 3.2.4).
11. Mount the upper and lower cover (refer to 3.2.4).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
14. Start the key test program by

    [SETUP : Service : Enter Password = 894129]

    [SETUP : Service : Enter Service Function: 2.0.14.0]
15. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
16. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.6 Replacing the RF Input Connector X1

1. Unmount the frontpanel (refer to 3.2.3.4).

For R&S FSWP8:

a) Remove the label R&S FSWP connector around the input connector.
b) Unscrew the four screws fastening the N-type input connector.
c) Replace the input connector by a new one.
Note: The holder of the old input connector is reused. So disassemble the input connector and install the holder with the new input connector.
d) Fasten the four screws previously removed.
e) Add a new label R&S FSWP connector.

For R&S FSWP26 / 50:

a) Unscrew the nut fastening the input connector.
b) Replace the input connector to a new one.
c) Fasten the nut previously removed.

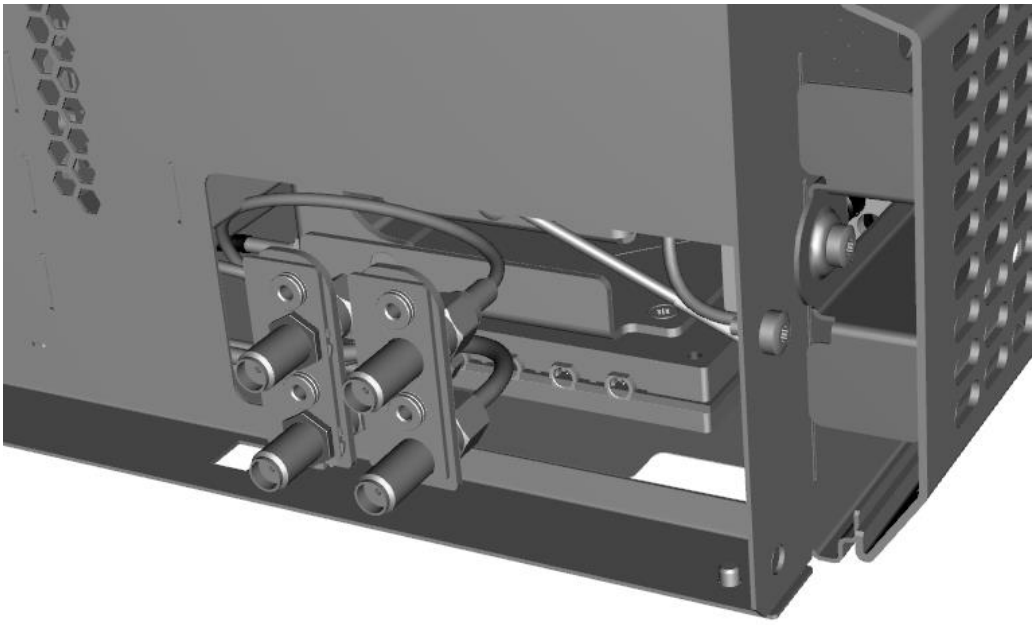
2. Mount the frontpanel to the instrument (refer to 3.2.4).
3. Mount the right side cover (refer to 3.2.4).
4. Mount the upper and lower cover (refer to 3.2.4).
5. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
6. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
7. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.7 Replacing the RF Connector of the signal source output FSWP-B64

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unscrew the four screws fastening the N-type connector of the signal source output.
3. Replace the connector by a new one.

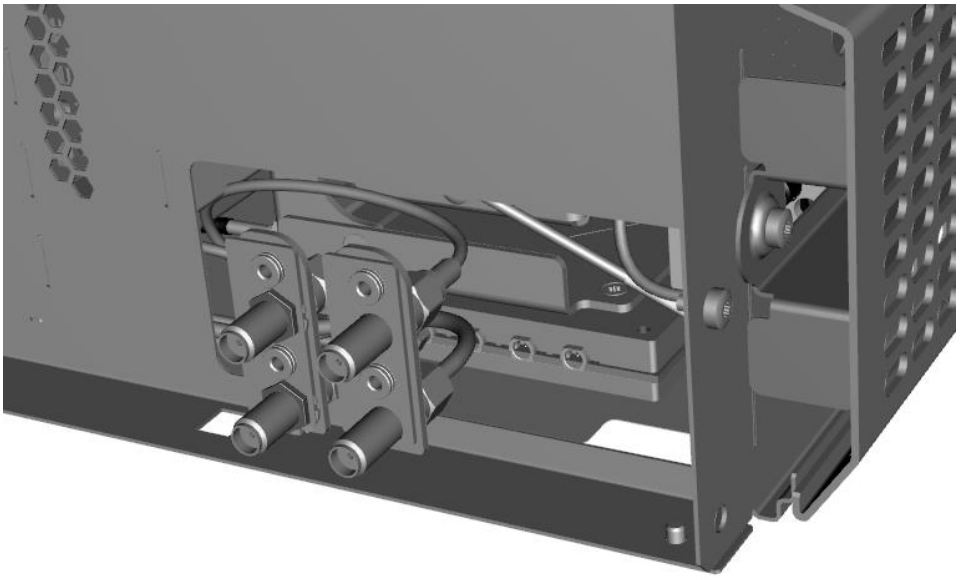
   Note: The holder of the old connector is reused. So disassemble the input connector and install the holder with the new input connector.
4. Fasten the four screws previously removed.
5. Mount the frontpanel to the instrument (refer to 3.2.4).
6. Mount the right side cover (refer to 3.2.4).
7. Mount the upper and lower cover (refer to 3.2.4).
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
10. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.8 Replacing the AUX input connectors of the option FSWP-B64



1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unmount the two SMA connectors from the cable.
3. Remount the new connectors in the same orientation the original ones were installed.
4. Mount the frontpanel to the instrument (refer to 3.2.4).
5. Mount the right side cover (refer to 3.2.4).
6. Mount the upper and lower cover (refer to 3.2.4).
7. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
8. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
9. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.9 Replacing the LO input/IF output connectors of the option FSWP-B21

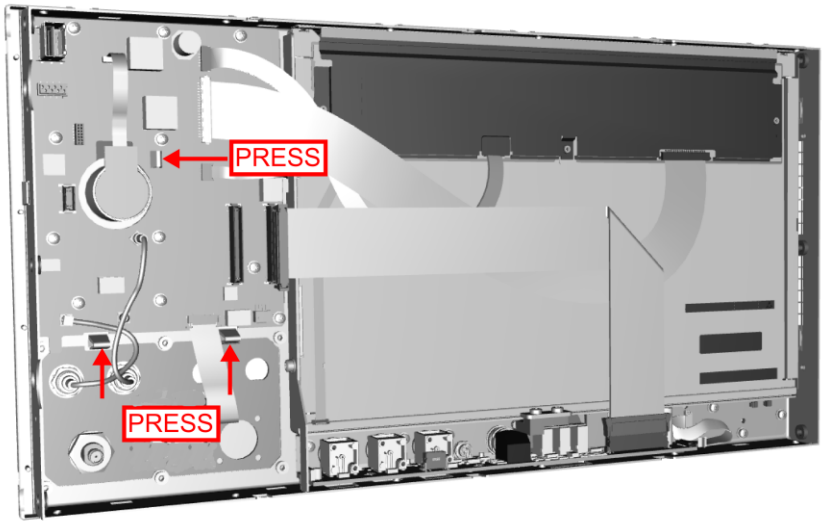


1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unmount the two SMA connectors from the cable.
3. Remount the new connectors in the same orientation the original ones were installed.
4. Mount the frontpanel to the instrument (refer to 3.2.4).
5. Mount the right side cover (refer to 3.2.4).
6. Mount the upper and lower cover (refer to 3.2.4).
7. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
8. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
9. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.10 Replacing the Frontcover

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug display data cable and display backlight cable at the plugs on the front board.
3. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
4. Unplug flat ribbon cable on front board.
5. Unplug the foil cable on the frontpanel keyboard board
6. Unscrew the eight screws fastening the frontpanel keyboard and remove it.
7. Unsnap the frontcover from the sheet metal.

   Note: unlock the front cover by unlocking the three hooks marked in the picture below. Then unlock the hooks at the rim of the frontpanel.



8. Snap the new front cover onto the sheet metal.
9. Reinstall the frontpanel keyboard and fasten the eight screws.

   Note: Be sure the push-button board is inserted correct in the front bezel.
10. Replug the display data cable and display backlight cable.
11. Replug the touch cable and rotary pulse generator cable.
12. Replug the flat ribbon cable.
13. Replug the foil cable on the frontpanel keyboard board
14. Mount the frontpanel to the instrument (refer to chapter 3.2.4).
15. Install the new labels on the front cover.

    Note: Be sure to mount the labels properly. They can only be installed once!
16. Mount the upper and lower cover (refer to chapter 3.2.4).

17. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
18. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
19. Start the key test program by

    [SETUP : Service : Enter Password = 894129]

    [SETUP : Service : Enter Service Function: 2.0.14.0]
20. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
21. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.11 Replacing the Pushbutton Board Upper Half

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug display data cable and display backlight cable at the plugs on the front board.
3. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
4. Unplug flat ribbon cable on frontpanel keyboard.
5. Unplug the two RF cables.
6. Unplug the foil cable on the frontpanel keyboard board
7. Unscrew the eight screws fastening the frontpanel keyboard and remove the board.
8. Replace the pushbutton board by a new one.
9. Reinstall the frontpanel keyboard and fasten the eight screws previously removed.

   Note: Be sure the push-button board is inserted correct in the front bezel.
10. Replug the display data cable and display backlight cable.
11. Replug the touch cable and rotary pulse generator cable.
12. Replug the flat ribbon cable.
13. Replug the two RF cables.

    NOTICE: Be sure to plug in the RF cable to the correct connector!
14. Replug the foil cable on the frontpanel keyboard board
15. Mount the frontpanel to the instrument (refer to chapter 3.2.4).
16. Mount the right side cover (refer to chapter 3.2.4).
17. Mount the upper and lower cover (refer to chapter 3.2.4).
18. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
19. To calibrate the touch screen you need an USB mouse or an USB keyboard with a touch ball. Connect it to an USB port and run the touch screen alignment tool:

    [SETUP : Alignment : Touch Screen Alignment],

    and follow the instructions on the screen.
20. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
21. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
22. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
23. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.12 Replacing the Pushbutton Board Lower Half

1. Unmount the frontpanel (refer to chapter 3.2.3.4)
2. Unplug standby cable at the plug on the standby board.
3. Unscrew the five screws fastening the standby board.
4. Remove the standby board.
5. Replace push button board by a new one.
6. Reinstall the standby board.

   Note: Be sure the push button board is inserted properly and the plastic rim around the ON/OFF key is installed.
7. Fasten the five screws previously removed.
8. Plug in standby cable.

   Note: The plug is contacting the cable on the top side!
9. Mount the frontpanel to the instrument (refer to chapter 3.2.4).
10. Mount the right side cover (refer to chapter 3.2.4).
11. Mount the upper and lower cover (refer to chapter 3.2.4).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
14. Start the key test program by

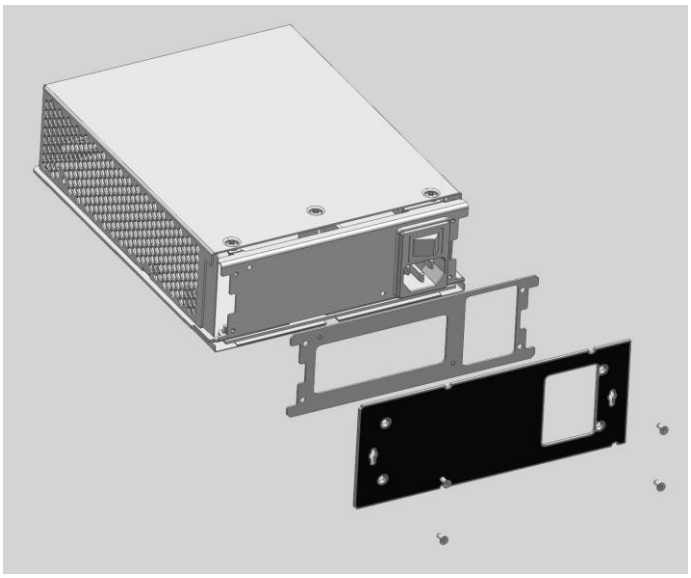
    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
15. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
16. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.2.13 Replacing the RF connector board

1. Unmount the frontpanel (refer to 3.2.3.4).
2. Unplug the two RF cables at the frontpanel keyboard board.
3. Unplug the foil cable on the RF connector board.
4. Unscrew the six screws fastening the RF connector board and remove the board.
5. Unmount all connectors from the old RF connector board.
6. Mount all connectors formerly removed to the new RF connector board.
7. Install the new RF connector board to the frontpanel and reinstall the six screws formerly removed.
8. Reconnect the two RF cables to the frontpanel keyboard board.
9. Reconnect the foil cable to the RF connector board.
10. Mount the frontpanel to the instrument (refer to 3.2.4).
11. Mount the right side cover (refer to 3.2.4).
12. Mount the upper and lower cover (refer to 3.2.4).
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
15. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.3 Replacing the Power Supply Unit A80

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the six screws fastening the power supply
3. Remove the power supply using the BW2010 KEY tool.
4. Unscrew the four screws fastening the back panel and the distance plate and remove it from the power supply.
5. Install the back panel and the distance plate on the new power supply by fastening the four screws formerly removed.



6. Insert the new power supply carefully into the instrument frame.
7. Reinstall the six screws formerly removed.
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.4 Replacing the Frontend Board A100 (Option R&S FSWP-B1)

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to 3.2.3.1).
3. Unmount the inner lid1 (refer to 3.2.3.2).
4. Unplug all RF cables at the frontend board.

   Note: There are two cables routed on the upper side of the instrument!
5. Remove the frontend board carefully from the instrument frame.
6. Install the new frontend board.
7. Reconnect all RF cables at the frontend board.

   Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid 1 (refer to chapter 3.2.4).
9. Mount the upper and lower cover (refer to chapter 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
12. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.5 Replacing the LPN Frontend Board A110

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to 3.2.3.1).
3. Unmount the inner lid1 (refer to 3.2.3.2).
4. Unplug all RF cables at the Synthesizer 2 board, if installed.

   Note: There are cables routed on the upper side of the instrument!
5. Unplug all RF cables at the low phase noise board board.

   Note: There are cables routed on the upper side of the instrument!
6. Remove the Synthesizer 2 board A180, if installed, carefully from the instrument frame.
7. Remove the low phase noise board carefully from the instrument frame.
8. Install the new low phase noise board.
9. Reinstall the Synthesizer 2 board if it was installed formerly.
10. Reconnect all RF cables at the low phase noise.

    Tip: The connector to plug in is written on the yellow tube on the cable.
11. Reconnect all RF cables at the synthesizer 2 board, if installed.

    Tip: The connector to plug in is written on the yellow tube on the cable.
12. Mount the inner lid 1 (refer to chapter 3.2.4).
13. Mount the upper and lower cover (refer to chapter 3.2.4).
14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
15. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
16. Perform a frequency response correction as described in chapter 3.2.5.2.

Note: The following matrix shows which combinations of the Low Phase Noise Board A110 with Synthesizer modules A140 and A180 are working.

	A140 Synthesizer 18G		A180 Synthesizer 18G	
	Var. 02	**Var. 03**	**Var. 02**	**Var. 03**
A110 Low Phase Noise Board Var. 03	possible	possible	Not available	Not available
A110 Low Phase Noise Board Var. 04	***Not*** possible	possible	possible	possible

4.3.6 Replacing the Synthesizer 2 board A180 (Options R&S FSWP-B60and R&S FSWP-B64 and R&S FSWP-B61)

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to 3.2.3.1).
3. Unmount the inner lid 1 (refer to 3.2.3.2).
4. Unplug all RF cables at the synthesizer 2 board.

   Note: There are cables routed on the upper side of the instrument!
5. Remove the Synthesizer 2 board carefully from the instrument frame.
6. Install the new Synthesizer 2 board.
7. Reconnect all RF cables at the synthesizer 2 board.

   Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid 1 (refer to chapter 3.2.4).
9. Mount the upper and lower cover (refer to chapter 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
12. Perform a frequency response correction as described in chapter 3.2.5.2.

Note: Before replacing the Synthesizer Board A180 see combination matrix in Section 4.3.64.3.5.

4.3.7 Replacing Reference 2 board A150 (Options R&S FSWP-B60 and R&S FSWP-B61 and R&S FSWP-B64)

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to 3.2.3.1).
3. Unmount the inner lid1 (refer to 3.2.3.2).
4. Unplug all RF cables at the reference 2 board, if installed.

   Note: There are cables routed on the upper side of the instrument!
5. Remove the reference 2 board carefully from the instrument frame.
6. Install the new reference 2 board.
7. Reconnect all RF cables at the reference 2 board .

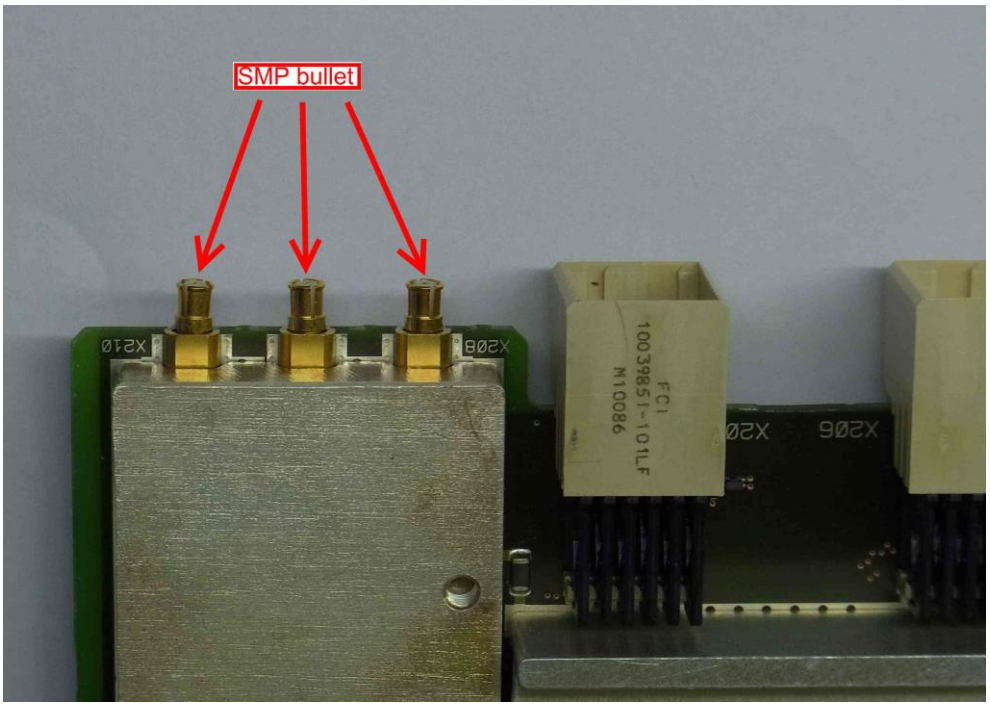
   Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid 1(refer to chapter 3.2.4).
9. Mount the upper and lower cover (refer to chapter 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
12. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.8 Replacing the Detector Board A200

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the eight screws on the back cover of the instrument.
3. Remove the detector board using the BW2010 tool.

   Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument.
4. Reinstall the new module.

   Note: Be sure to plug in the module properly. The back panel must seat solidly to the instrument frame. **Do not forget to install the three SMP bullets.**



5. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

   Note: If the firmware shows a “DCM unlock” error (refer to 3.4.3.2) when booting the instrument check the SMP bullets in the detector board for proper installation!

4.3.9 Replacing the Attenuator A60

For R&S FSWP8 if Option R&S FSWP-B1 is installed: The attenuator is mounted to the side wall of the instrument.

For R&S FSWP 26 / 50: The attenuator is mounted on the microwave converter frontend unit.

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to 3.2.3.1).
3. Unmount the right side cover (refer to 3.2.3.3).
4. Disconnect the RF cable to the frontpanel at the side of the step attenuator.
5. Disconnect the calibration signal cable at the side of the step attenuator.

For R&S FSWP8:

a) Remove RF cable to the frontend.
b) Unscrew the three screws fastening the attenuator from the right side of the instrument.

For R&S FSWP26 / 50:

a) Remove the microwave converter frontend unit. For removing the microwave converter frontend unit in a FSWP 26 refer to chapter 3.3.11.2 for a FSWP 50 refer to chapter 4.3.12.2.
b) Remove RF cable to the microwave converter frontend.
c) Unscrew the screws fastening the attenuator to the microwave converter frontend unit.

6. Unplug the flat ribbon cable at the plug on the attenuator.

   Note: the connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

7. Carefully remove the attenuator from the instrument.
8. Replug the flat ribbon cable to the new attenuator.

   NOTICE! Risk of serious damage to the instrument! Be sure you have plugged in the flat ribbon cable in the correct connector. The information where to plug in the cable is given on the bottom of the frame of the instrument!

For R&S FSWP8:

a) Install the new attenuator to the instrument.
b) Fasten the three screws previously removed.
c) Reinstall the RF cable to the frontend.

For R&S FSWP26 / 50:

a) Reinstall the step attenuator to the microwave converter frontend unit by fastening the screws formerly removed.
b) Reinstall the RF cable to the microwave converter frontend.
c) Reinstall the microwave converter frontend unit. For reinstalling the microwave converter frontend unit in a FSWP 26 refer to chapter 3.3.11.3. for a FSWP 50 refer to chapter 4.3.12.3
d) Fasten the four screws previously removed.

9. Reconnect the RF cable to the frontpanel at the step attenuator side.
10. Reconnect the calibration signal cable at the step attenuator side.
11. Mount the right side cover (refer to 3.2.4).
12. Mount the lower cover (refer to chapter 3.2.4)
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
15. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.10 Digital Motherboard A20

NOTICE

Risk of losing important information

Important information about the type of instrument, installed hardware, options, etc., is stored on the motherboard, on the hard drive and the smart card. This information is required in order to restore the instrument in case of errors. Thus, do not replace the motherboard, the hard drive and the smart card at the same time, as doing so will cause this information to be lost. If the instrument does not function after the hard drive has been replaced, do not replace the motherboard or the smart card. Instead, re-install the old hard drive and then replace the motherboard or the smart card.

4.3.10.1 Replacing the Digital Motherboard A20

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to 3.2.3.1).
3. Unmount the inner lid1 and inner lid2(refer to 3.2.3.2).
4. Remove the CPU Board using the BW2010 tool (refer to 3.3.1.1).
5. Remove the power supply unit using the BW2010 tool (refer to 3.3.3).

For R&S FSWP26:

► Remove the microwave converter frontend unit according to chapter 4.3.11.2,

For R&S FSWP50:

► Remove the microwave converter frontend unit according to chapter 4.3.12.2,

6. Unplug the fans at the digital motherboard.

   Note: The connectors are locked! To unlock press the lever down and disconnect the cable carefully!

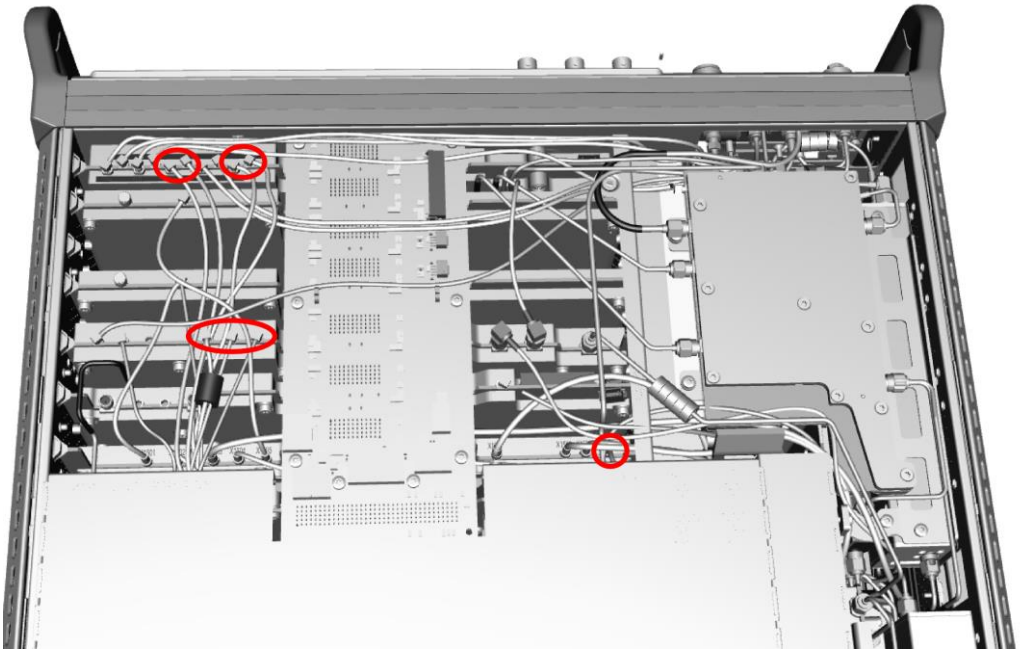
7. Unplug the attenuator and the preamplifier, if installed, on the digital motherboard.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

8. Unplug the display cable to the frontpanel from the connector on the digital motherboard.

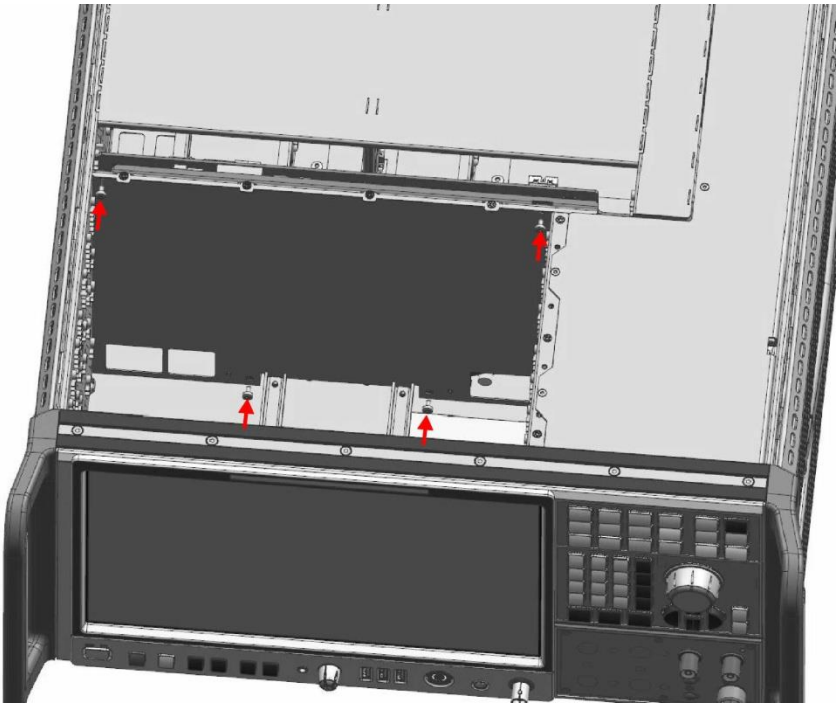
   Note: The connector is locked! To unlock it press the silver lever down and disconnect the cable carefully!

9. Unplug all RF cables at the modules marked with a red circle in the picture below.



10. Remove the screws fastening the digital motherboard with its holder.

    Tip: You can access two screws from the top of the instrument and two screws from the bottom of the instrument. There is no need to remove the analog modules before removing the digital motherboard!



11. Remove the digital motherboard with its holder carefully from the instrument frame.

    NOTICE! The RF cables formerly removed must be carefully guided through the hole in the instrument frame

12. Remove the screws fastening the holder of the digital motherboard.

13. Remove the RF cables from the digital motherboard using the SMP removal tool.

14. Install the previously removed cables to the new digital motherboard. Make sure you install the connectors at the right position! The connector identifier is printed on the yellow tube on the cable as well as on the motherboard near the hole for the connector. Route the cables as shown below!

Note: The SMP connectors must be pushed into the motherboard in a right angle. Be careful not to damage any components on the motherboard! The connectors snap to the motherboard if correctly installed and can only be removed with the removal tool! Route the cables as shown in the picture below.

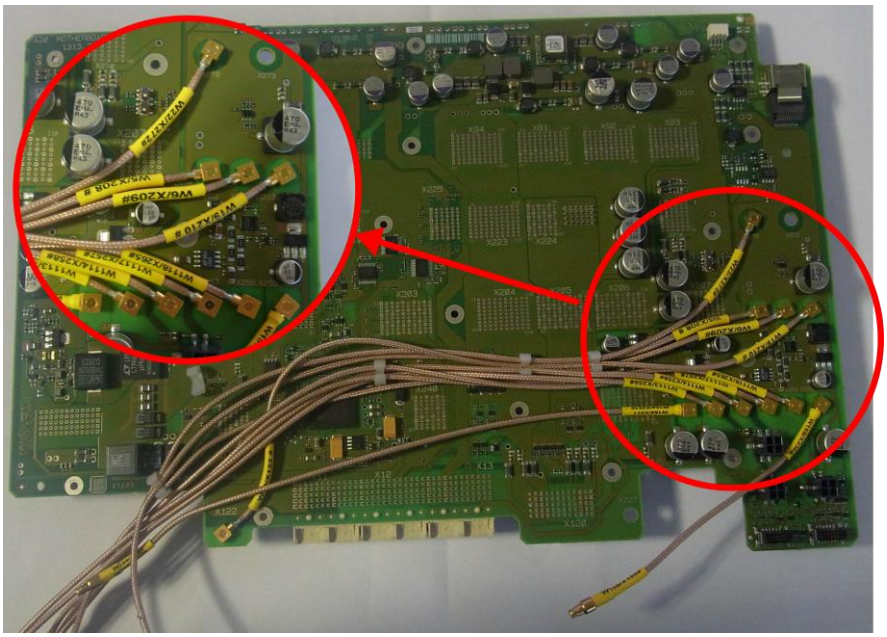


Figure 3-2: Cable routing with all options installed

15. Replace the old digital motherboard by the new one and install it on the old holder. Reinstall the screws previously removed.
16. Carefully install the motherboard with the holder in the frame of the instrument.

    NOTICE! Carefully route the RF cables through the hole in the instrument frame!
17. Remount the motherboard to the instrument frame using the previously removed screws.
18. Reinstall the CPU Board (refer to chapter 3.3.1.1).
19. Reinstall the power supply unit (refer to chapter 3.3.3).
20. Plug in the fans as described in chapter 3.3.12.

    Note: Be sure to connect the fans to the correct connector.
21. Plug in the attenuator and, if installed, the preamplifier.

For R&S FSWP26:

► Reinstall the microwave converter frontend unit according to chapter 4.3.11.2.

For R&S FSWP50:

► Reinstall the microwave converter frontend unit according to chapter 4.3.12.3.

22. Plug in the display cable.

    Note: Be sure the display cable connector is locked! When inserting the plug in its corresponding connector you may hear some “CLICK”.
23. Plug in the RF cables formerly removed
24. Mount the right side cover (refer to 3.2.4).
25. Unmount the upper and lower cover (refer to 3.2.3.1).
26. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
27. Restore the data stored on the motherboard EEPROM by performing the following service function:

    [SETUP : Service : Enter Password = 20122004]

    [SETUP : Service : Enter Service Function: 10.0.3]
28. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
29. Perform a frequency response correction as described in chapter 3.2.5.2.

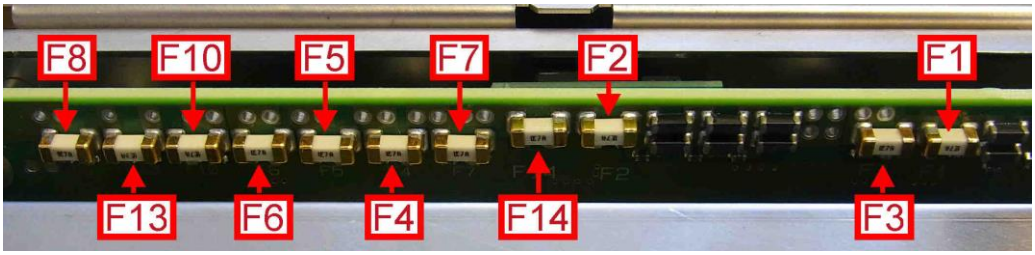
4.3.10.2 Replacing a Defective Fuse

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to 3.2.3.1).
3. Unmount the inner lid1 (refer to 3.2.3.2).
4. The fuses are located on the upper side of the digital motherboard.
5. To identify the blown fuse refer to chapter 3.4.
6. Carefully desolder the defective fuse.

   Note: Be careful not to damage the board! A good practice is to use one solder iron for each pin of the fuse to desolder it.
7. Clean the pads on the board carefully using a desolder wick.

   Note: Replace the defective fuse only by an original spare part! Otherwise you will lose the safety approbation of the instrument! The fuses and its spare parts are listed in the following table:

F1	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V A
F2	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V B
F3	2079.5994.00	7A FF	Power supply rail for DC/DC converter 3,3V, -6,5V, probe supply, 5V, 30V
F4	2079.5994.00	7A FF	Power supply rail for digital boards
F5	2079.5994.00	7A FF	Power supply rail for analog boards
F6	2079.5994.00	7A FF	Power supply rail for main fans
F7	2079.5994.00	7A FF	Power supply rail for microwave converter
F8	2079.5994.00	7A FF	Supply rail for detector extension board #1
F10	2079.5994.00	7A FF	Supply rail for CPU Board
F13	6100.7862.00	3A FF	Standby supply rail
F14	2079.5994.00	7A FF	Supply rail for detector extension board #2



8. Solder carefully the fuse to the corresponding pads on the motherboard using a Pb free solder tin.

   Note: Be careful not to overheat the fuse. This may result in a defective fuse! Make sure there is no short circuit on the board!

9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

   Note: Mains voltage is applied to the power supply.

10. Check the power rail with the replaced fuse by measuring the corresponding voltage on both sides of the fuse. The voltage on all fuses is rated by 12.2V ± 5 %.

    Tip: If the fuse is blown again check the boards supplied by this power rail. See chapter 3.4 for further details.

11. Switch off the instrument and disconnect the power plug.
12. Mount the inner lid1 (refer to 3.2.3.2).
13. Mount the upper cover (refer to 3.2.3.1).
14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
15. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.10.3 Replacing the Analog Motherboard A10

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to 3.2.3.1).
3. Remove cables connected to X15, X16 and/or X17
4. Remove the eight screws fastening the analog motherboard.
5. Carefully remove the analog motherboard.
6. Carefully plug in the new module.
7. Fasten the eight screws previously removed.
8. Re-connect cables to X15, X16 and/or X17
9. Mount the lower cover (refer to chapter 3.2.4)
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.11 Microwave Converter A161, A162 and A170 (R&S FSWP26)

The microwave converter consist of two parts: the microwave converter base board A170 and the microwave converter frontend unit. This microwave converter frontend unit consists of the MWC frontend A161 and the YIG filter A162 (Option R&S FSWP-B1) and the triplexer A340 (Option R&S FSWP-B1) and the step attenuator A60 and the preamplifier A270 (Option R&S FSWP-B24). If any of the parts mounted on the microwave converter frontend unit has to be changed the whole frontend unit must be unmounted from the instrument.

4.3.11.1 Replacing the Base Board A170

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 3.2.3.1).
3. Unmount the inner lid 1 (refer to chapter 3.2.3.2).
4. Unplug the flat ribbon cable to the microwave converter frontend at the microwave converter base board side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
5. Unplug the flat ribbon cable to the microwave converter triplexer at the microwave converter base board side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
6. Unplug the RF cables from the microwave converter base board.
7. Set the dip switches on the new microwave converter baseboard according to the label on the board.
8. Carefully replace the microwave converter base board by a new one.
9. Reconnect the flat ribbon cables.

NOTICE

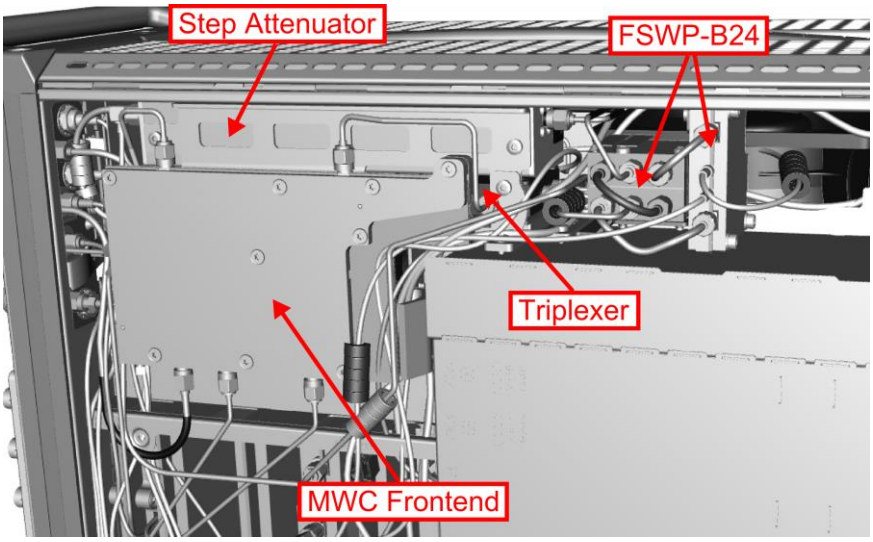
Risk of damaging connector contacts

Make sure you plug in the flat ribbon cable connectors in a right angle. Otherwise, the contacts inside the connector may be damaged.

10. Reconnect the RF cables.

    Tip: The connector to plug in is written on the yellow tube on the cable.
11. Mount the upper and lower cover (refer to chapter 3.2.4).
12. Mount the inner lid 1 (refer to 3.2.4).
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform a frequency response correction as described in chapter 3.2.5.2.
15. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.11.2 Unmounting the Microwave converter frontend unit



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and the lower cover (refer to chapter 3.2.3.1).
3. Unmount inner lid 2 (refer to chapter 3.2.3.2)
4. Unmount the right side cover (refer to chapter 3.2.3.3).
5. Unplug the flat ribbon cable at the microwave converter frontend side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
6. Unplug the flat ribbon cable of the step attenuator at the motherboard side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
7. Unplug the signal relay cable on the analog motherboard at connector X16.

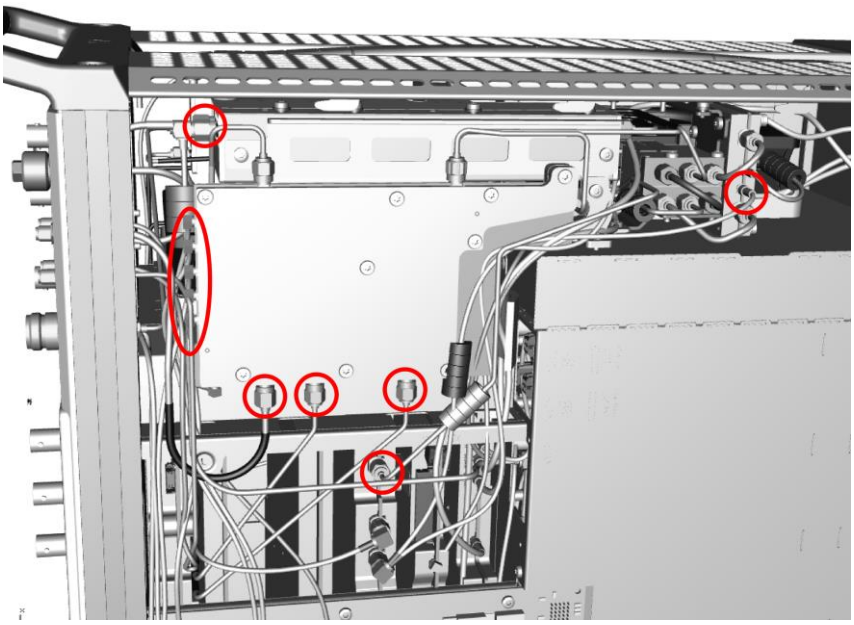
If option R&S FSWP-B24 is installed:

► Unplug the cable to the preamplifier at the mother board.

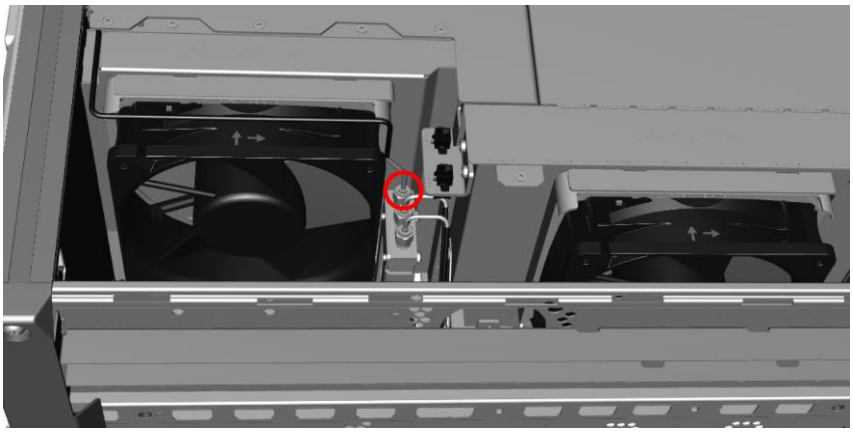
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

8. Unplug all RF cables marked in the picture below from the microwave converter frontend unit at the top and the bottom side of the instrument.

   Note: The picture shows an instrument with option R&S FSWP-B24 installed.

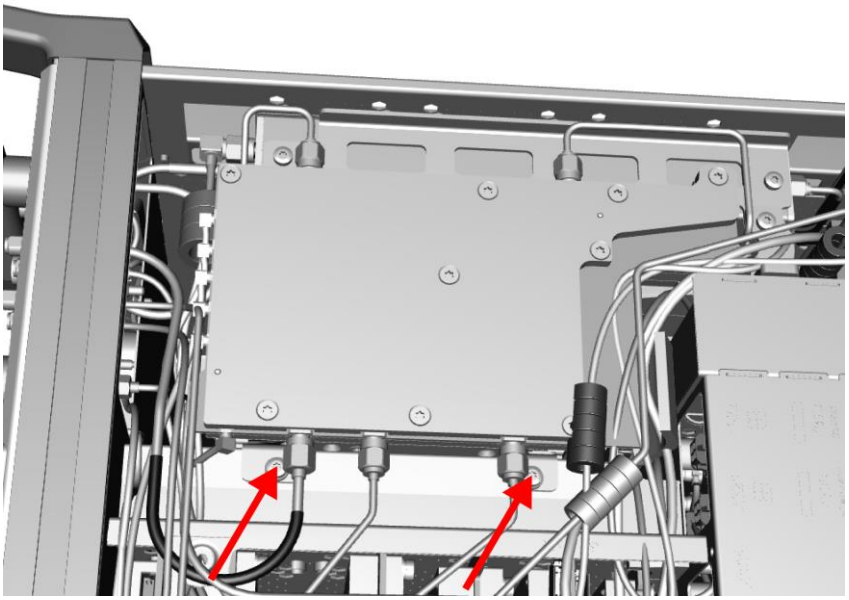


Bottom side of instrument



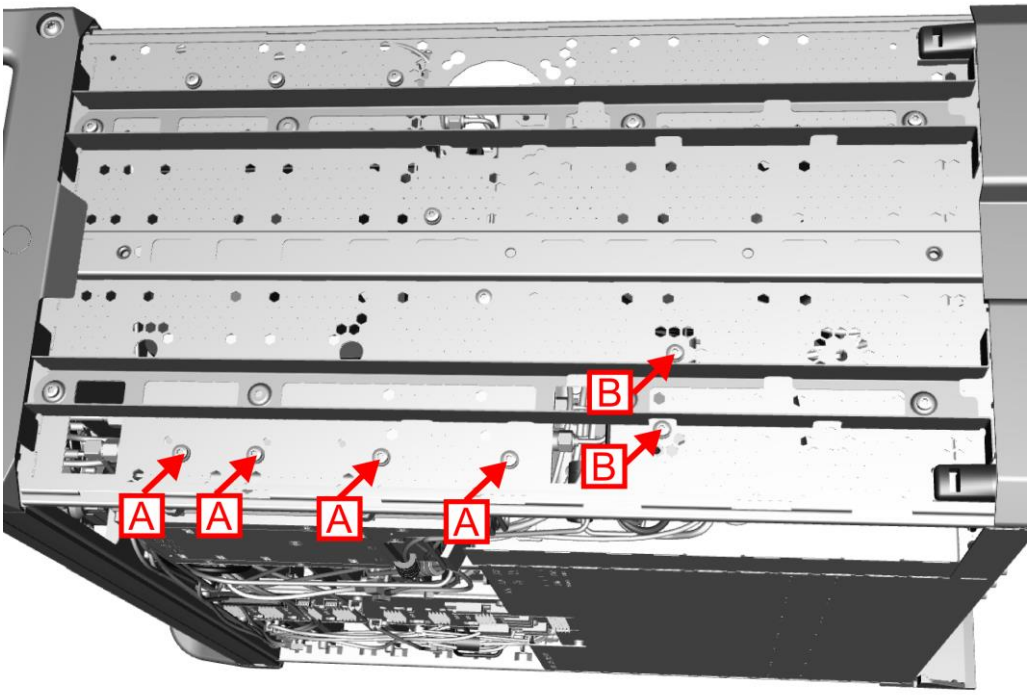
Top side of instrument

9. Unscrew the two screws marked with an arrow fastening the microwave converter frontend unit.



If option R&S FSWP-B24 is installed:

► Unscrew additionally the two screws at the right side of the instrument, marked with B in the picture below.

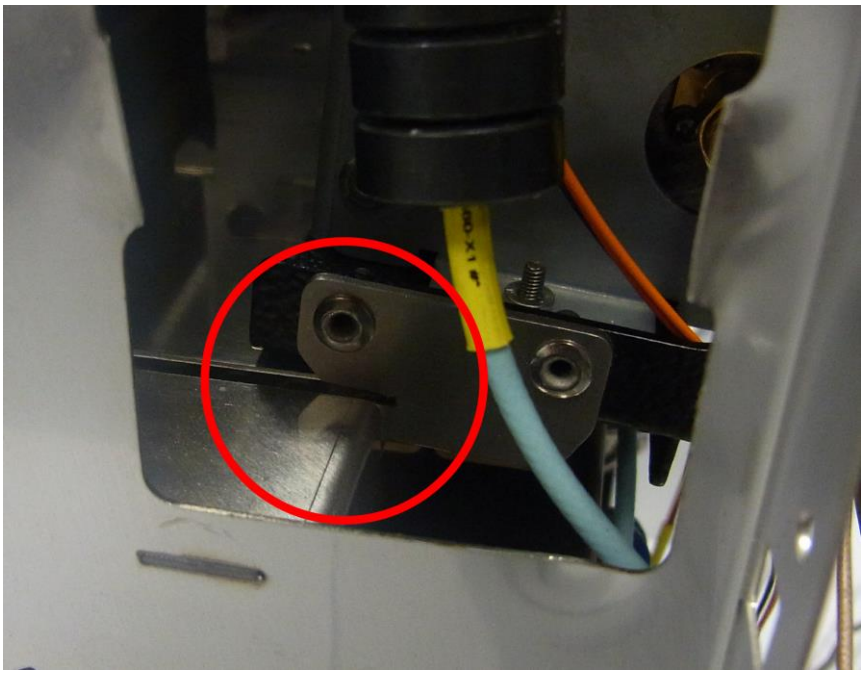


10. Unscrew the screws fastening the step attenuator at the right side of the instrument marked with A.
11. Carefully remove the microwave converter frontend unit from the instrument chassis by pulling it towards the bottom of the instrument.

4.3.11.3 Installing the microwave converter frontend unit

1. Carefully insert the microwave converter frontend unit in the instrument chassis.

   NOTICE: the hooks on both sides of the microwave converter frontend unit must match the trenches in the instrument chassis.



2. Fasten the microwave converter frontend unit by installing the screws previously removed
3. Reconnect all RF cables previously removed.
4. Reconnect the flat ribbon cables at the microwave converter base board.
5. Reconnect the cable of the step attenuator at the digital motherboard A20.
6. Reconnect the relay cable to X16 on the analog motherboard A10.

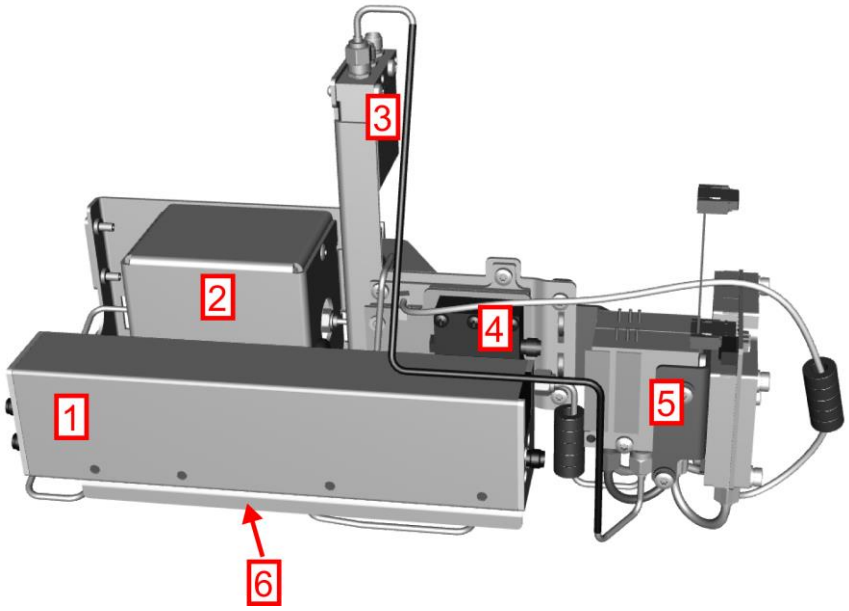
If option R&S FSWP-B24 is installed:

► Reconnect the cable to the preamplifier at the digital motherboard A20.

7. Mount the lower cover (refer to chapter 3.2.4). Mount the right cover (refer to 3.2.4).
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. Perform a frequency response correction as described in chapter 3.2.5.2.
10. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

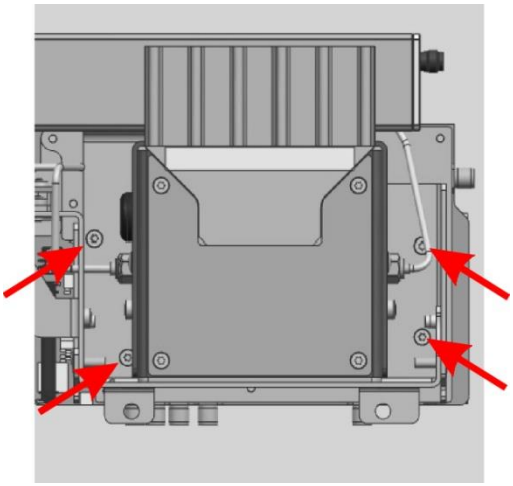
4.3.11.4 Replacing the Microwave Converter Frontend A161

The microwave converter frontend is part of the microwave converter frontend unit. For replacing the frontend board first uninstall the microwave converter frontend unit as described in chapter 3.3.11.2. The picture below shows a R&S FSWP26 microwave converter frontend unit with installed option R&S FSWP-B24.



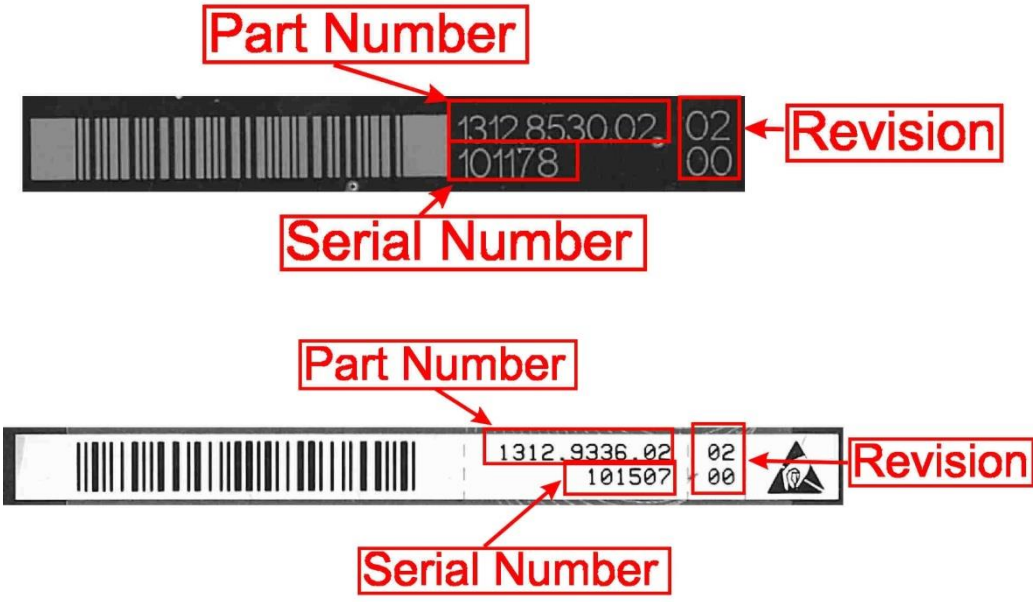
Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

1. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unscrew the four screws fastening the microwave converter frontend to the frontend unit holder.



4. Disconnect the YIG filter control cable at the microwave converter frontend side
5. Replace the microwave converter frontend by a new one and fasten the four screws previously removed.
6. Write down the serial number, the part number and the revision of the new board.

   Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the EEPROM!)



7. Replug the YIG filter control cable to the new microwave converter frontend.
8. Reconnect the RF cables at connector X161 and X162 and the YIG filter

   Tip: The connector to plug in is written on the yellow tube on the cable.
9. Reinstall the microwave converter frontend unit to the instrument as described in chapter 3.3.11.3.

10. Mount the right side cover (refer to chapter 3.2.4).
11. Mount the upper and lower cover (refer to 3.2.4).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Update the EPROM data of the microwave converter frontend.
    a) Enter the service password
    [SETUP : Service : Service Function : Password = 30473035]
    b) Enter the service function
    3.7.7.1.FRONTEND.xxxx.xxxx.xx.yyyyyy.zz.zz
    in the service dialog
    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 11!

NOTICE

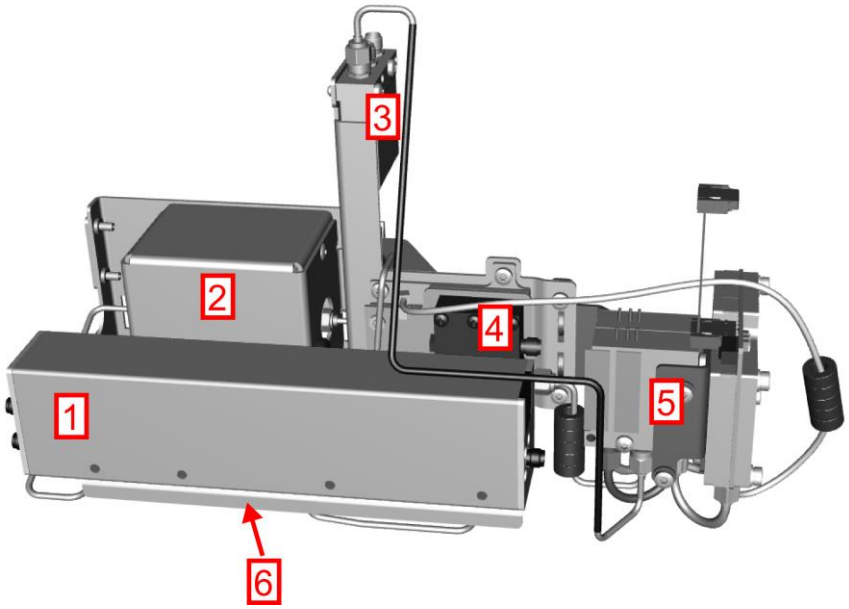
Risk of losing important information

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

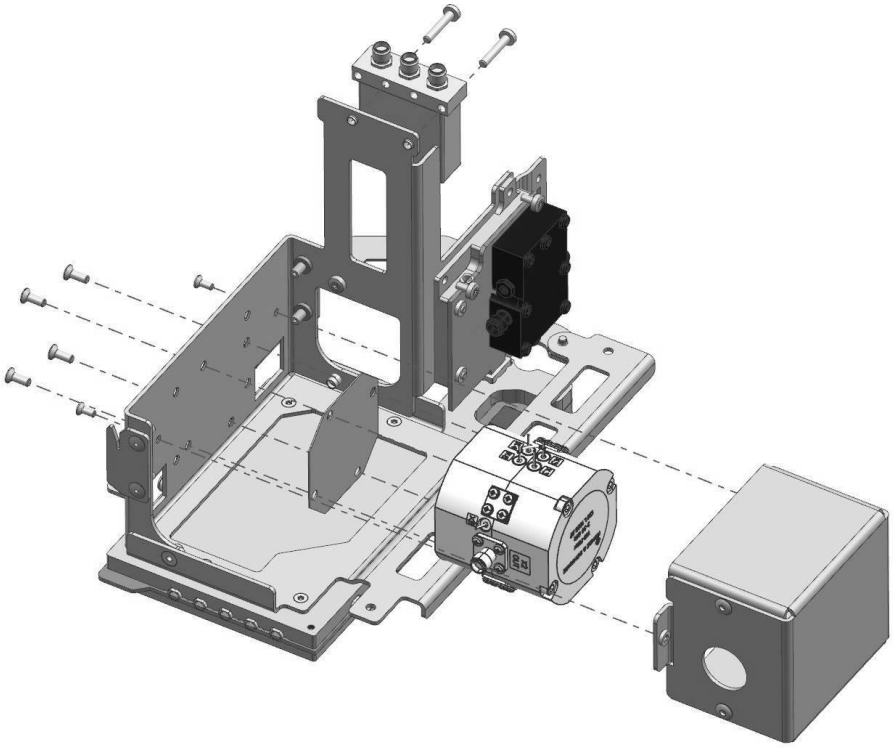
14. Enter the service function
    [3.7.7.0.FRONTEND]
    and verify the displayed data with the data of the new installed hardware.
15. Reset the service password
    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]
16. Perform a frequency response correction as described in chapter 3.2.5.2.
17. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.11.5 Replacing the YIG Filter A162 (only installed if option FSWP-B1 is installed)

The YIG filter is mounted on the microwave converter frontend unit. To replace it the whole microwave converter frontend unit has to be removed from the instrument.



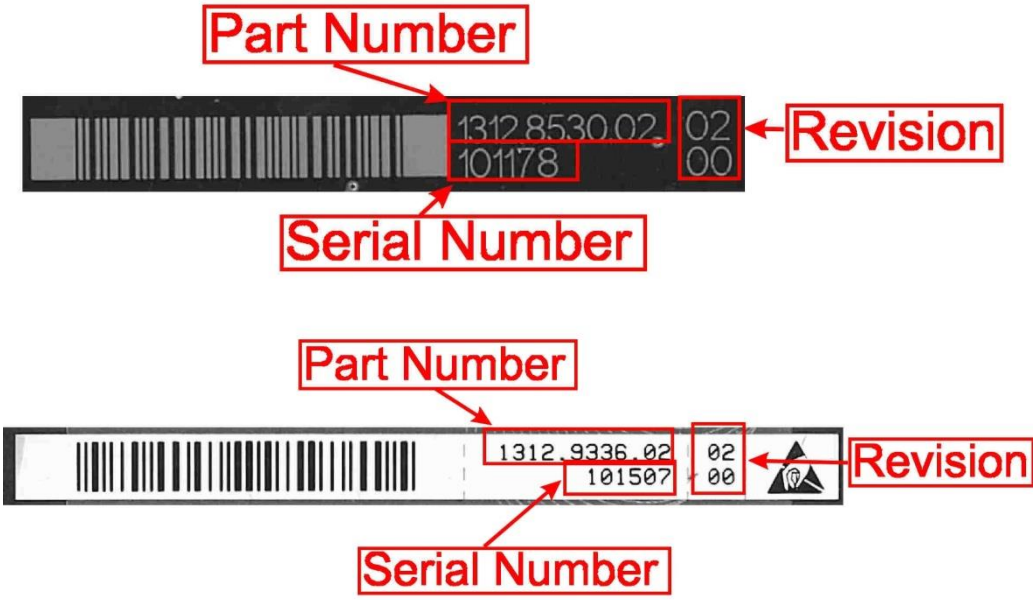
Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161



1. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unplug the YIG filter control cable at the microwave converter frontend.
4. Unscrew the two screws fastening the shielding cover of the YIG filter and remove the cover.
5. Uninstall the two RF cable on the YIG filter.

   Note: You can reach the two SMA connectors at the YIG filter more easily by sliding the shielding cab towards the YIG filter!
6. Remove the shielding cap from the YIG filter.
7. Unscrew the four screws fastening the YIG filter to the microwave converter frontend unit.
8. Replace the YIG filter by a new one.
9. Write down the serial number, the part number and the revision of the new filter.

   Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the eeprom!)



10. Fasten the four screws previously removed.
11. Reinstall the shielding cover.

    Note: Be sure to route the YIG filter control cable properly!
12. Reconnect the YIG filter control cable
13. Reconnect the RF cables to connector X161 and X162.
14. Reinstall the microwave converter frontend unit to the instrument as described in chapter 3.3.11.3
15. Mount the right side cover (refer to chapter 3.2.4).
16. Mount the upper and lower cover (refer to 3.2.4).
17. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
18. Update the EPROM Data of the YIG filter

    a) Enter the service password
    [SETUP : Service : Service Function : Password = 30473035]

    b) Enter the service function
    3.7.7.1.YIG_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz

    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.

19. Enter the service function

    [3.7.7.0.YIG_UNIT]

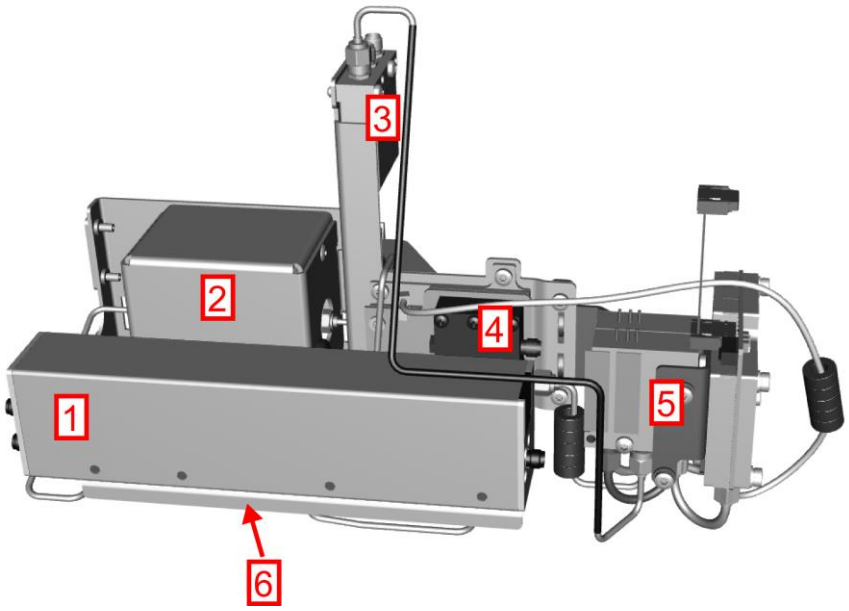
    and verify the displayed data with the data of the new installed hardware.
20. Reset the service password

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    [Reset Password]
21. Perform a frequency response correction as described in chapter 3.2.5.2.
22. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

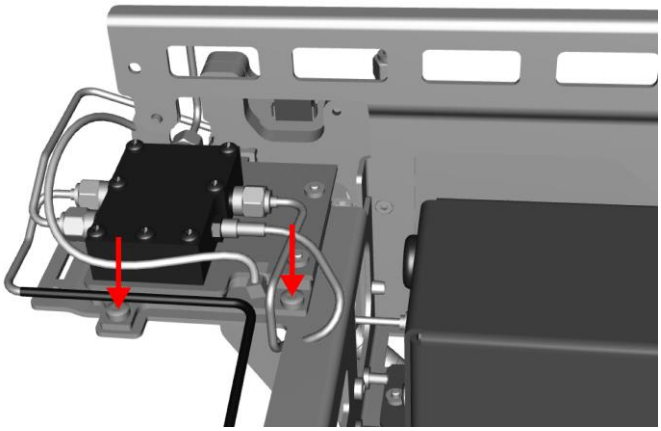
4.3.11.6 Replacing the Triplexer A340 (only installed if option R&S FSWP-B1 is installed)

The triplexer is located on the microwave converter frontend unit.



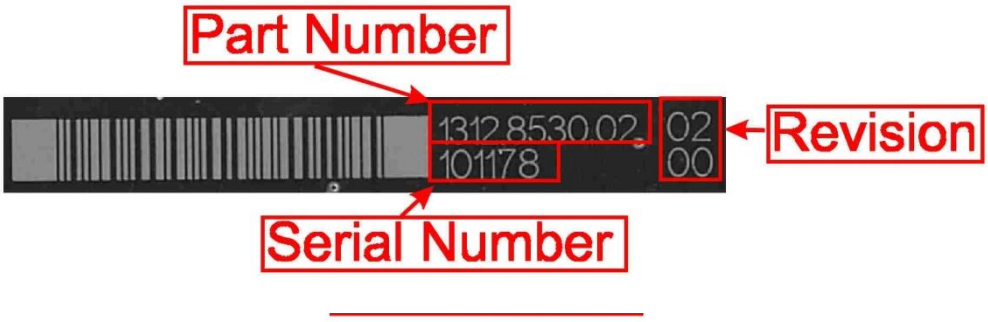
Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

1. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2.
2. Unconnected the RF cables to the step attenuator.
3. Unmount the step attenuator from the microwave converter frontend unit. Refer to chapter 3.3.9.
4. Uninstall the five RF cables to the triplexer.
5. Unscrew the two screws fastening the triplexer marked with an arrow in the picture below.



6. Carefully unplug the triplexer from the microwave converter frontend.
7. Replace the triplexer by a new one.
8. Replug the triplexer to the microwave converter frontend.
9. Fasten the triplexer by the screws previously removed.
10. Write down the serial number, the part number and the revision of the new triplexer.

    Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the EEPROM!)



11. Reinstall the three RF cables.

    Tip: The connector to plug in is written on the yellow tube on the cable.
12. Reinstall the step attenuator to the microwave converter frontend unit.
13. Reinstall the cables to the step attenuator.
14. Reinstall the microwave converter frontend unit to the instrument as describe in chapter 3.3.11.3
15. Mount the right side cover (refer to chapter 3.2.4).
16. Mount the upper and lower cover (refer to 3.2.4).

17. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
18. Update the EPROM Data of the triplexer
    a) Enter the service password
    [SETUP : Service : Service Function : Password = 30473035]
    b) Enter the service function
    3.7.7.1.TRIPLEXER.xxxx.xxxx.xx.yyyyyy.zz.zz

    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 8.
19. Enter the service function

    [3.7.7.0.TRIPLEXER]

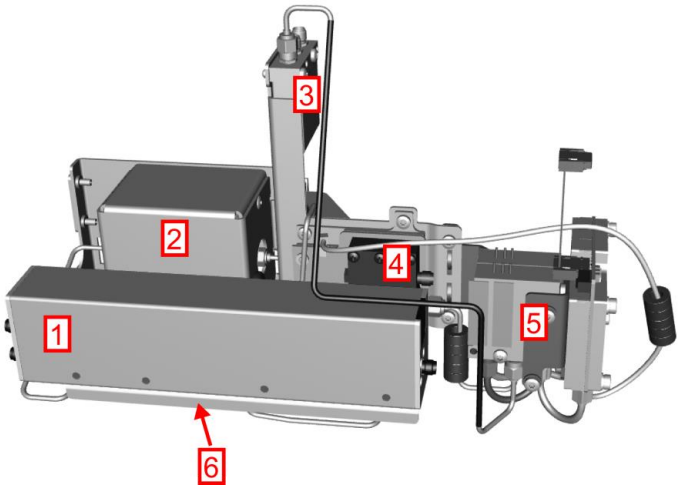
    and verify the displayed data with the data of the new installed hardware.
20. Reset the service password

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    [Reset Password]
21. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
22. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.11.7 Replacing the signal path relay A580

The signal path relay is installed on the microwave converter frontend unit.



Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

1. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2.
2. Disconnect all RF cables at the relay.
3. Unscrew the two screws fastening the relay.
4. Replace the relay by a new one and fasten it by the two screws formerly removed.
5. Reconnect all RF cables on the relay.
6. Reinstall the microwave converter frontend unit to the instrument as described in chapter 3.3.11.3
7. Mount the right side cover (refer to chapter 3.2.4).
8. Mount the upper and lower cover (refer to 3.2.4).
9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
10. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
11. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.12 Microwave Converter A161, A162 and A170 (R&S FSWP50)

The microwave converter consist of two parts: the microwave converter base board A170 and the microwave converter frontend unit. This microwave converter frontend unit consists of the MWC frontend A161 and the YIG filter A162 (Option R&S FSWP-B1) and the triplexer A340 (Option R&S FSWP-B1) and the step attenuator A60 and the preamplifier A270 (Option R&S FSWP-B24). If any of the parts mounted on the microwave converter frontend unit has to be changed the whole frontend unit must be unmounted from the instrument.

4.3.12.1 Replacing the Base Board A170

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 3.2.3.1).
3. Unmount the inner lid 1 (refer to chapter 3.2.3.2).
4. Unplug the flat ribbon cable to the microwave converter frontend at the microwave converter base board side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
5. Unplug the flat ribbon cable to the microwave converter triplexer at the microwave converter base board side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
6. Unplug the RF cables from the microwave converter base board.
7. Set the dip switches on the new microwave converter baseboard according to the label on the board.
8. Carefully replace the microwave converter base board by a new one.
9. Reconnect the flat ribbon cables.

NOTICE

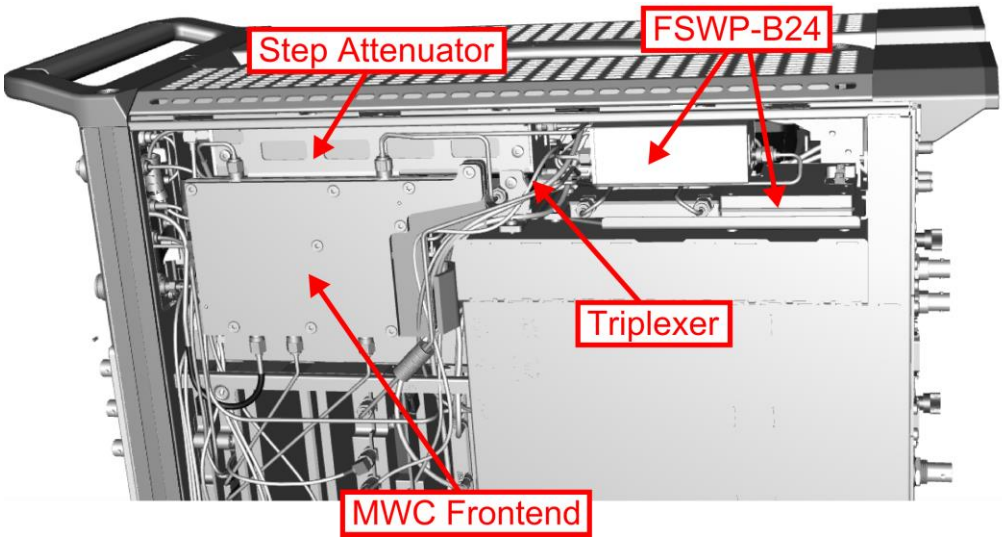
Risk of damaging connector contacts

Make sure you plug in the flat ribbon cable connectors in a right angle. Otherwise, the contacts inside the connector may be damaged.

10. Reconnect the RF cables.

    Tip: The connector to plug in is written on the yellow tube on the cable.
11. Mount the upper and lower cover (refer to chapter 3.2.4).
12. Mount the inner lid 1(refer to 3.2.4).
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform a frequency response correction as described in chapter 3.2.5.2.
15. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.12.2 Unmounting the Microwave converter frontend unit



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and the lower cover (refer to chapter 3.2.3.1).
3. Unmount inner lid 2 (refer to chapter 3.2.3.2)
4. Unmount the right side cover (refer to chapter 3.2.3.3).
5. Unplug the flat ribbon cable at the microwave converter frontend side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
6. Unplug the flat ribbon cable of the step attenuator at the motherboard side.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
7. Unplug the signal relay cable on the analog motherboard at connector X16.

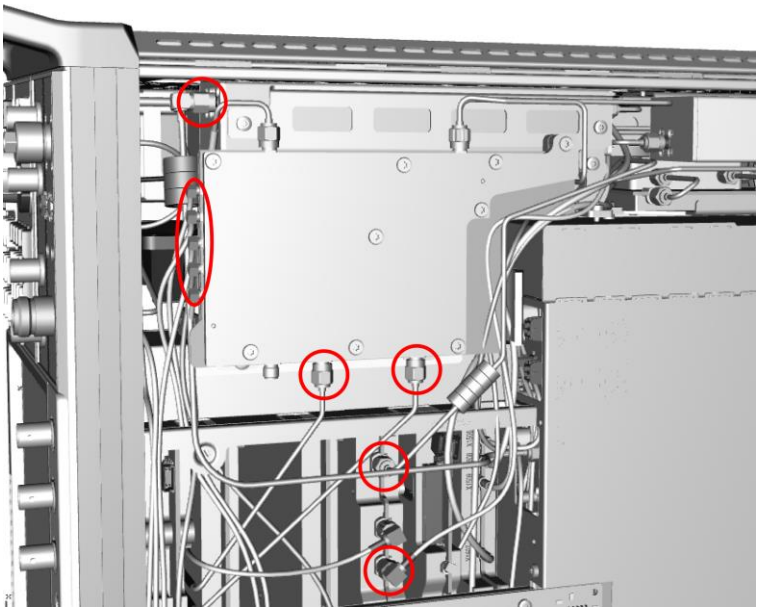
If option R&S FSWP-B24 is installed:

► Unplug the cable to the preamplifier at the mother board.

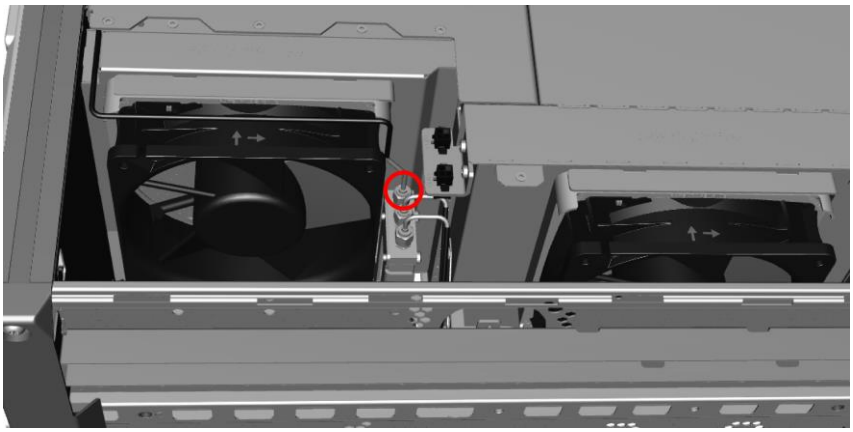
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

8. Unplug all RF cables marked in the picture below from the microwave converter frontend unit at the top and the bottom side of the instrument.

   Note: The picture shows an instrument with option R&S FSWP-B24 installed.

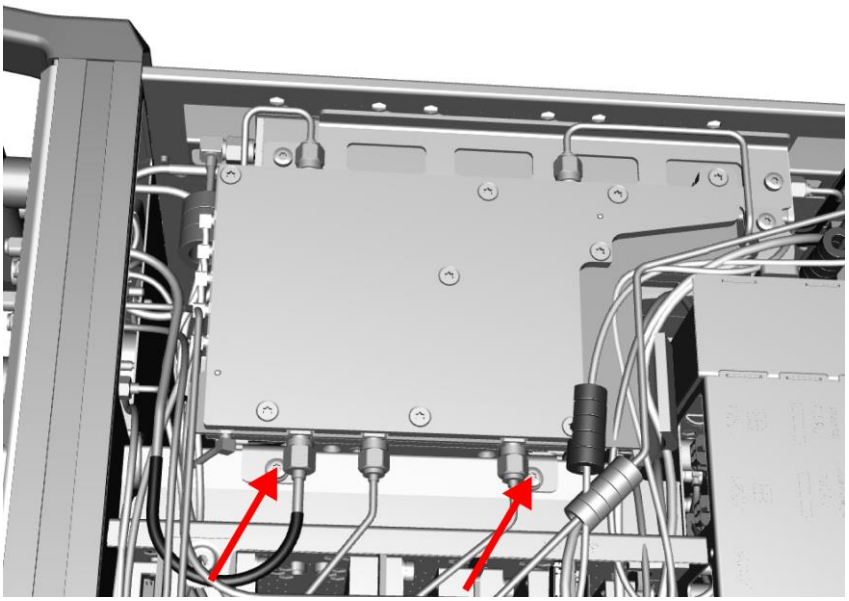


Bottom side of instrument



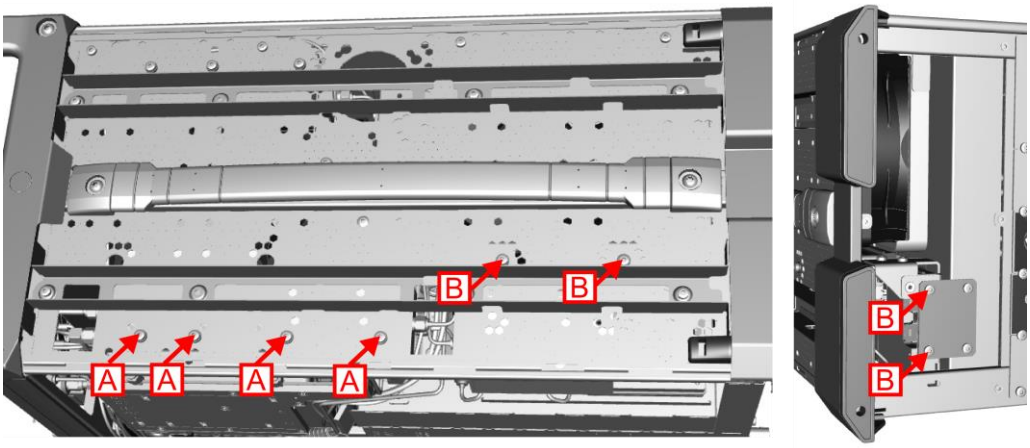
Top side of instrument

9. Unscrew the two screws marked with an arrow fastening the microwave converter frontend unit.



If option R&S FSWP-B24 is installed:

a) Unmount the left rear plate of the instrument by unscrewing the six screws.
b) Unscrew additionally the two screws at the right side of the instrument and the two screws at the rear side of the instrument, all marked with B in the picture below.

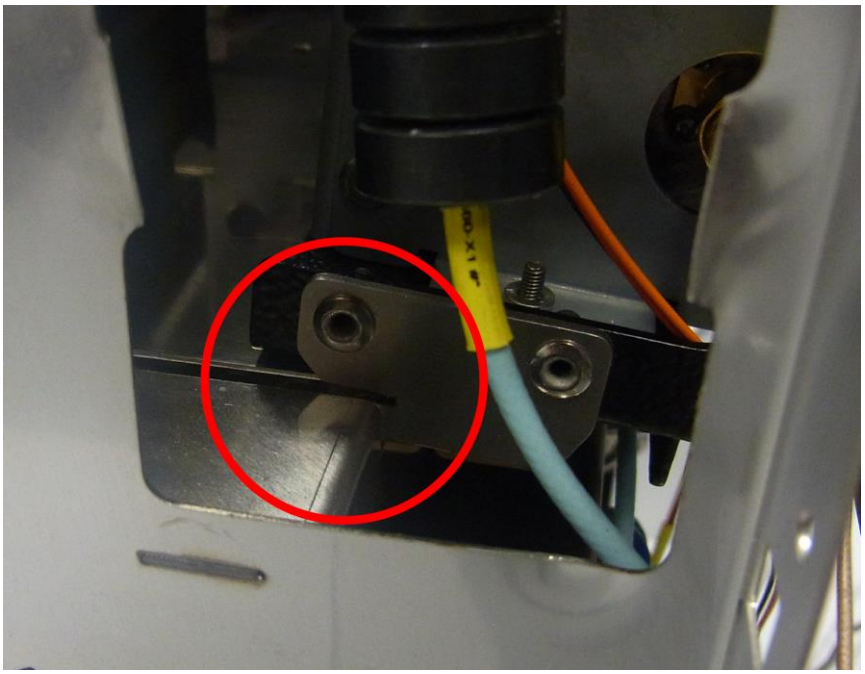


10. Unscrew the screws fastening the step attenuator at the right side of the instrument marked with A.
11. Carefully remove the microwave converter frontend unit from the instrument chassis by pulling it towards the bottom of the instrument.

4.3.12.3 Installing the microwave converter frontend unit

1. Carefully insert the microwave converter frontend unit in the instrument chassis.

   NOTICE: the hooks on both sides of the microwave converter frontend unit must match the trenches in the instrument chassis.



2. Fasten the microwave converter frontend unit by installing the screws previously removed
3. Reconnect all RF cables previously removed.
4. Reconnect the flat ribbon cables at the microwave converter base board.
5. Reconnect the cable of the step attenuator at the digital motherboard A20.
6. Reconnect the relay cable to X16 on the analog motherboard A10.

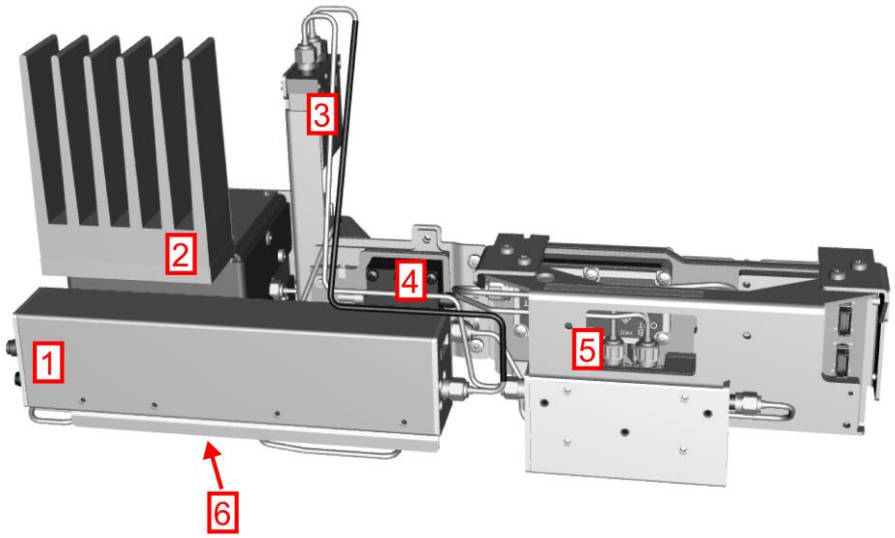
If option R&S FSWP-B24 is installed:

a) Reconnect the cable to the preamplifier at the digital motherboard A20.
b) Mount the rear plate formerly removed.

7. Mount the lower cover (refer to chapter 3.2.4).Mount the right cover (refer to 3.2.4).
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. Perform a frequency response correction as described in chapter 3.2.5.2.
10. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

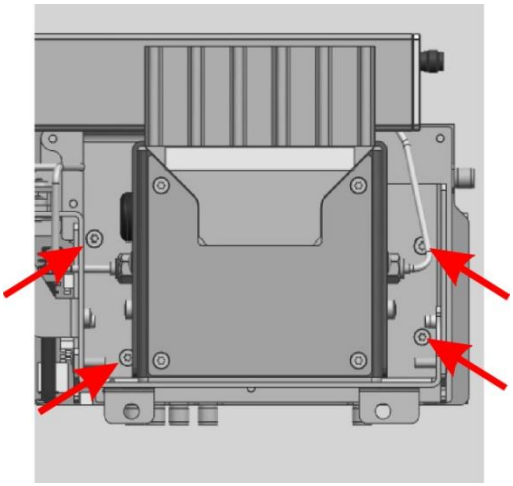
4.3.12.4 Replacing the Microwave Converter Frontend A161

The microwave converter frontend is part of the microwave converter frontend unit. For replacing the frontend board first uninstall the microwave converter frontend unit as described in chapter 3.3.11.2. The picture below shows a R&S FSWP50 microwave converter frontend unit with installed option R&S FSWP-B24.



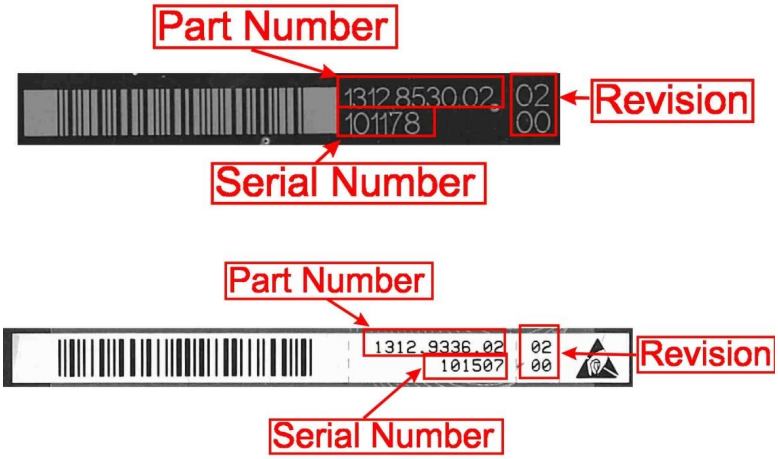
Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

11. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2
12. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
13. Unscrew the four screws fastening the microwave converter frontend to the frontend unit holder.



14. Disconnect the YIG filter control cable at the microwave converter frontend side
15. Replace the microwave converter frontend by a new one and fasten the four screws previously removed.
16. Write down the serial number, the part number and the revision of the new board.

    Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the EEPROM!)



17. Replug the YIG filter control cable to the new microwave converter frontend.
18. Reconnect the RF cables at connector X161 and X162 and the YIG filter

    Tip: The connector to plug in is written on the yellow tube on the cable.
19. Reinstall the microwave converter frontend unit to the instrument as described in chapter 3.3.11.3.
20. Mount the right side cover (refer to chapter 3.2.4).
21. Mount the upper and lower cover (refer to 3.2.4).
22. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

23. Update the EPROM data of the microwave converter frontend.

    a) Enter the service password
    [SETUP : Service : Service Function : Password = 30473035]

    b) Enter the service function
    3.7.7.1.FRONTEND.xxxx.xxxx.xx.yyyyyy.zz.zz
    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 11!

NOTICE

Risk of losing important information

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

24. Enter the service function

    [3.7.7.0.FRONTEND]

    and verify the displayed data with the data of the new installed hardware.

25. Reset the service password

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

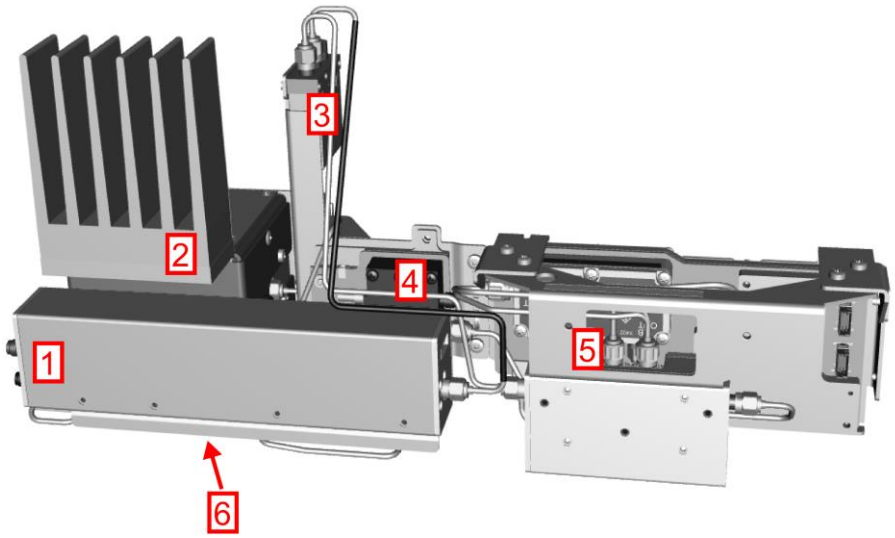
    [Reset Password]

26. Perform a frequency response correction as described in chapter 3.2.5.2.

27. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

4.3.12.5 Replacing the YIG Filter A162 (only installed if option FSWP-B1 is installed)

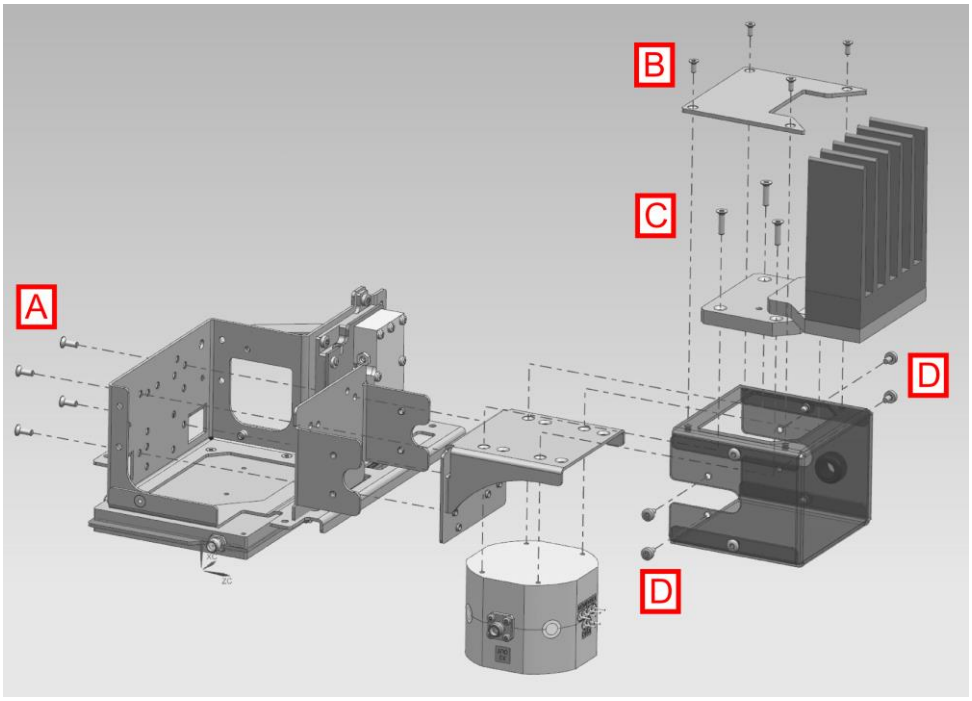
The YIG filter is mounted on the microwave converter frontend unit. To replace it the whole microwave converter frontend unit has to be removed from the instrument.



Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

1. Unmount the microwave converter frontend unit as described in chapter 4.3.11.2
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unplug the YIG filter control cable.
4. Uninstall the two RF cable on the YIG filter.
5. Uninstall the YIG filter with its shielding cap and heat sink by unscrewing the four screws marked with A in the picture below.

6. Uninstall the covering plate by unscrewing the four screws marked with B in the picture below.
7. Uninstall the heat sink on the YIG filter by removing the four screws marked with C in the picture below.

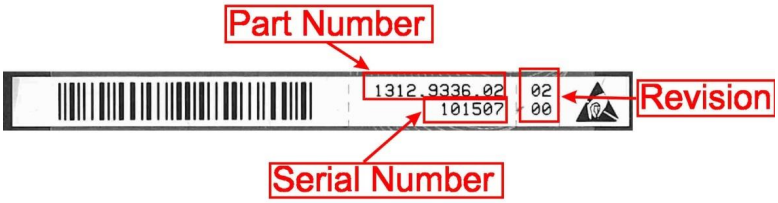


8. Uninstall the shielding cap with the YIG filter by unscrewing the four screws marked with D in the picture above.

   NOTICE: the YIG filter is held by the screws removed with the heat sink! So be careful when uninstalling the shielding cap.

   NOTICE: Do not damage the YIG filter control cable when uninstalling the shielding cap!
9. Replace the YIG filter by a new one.
10. Write down the serial number, the part number and the revision of the new filter.

    Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



11. Mount the YIG filter with its shielding cap and heat sink in inverted order of disassembling it. Use the screws formerly removed. Replace the thermal conductive pad if it was installed formerly before reinstalling the heat sink.
12. Reinstall the YIG filter to the microwave converter frontend unit.
13. Replug the YIG filter control cable to the microwave converter frontend.
14. Reconnect the RF cables at connector X161 and X162 and the YIG filter

    Tip: The connector to plug in is written on the yellow tube on the cable.
15. Reinstall the microwave converter frontend unit to the instrument as described in chapter 3.3.11.3
16. Mount the right side cover (refer to chapter 3.2.4).
17. Mount the upper and lower cover (refer to 3.2.4).
18. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
19. Update the EPROM Data of the YIG filter

    a) Enter the service password
    [SETUP : Service : Service Function : Password = 30473035]

    b) Enter the service function
    3.7.7.1.YIG_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz

    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.
20. Enter the service function

    [3.7.7.0.YIG_UNIT]

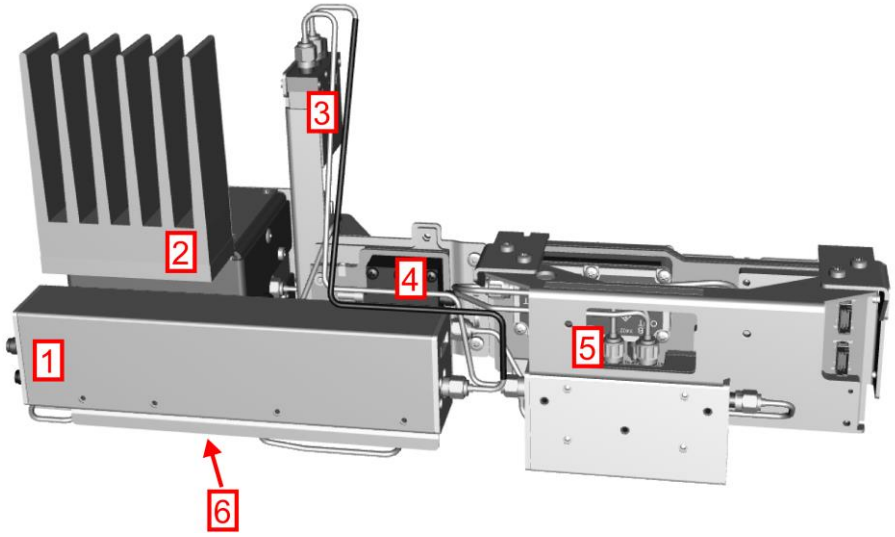
    and verify the displayed data with the data of the new installed hardware.
21. Reset the service password

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    [Reset Password]
22. Perform a frequency response correction as described in chapter 3.2.5.2.
23. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

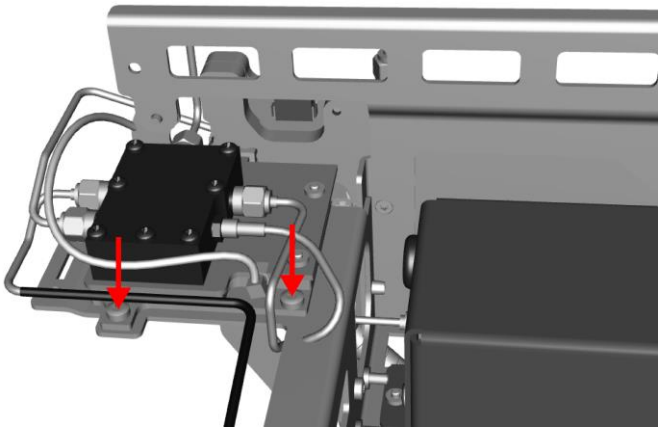
4.3.12.6 Replacing the Triplexer A340 (only installed if option R&S FSWP-B1 is installed)

The triplexer is located on the microwave converter frontend unit.



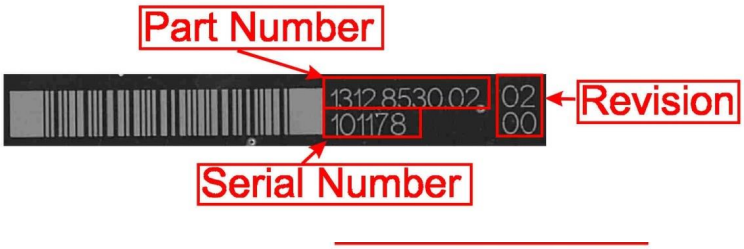
Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

1. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2.
2. Unconnected the RF cables to the step attenuator.
3. Unmount the step attenuator from the microwave converter frontend unit. Refer to chapter 3.3.9.
4. Uninstall the five RF cables to the triplexer.
5. Unscrew the two screws fastening the triplexer marked with an arrow in the picture below.



6. Carefully unplug the triplexer from the microwave converter frontend.
7. Replace the triplexer by a new one.
8. Replug the triplexer to the microwave converter frontend.
9. Fasten the triplexer by the screws previously removed.
10. Write down the serial number, the part number and the revision of the new triplexer.

    Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the EEPROM!)



11. Reinstall the three RF cables.

    Tip: The connector to plug in is written on the yellow tube on the cable.
12. Reinstall the step attenuator to the microwave converter frontend unit.
13. Reinstall the cables to the step attenuator.
14. Reinstall the microwave converter frontend unit to the instrument as describe in chapter 3.3.11.3
15. Mount the right side cover (refer to chapter 3.2.4).
16. Mount the upper and lower cover (refer to 3.2.4).
17. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

18. Update the EPROM Data of the triplexer

    a) Enter the service password
    [SETUP : Service : Service Function : Password = 30473035]

    b) Enter the service function
    3.7.7.1.TRIPLEXER.xxxx.xxxx.xx.yyyyyy.zz.zz

    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 8.

19. Enter the service function

    [3.7.7.0.TRIPLEXER]

    and verify the displayed data with the data of the new installed hardware.

20. Reset the service password

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

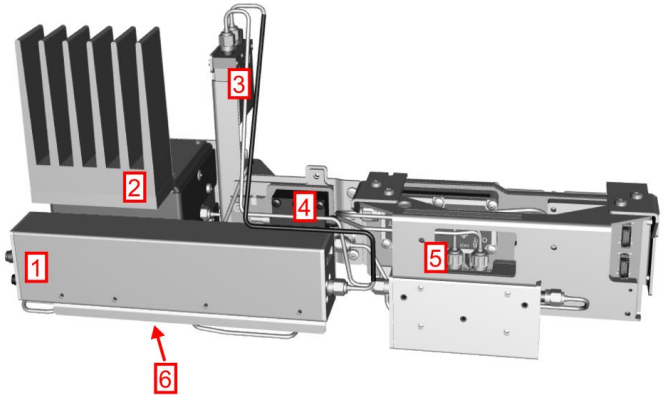
    [Reset Password]

21. Perform the Basic Instrument Checks according to chapter 3.2.5.1.

22. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.12.7 Replacing the signal path relay A580

The signal path relay is installed on the microwave converter frontend unit.



Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

1. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2.
2. Disconnect all RF cables at the relay.
3. Unscrew the two screws fastening the relay.
4. Replace the relay by a new one and fasten it by the two screws formerly removed.
5. Reconnect all RF cables on the relay.
6. Reinstall the microwave converter frontend unit to the instrument as described in chapter 3.3.11.3
7. Mount the right side cover (refer to chapter 3.2.4).
8. Mount the upper and lower cover (refer to 3.2.4).
9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
10. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
11. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.13 Replacing the Fans

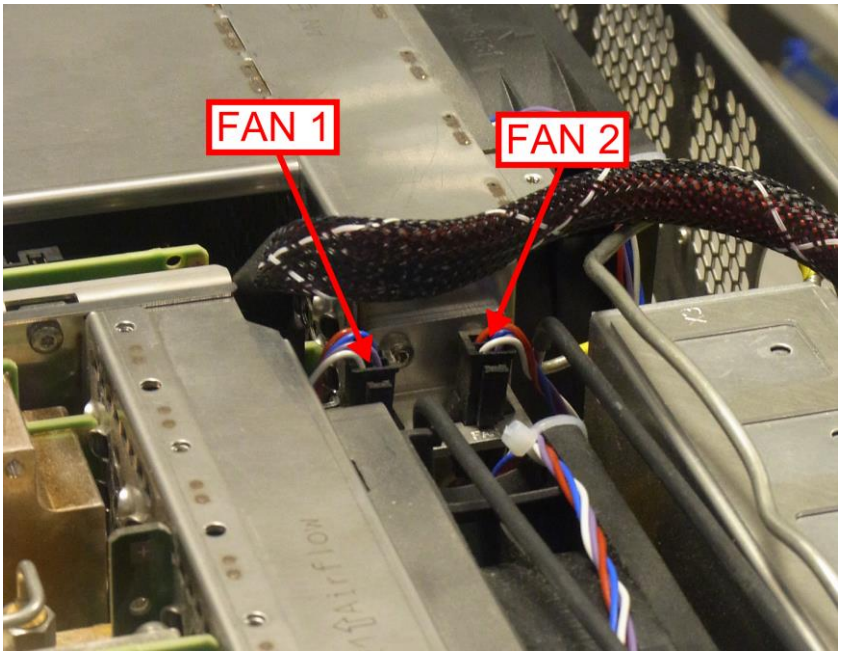
1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 3.2.3.1)
3. Unmount the inner lid 2 (refer to chapter 3.2.3.2).
4. Unplug the fan to be replaced.

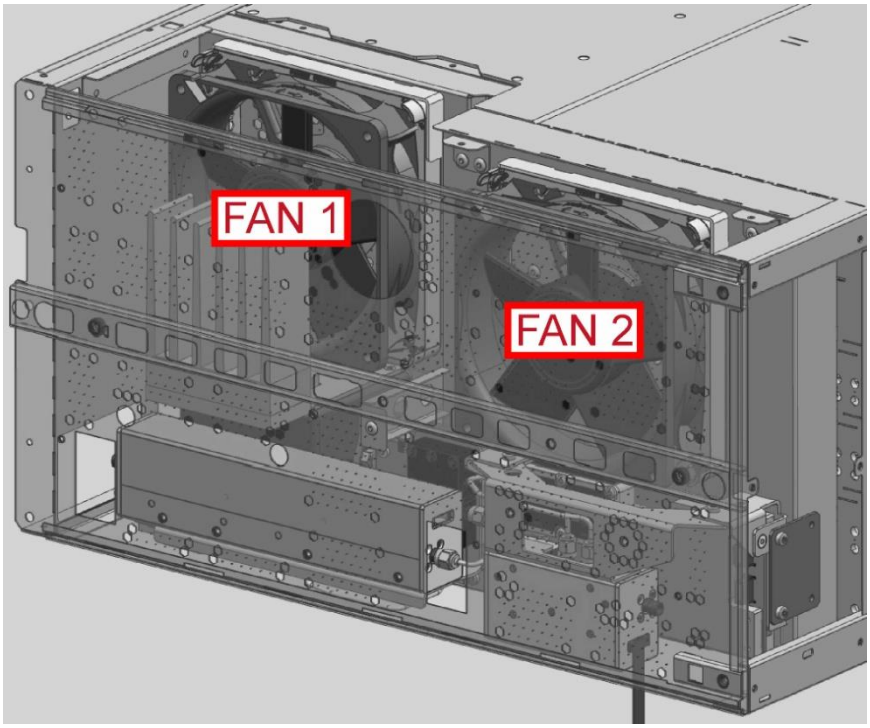
   Note: The connector is locked! To unlock it press the lever down and disconnect carefully the cable!
5. Remove the fan from its holder.

   Tip: you can pull at the lever on the rubber holder while pushing out the fan.
6. Install the new fan. Insert the lower corner of the fan in the holder, then press the other two corners in the holder. The fourth corner can be inserted in the holder by pulling the lever at that corner.

   Note: be sure to install the fan in the right orientation: the airflow (given by an arrow on the fan) must go into the instrument!
7. Plug in the fan cables in the corresponding plug. Refer to picture below.

   NOTICE! Be sure to plug in the fans in the correct connector on the motherboard otherwise the instrument can be damaged! If the fan which remains in the instrument is connected to the wrong connector correct its position according to the picture below.





8. Mount the inner lid 2 (refer to chapter 3.2.4).
9. Mount the upper and lower cover (refer to 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Check if the fans are running.

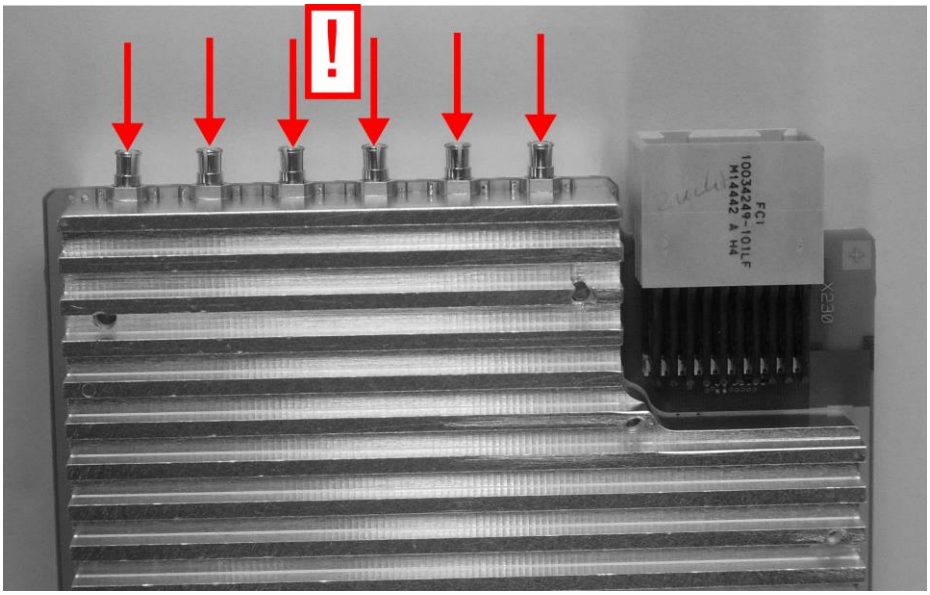
    Note: The fans start several seconds after powering up the instrument! This is no malfunction of the fans or the instrument!

    NOTICE! Be sure you have plugged in both fans in the correct connector! Otherwise the instrument can be damaged!
12. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
13. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.14 Replacing the PN-Digitizer Board A230

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the screws fastening the PN-digitizer board at the backside of the instrument.
3. Remove the PN-digitizer board using the BW2010 removal tool.
4. Reinstall the new PN-digitizer board to the instrument.

   Note: Check the six SMP bullets!



5. Reinstall the screws previously removed.
6. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
7. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
8. Perform a self-alignment.

4.3.15 Replacing the OCXO A260 (R&S FSWP-B4)

1. Switch off the instrument and disconnect the power plug.
2. Unscrew four screws fastening the OCXO.
3. Carefully remove the OCXO.
4. Insert the new OCXO carefully and mount it with the four screws previously removed.
5. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
6. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
7. Adjust the reference frequency according to chapter 2.2 or perform a frequency response correction as described in chapter 3.2.5.2.

4.3.16 Replacing the Synthesizer Board A140

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 3.2.3.1).
3. Unmount the inner lid 1 (refer to chapter 3.2.3.2).
4. Unplug all RF cables at the synthesizer board.

   Note: there are one or more cables routed on the upper side of the instrument!
5. Remove the synthesizer board carefully.
6. Install the new synthesizer board.
7. Reconnect all RF cables at the synthesizer board.

   Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid 1 (refer to chapter 3.2.4).
9. Mount the upper and lower cover (refer to chapter 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
12. Perform a frequency response correction as described in chapter 3.2.5.2.

Note: Before replacing the Synthesizer Board A140 see combination matrix in Section 4.3.64.3.5.

4.3.17 Replacing the Reference Board A120

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter 3.2.3.1)
3. Unscrew the eight screws fastening the reference board.

Without R&S FSWP-B4 installed:

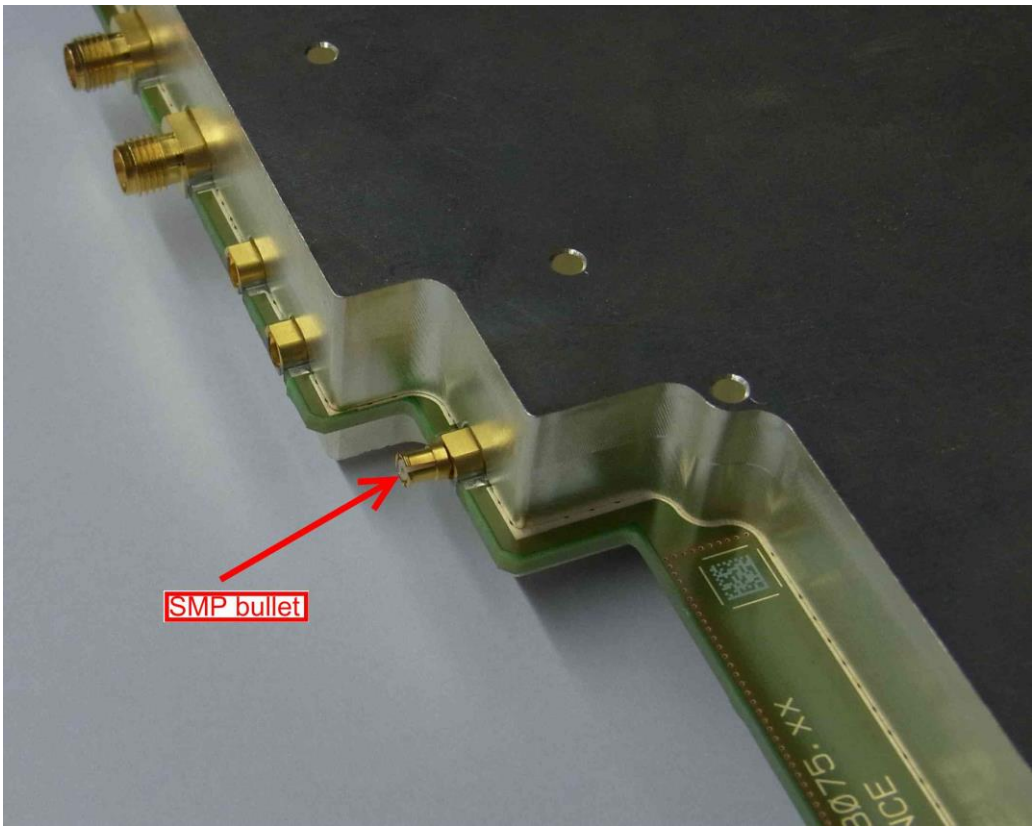
► Unscrew the four screws fastening the metal sheet covering the R&S FSWP-B4 slot and remove the cover.

With R&S FSWP-B4 installed:

► Uninstall **the R&S FSWP-B4 according to chapter** 3.3.14**.**

4. Unplug all RF cables inside the instrument from the reference board.
5. Remove the reference board from the instrument.
6. Install the new reference board.

   Note: Do not forget to install the SMP bullet!



7. Reconnect all RF cables at the reference board.

   Tip: The connector to plug in is written on the yellow tube on the cable.

Without R&S FSWP-B4 installed:

► Remount the slot cover by fastening the four screws previously removed.

With R&S FSWP-B4 installed:

► Reinstall the R&S FSWP-B4 according to chapter 3.3.14.

8. Fasten the reference board by installing the eight screws previously removed.
9. Mount the lower cover (refer to chapter 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
12. Perform a frequency response correction as described in chapter 3.2.5.2.

    Note: If the firmware shows a “DCM unlock” Error (refer to 3.4.3.2) when starting the instrument check the SMP bullet for proper installation!

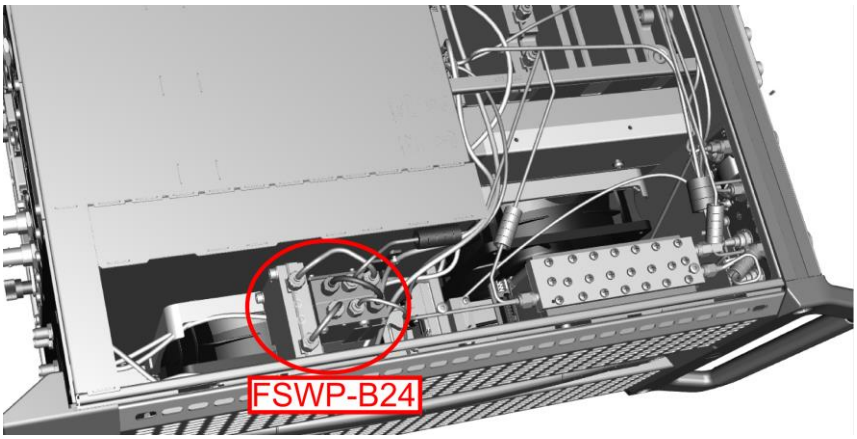
4.3.18 Preamplifier in R&S FSWP8/26 (Option R&S FSWP-B24)

The option R&S FSWP-B24 can only be installed in combination with the option R&S FSWP-B1. It is mounted on the microwave converter front end unit. If one of the parts of the option has to be replaced the whole microwave converter frontend unit must be uninstalled.

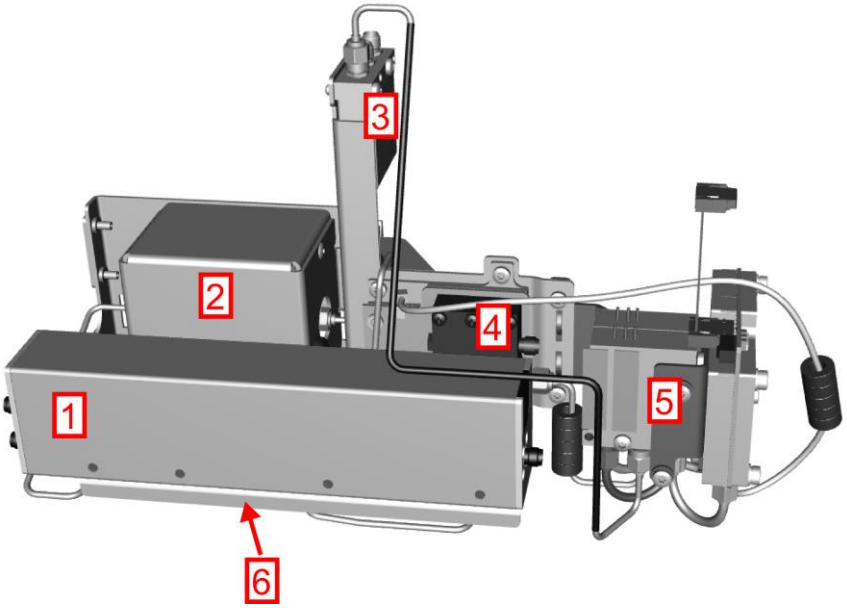
The option R&S FSWP-B24 includes two individual replaceable parts: the relay unit and the preamplifier board denoted by “MW preamp”. The two parts are mounted together as the preamplifier frontend unit.

Depending on the fault of the preamplifier, either the preamplifier board or the relays unit must be replaced.

R&S FSWP 8:



R&S FSWP 26:



Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier R&S FSWP-B24 A270
6	Microwave converter frontend A161

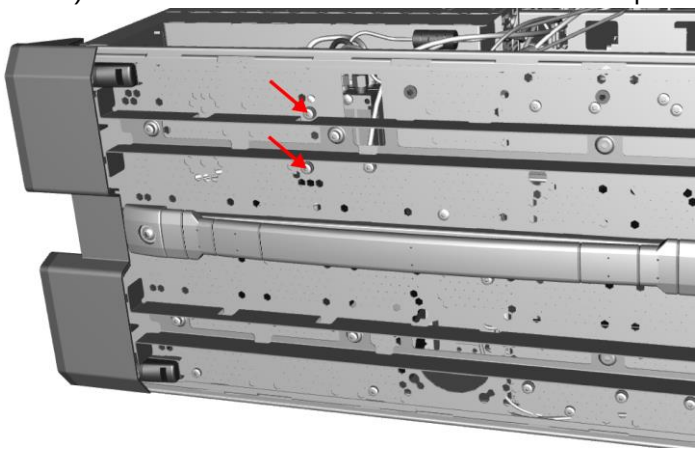
1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter 3.2.3.1).
3. Unmount the right side cover (refer to chapter 3.2.3.3).

R&S FSWP26:

a) Unmount the microwave converter frontend unit as described in chapter 3.3.11.2
b) Disconnect all RF cables at the preamplifier board.
c) Unmounts the preamplifier from the microwave converter frontend unit by unscrewing the two screws fastening the preamplifier to the microwave converter frontend unit.

R&S FSWP8:

a) Disconnect RF cables W27 and W23 at the preamplifier



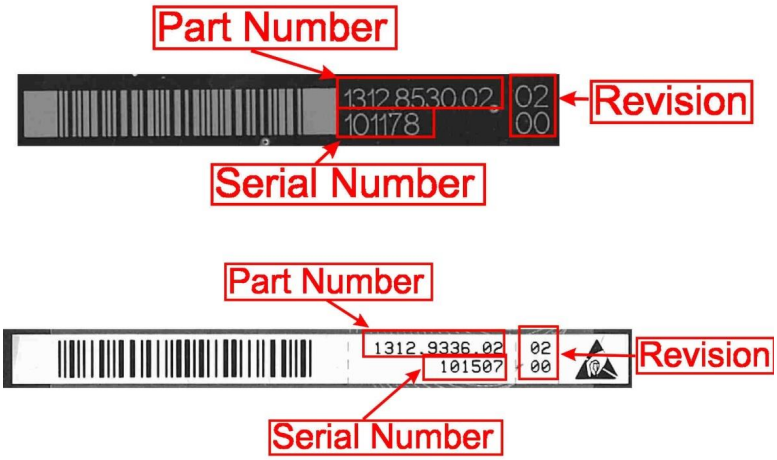
b) Unmount the preamplifier from the instrument by unscrewing the two screws marked with an arrow in the picture above fastening the preamplifier to the sidewall of the instrument and remove it.
Note: The flat ribbon cable is still connected. Be careful not to damage the cable or the board!

4. Unplug the flat ribbon cable at the preamplifier board.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

5. Replace either the preamp board referred by “MW preamp” or the relays unit by a new one and reassemble the preamplifier frontend unit.
6. Write down the serial number, the part number and the revision of the new part.

   Tip: You find this information on the barcode label on the printed circuit board. There are two different barcode labels: (The numbers shown in the picture are only for illustration. Do not use them for updating the EEPROM!)



7. Connect the flat ribbon cable to the preamplifier board.

R&S FSWP26:

a) Remount the preamplifier to the microwave converter frontend unit by installing the two screws formerly removed.
b) Reconnects all RF cables at the preamplifier board.
c) Reinstall the microwave converter frontend unit as described in chapter 3.3.11.3

R&S FSWP8:

a) Remount the preamplifier to the instrument by installing the two screws formerly removed.
   Note: The flat ribbon cable is still connected. Be careful not to damage the cable or the board!
b) Reconnect all RF cables to the preamplifier

8. Mount the right side cover (refer to chapter 3.2.4).
9. Mount the lower cover (refer to 3.2.4).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

11. Update the EPROM Data of the preamplifier unit

    a) When the preamplifier board “MW preamp” has been changed:
    Enter the service password

    [SETUP : Service : Service Function : Password = 30473035]

    Enter the service function

    3.16.7.1.PREAMP.xxxx.xxxx.xx.yyyyyy.zz.zz

    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 6.

NOTICE

Risk of losing important information

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

    Enter the service function

    [3.16.7.0.PREAMP]

    and verify the displayed data with the data of the new installed hardware.

    b) When the relay unit has been changed:
    Enter the service password

    [SETUP : Service : Service Function : Password = 30473035]

    Enter the service function

    3.16.7.1.RELAIS_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz

    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 8.

    Enter the service function

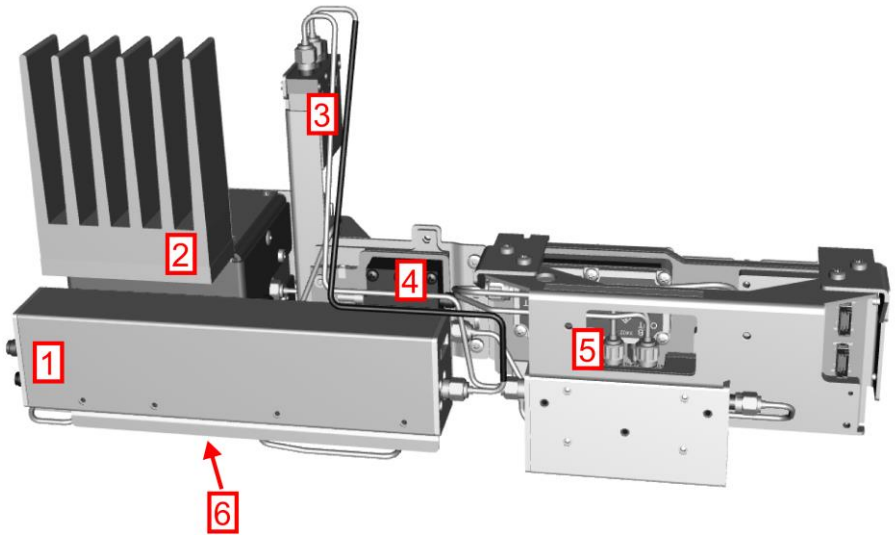
    [3.16.7.0.RELAIS_UNIT]

    and verify the displayed data with the data of the new installed hardware.

12. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
13. Perform a frequency response correction as described in chapter 3.2.5.2

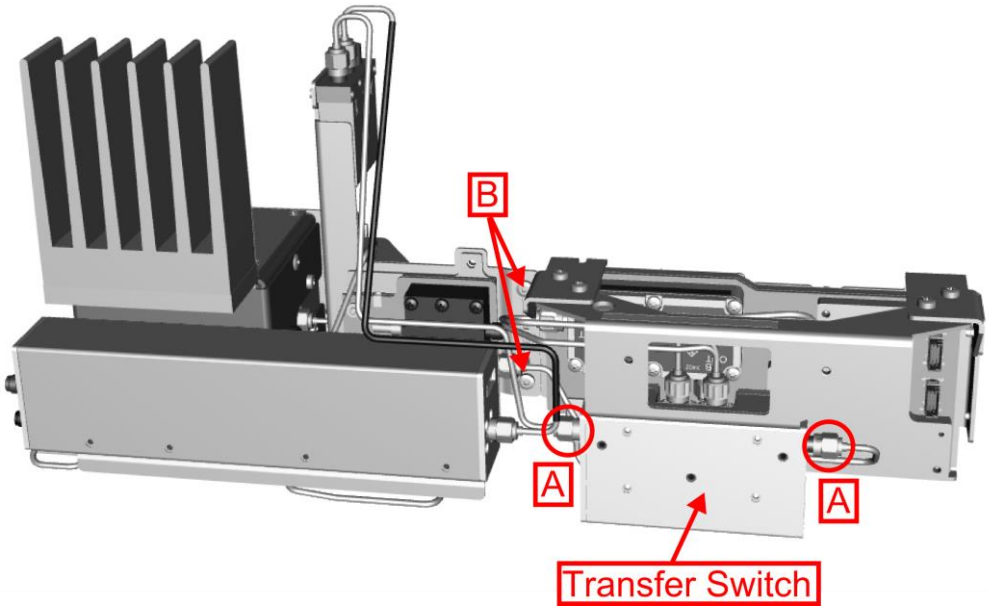
4.3.19 Preamplifier in R&S FSWP50 (Option R&S FSWP-B24)

The option R&S FSWP-B24 can only be installed in combination with the option R&S FSWP-B1. It is mounted on the microwave converter front end unit. If the option has to be replaced the whole microwave converter frontend unit must be uninstalled.



Position	Module
1	Step Attenuator A60
2	YIG filter A162
3	Signal path Relay A580
4	Triplexer module A340
5	Preamplifier Unit R&S FSWP-B24 A270
6	Microwave converter frontend A161

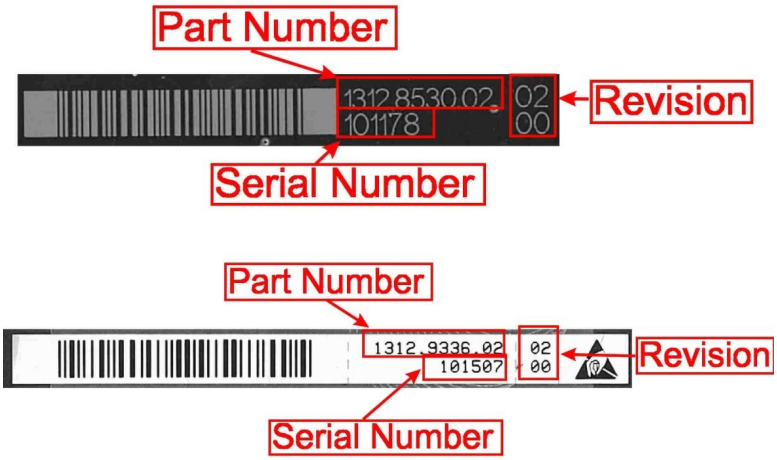
1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter 3.2.3.1).
3. Unmount the right side cover (refer to chapter 3.2.3.3).
4. Unmount the microwave converter frontend unit as described in chapter 3.3.11.2
5. Disconnect all RF cables at the transfer switch of the preamplifier unit marked with A in the picture below.



6. Unmount the preamplifier unit from the microwave converter frontend unit by unscrewing the two screws fastening the preamplifier unit to the microwave converter frontend unit marked with B in the picture above.
7. Unplug the flat ribbon cable at the preamplifier board.

   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
8. Replace the preamplifier unit by a new one.
9. Write down the serial number, the part number and the revision of the new part.

   Tip: You find this information on the barcode label on the printed circuit board. There are two different barcode labels: (The numbers shown in the picture are only for illustration. Do not use them for updating the EEPROM!)



10. Connect the flat ribbon cable to the preamplifier unit.
11. Remount the preamplifier unit to the microwave converter frontend unit by installing the two screws formerly removed.
12. Reconnects all RF cables at the transfer switch of the preamplifier unit.
13. Reinstall the microwave converter frontend unit as described in chapter 3.3.11.3
14. Mount the right side cover (refer to chapter 3.2.4).
15. Mount the lower cover (refer to 3.2.4).
16. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
17. Update the EPROM Data of the preamplifier unit
18. When the preamplifier has been changed:

    Enter the service password

    [SETUP : Service : Service Function : Password = 30473035]

    Enter the service function

    3.16.7.1.PREAMP.xxxx.xxxx.xx.yyyyyy.zz.zz

    in the service dialog

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]

    where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 6.

NOTICE

Risk of losing important information

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

    Enter the service function

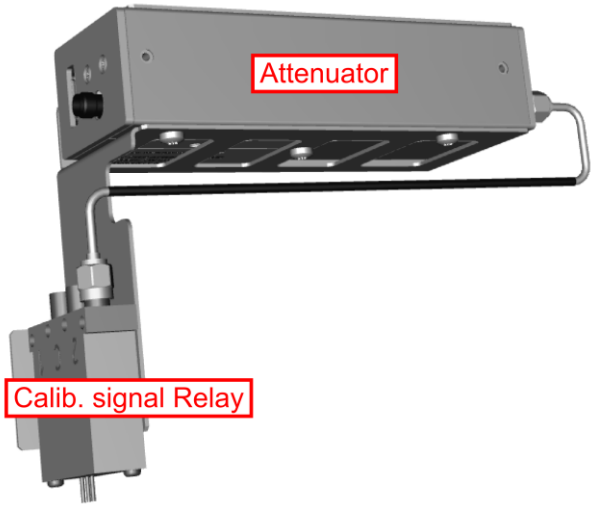
    [3.16.7.0.PREAMP]

    and verify the displayed data with the data of the new installed hardware.

19. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
20. Perform a frequency response correction as described in chapter 3.2.5.2

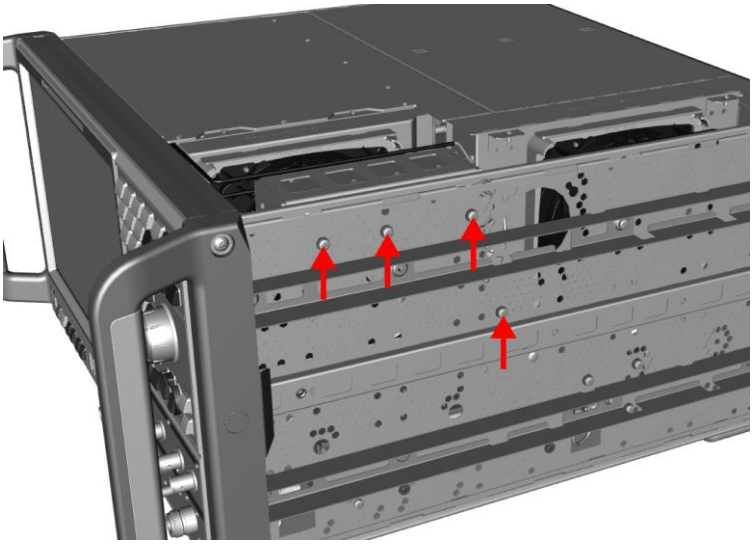
4.3.20 Replacing the Signal Source Attenuator A570 (option R&S FSWP-B64)

The attenuator for the signal source output in mounted on a carrier with the alignment signal relay. This carrier can be remove from the instrument towards the inner lid 2.



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 3.2.3.1)
3. Unmount the inner lid 2 (refer to chapter 3.2.3.2).
4. Unmount the right side cover (refer to chapter 3.2.3.3)
5. Disconnect the flat ribbon cable on the attenuator

   Note: the connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
6. Disconnect the RF cables at the attenuator.
7. Disconnect all RF cables at the alignment signal relay except W592.
8. Disconnect the alignment signal relay control cable at connector X17 on the analog motherboard at the bottom side of the instrument.
9. Unscrew the 4 screws fastening the carrier to the instrument chassis and remove the carrier with the attenuator towards the top of the instrument.

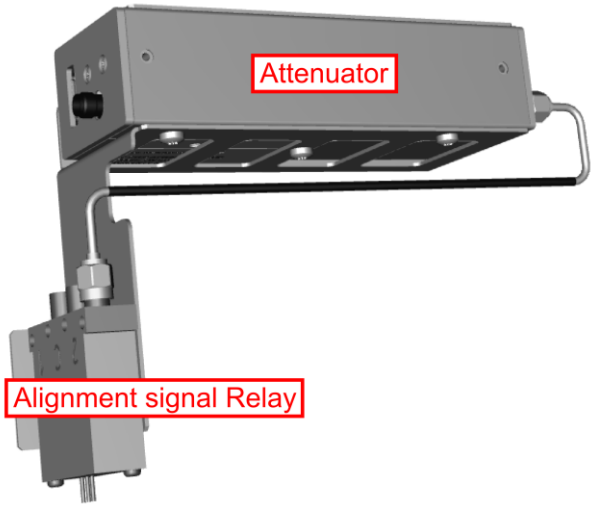


10. Unscrew the 3 screws fastening the attenuator to the carrier.
11. Replace the attenuator by a new one.
12. Fasten the attenuator to the carrier by installing the 3 screws formerly removed.
13. Reinstall the carrier to the instrument and fasten it by the 4 screws formerly removed.

    Note: Be sure to route the control cable properly!
14. Reconnect the control cable to the connector X17 on the analog motherboard.
15. Reconnect the flat ribbon cable to the attenuator.
16. Reconnect all RF cables formerly removed to the attenuator.
17. Reconnect all RF cables formerly removed to the alignment signal relay.
18. Mount the right side cover (refer to 3.2.4).
19. Mount the inner lid 2 (refer to 3.2.4)
20. Mount the upper and lower cover (refer to chapter 3.2.4)
21. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
22. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
23. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.21 Replacing the Alignment Signal Relay A590 (option R&S FSWP-B64)

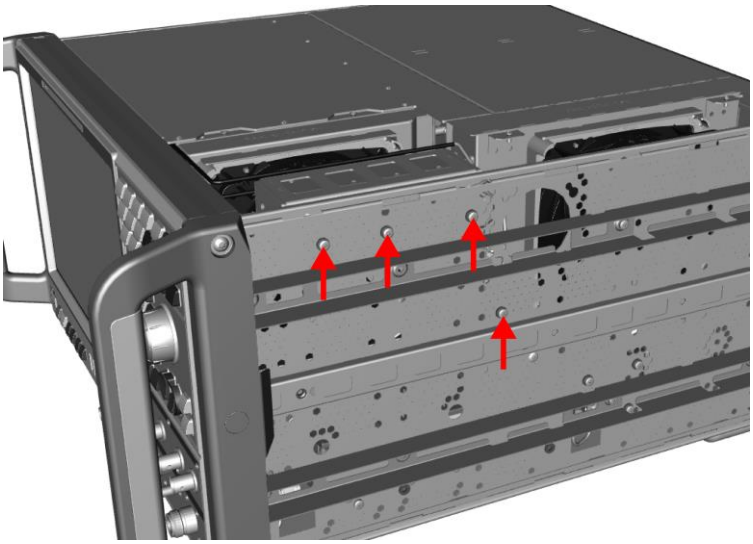
The alignment signal relay is mounted on a carrier with the signal source attenuator. The control cable is connected to connector X17 on the analog motherboard on the bottom side of the instrument.



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 3.2.3.1)
3. Unmount the inner lid 2 (refer to chapter 3.2.3.2).
4. Unmount the right side cover (refer to chapter 3.2.3.3)
5. Disconnect the flat ribbon cable on the attenuator

   Note: the connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
6. Disconnect the RF cables at the attenuator except W592.
7. Disconnect all RF cables at the alignment signal relay.
8. Disconnect the alignment signal relay control cable at connector X17 on the analog motherboard at the bottom side of the instrument.

9. Unscrew the 4 screws fastening the carrier to the instrument chassis and remove the carrier with the attenuator towards the top of the instrument.

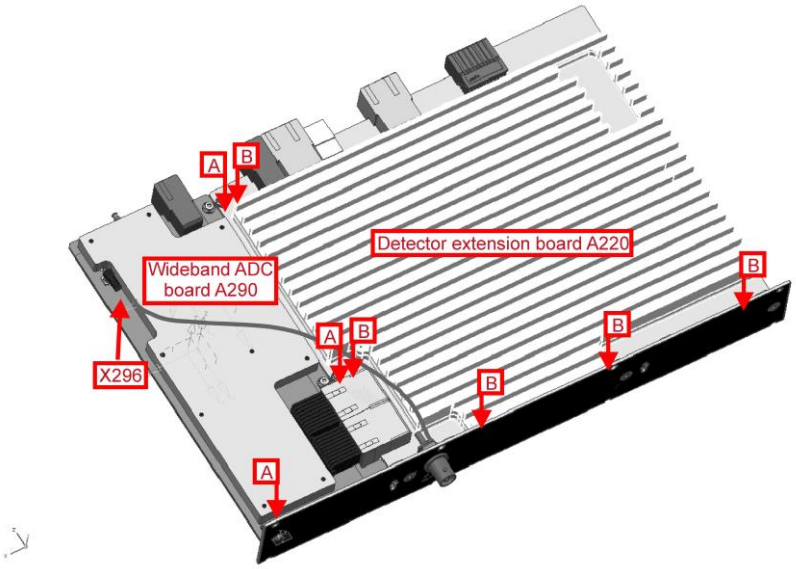


10. Unscrew the 2 screws fastening the relay to the carrier.
11. Replace the relay by a new one.
12. Fasten the relay to the carrier by installing the 2 screws formerly removed.
13. Reinstall the carrier to the instrument and fasten it by the 4 screws formerly removed.

    Note: Be sure to route the control cable properly!
14. Reconnect the control cable to the connector X17 on the analog motherboard.
15. Reconnect the flat ribbon cable to the attenuator.
16. Reconnect all RF cables formerly removed to the attenuator.
17. Reconnect all RF cables formerly removed to the alignment signal relay.
18. Mount the right side cover (refer to 3.2.4).
19. Mount the inner lid 2 (refer to 3.2.4)
20. Mount the upper and lower cover (refer to chapter 3.2.4)
21. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
22. Perform the Basic Instrument Checks according to chapter 3.2.5.1.
23. Perform a frequency response correction as described in chapter 3.2.5.2.

4.3.22 Replacing the Bandwidth Extension (option R&S FSWP-B320)

The option R&S FSWP-B320 consists of two boards: The wideband ADC board A290 and the detector extension board A220. The boards can be replaced independently.



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the eight screws on the back cover of the instrument.
3. The wideband ADC board is bundled with the detector extension board. The two boards can only be removed as a pair. To remove the detector extension board and the wideband ADC board using the BW2010 tool.

   Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument.

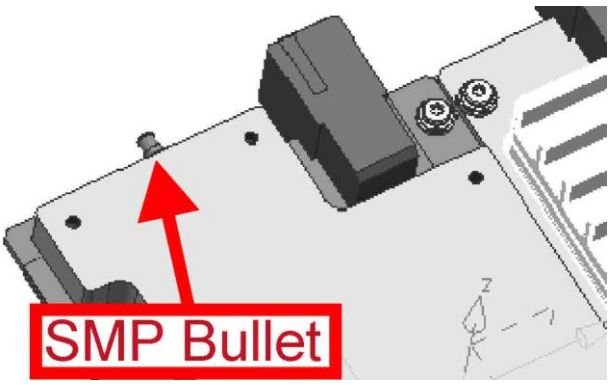
Replacing the wideband ADC board A290

a) Unscrew the three screws, marked with A in the picture above, fastening the wideband ADC board.
b) Unplug the RF cable at connector X296 and the SMP bullet.
c) Unplug the wideband ADC board from the detector extension board.
d) Replug the new wideband ADC board to the detector extension board.
e) Reinstall the three screws previously removed.
f) Replug the RF cable and reinstall the SMP bullet previously removed.

Replacing detector extension board A220

a) Unscrew the six screws, marked with B in the picture above, fastening the detector extension board as shown in the picture above
b) Unplug the detector extension board from the wideband ADC board.
c) Replug the new detector extension board to the wideband ADC board.
d) Reinstall the six screws previously removed.

4. Be sure the SMP bullet is installed properly to the wideband ADC board



5. Reinstall the two modules in the instrument.

   Note: Be sure to plug in the module properly. The back panel must seat solidly to the instrument frame.

6. Reinstall the eight screws previously removed.

7. Perform the Basic Instrument Checks according to chapter "Basic Instrument Checks" on page 97.

4.4 Troubleshooting

Malfunctions may have simple reasons but also may be caused by faulty components.

These troubleshooting instructions enable you to locate error causes down to board level and make the instrument ready for use again by means of board replacement.

We recommend that the instrument is shipped to our experts in the service centers (see address list) for module replacement and further error elimination.

For successfully detect an error perform the checks described in the in the flowcharts in the given order. The exact way to carry out the checks is described in the chapter after the flowcharts.

WARNING

Shock hazard

Before opening the casing, make sure that the instrument is switched off and disconnected from all power supplies.

Read all safety instructions at the beginning of this manual carefully!

NOTICE

Risk of damage to the boards

Be careful not to cause short circuits when measuring voltages at pins placed close together!

Utilities provided in the R&S FSWP for diagnostic purposes:

- Permanent monitoring of levels and frequencies in the instrument
- Self-test
- Frequency response correction

Frequent cause of problems: connections

When problems occur, first check whether any cables, plug-in connections of boards, etc. are damaged and whether they are connected properly.

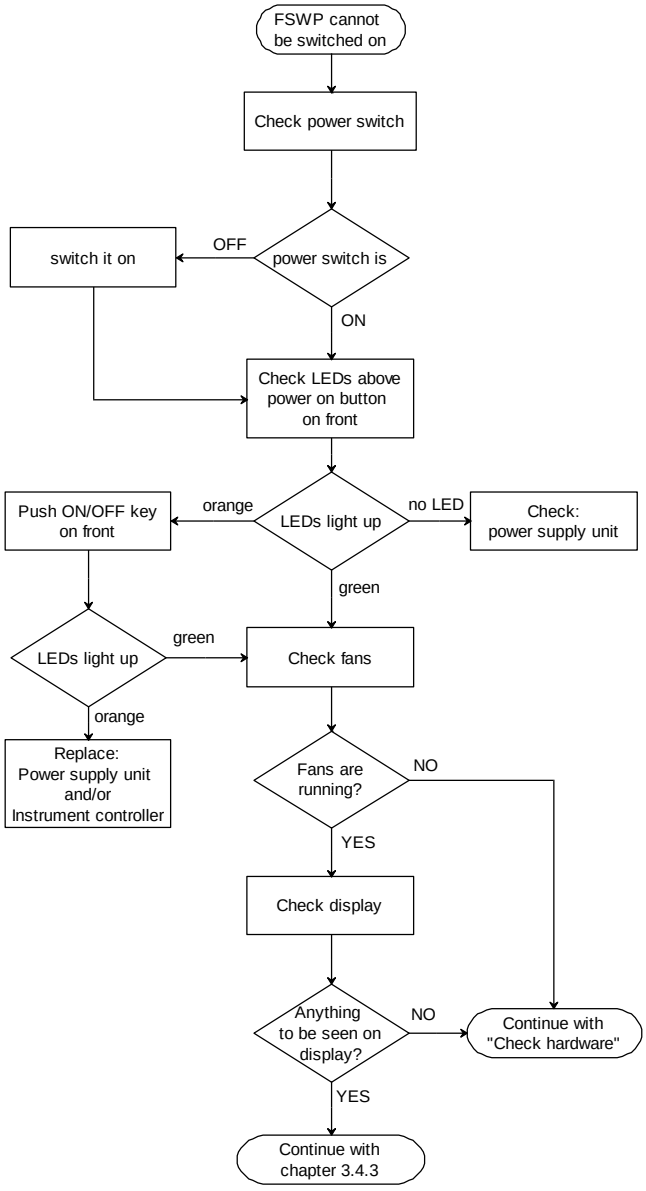
4.4.1 Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S-Order No.	Use
1	DC meter		Keysight 34401A or Keysight 34461A		Troubleshooting Start Up
2	spectrum analyzer		R&S FSW26	1331.5003.26	troubleshooting analog hardware
3	signal generator		R&S SMA100B	1419.8888.02	troubleshooting analog hardware
4	Low Phase Noise Reference		R&S LPNR100	5026.6520.02	troubleshooting PN-Digitizer module

4.4.2 Troubleshooting: Instrument cannot be Switched On

Before you get started with the algorithms make sure your wall outlet is functioning properly and your mains cable is ok.

4.4.2.1 Part 1: Basic Checks: Algorithm



4.4.2.2 Part 1: Basic Checks: Detailed Description

“Check power switch”: The power switch is located on the back side of the instrument above power inlet. The setting of the switch is marked on the switch.

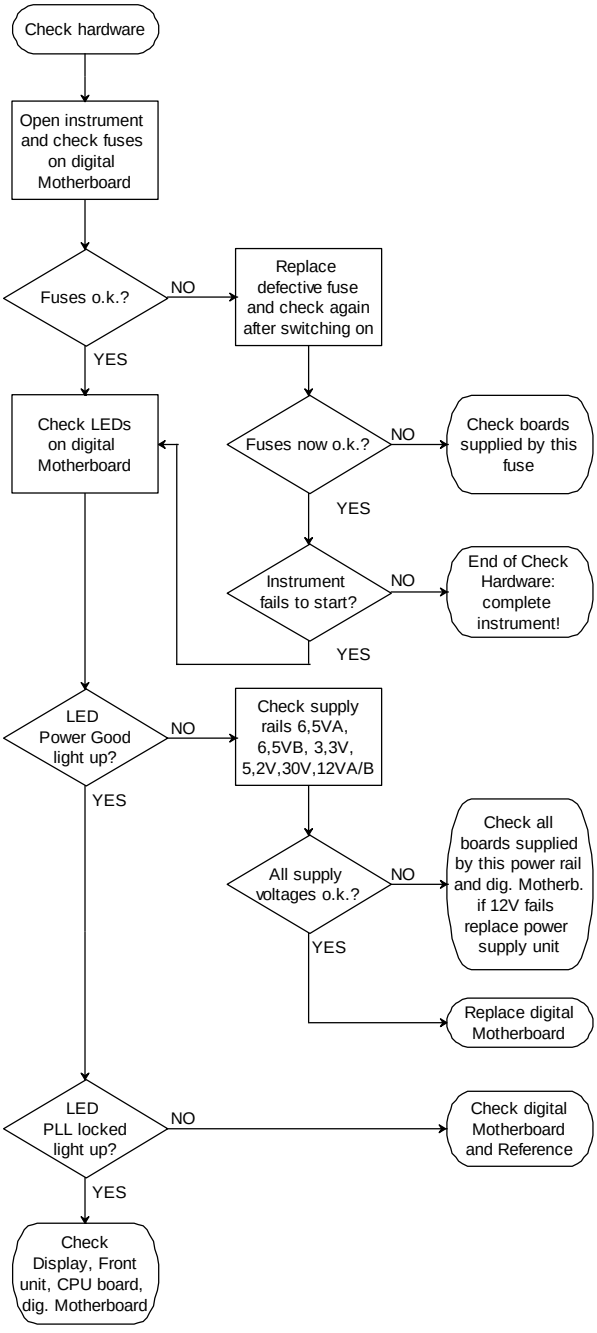
“Check LEDs above power on button on front”: The LEDs to check are located above the power on button on the front of the instrument. There is a green LED which lights up when the instrument is switched on, and an orange one which lights up when the instrument is in standby state.

“Check fans”: The two main fans of the instrument are located on the right side of the instrument. In a quiet surrounding you can hear if the fans are running. The fans start running with a delay of a few seconds after switching on the instrument.

“Check display”: check the display for any displayed information. For detailed information refer to 3.4.3.

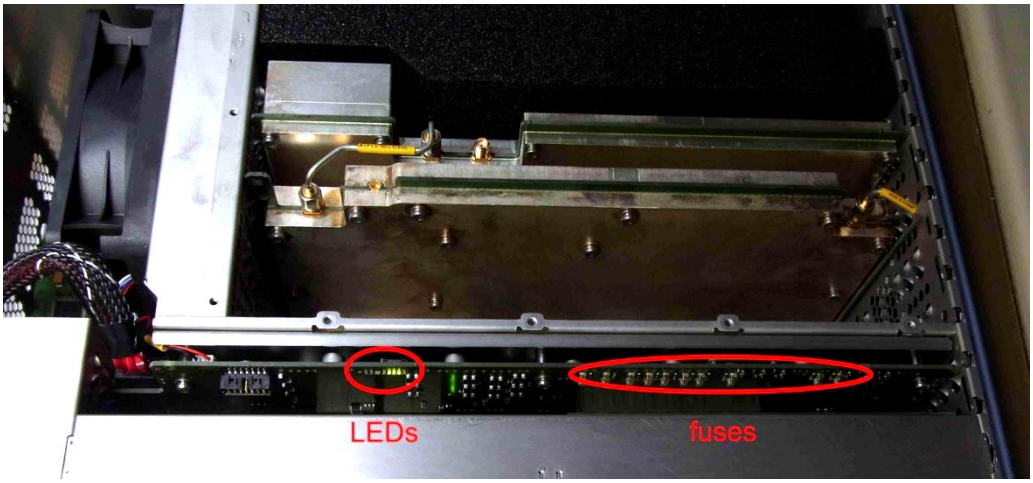
“Check Power Supply Unit”: Check the voltages supplied by the power supply (refer to Part 2: Hardware Checks: Detailed Description “Check supply rails”) First check the standby voltage. If this is present check the fuse F13 (refer to Part 2: Hardware Checks: Detailed Description “Check fuses on digital motherboard”). If fuse F13 is o.k. and the green LED on the front of the instrument is not lighting up after pressing the power on button replace the CPU Board.

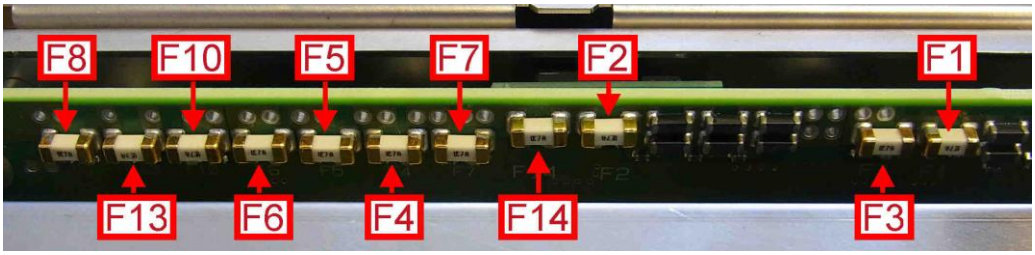
4.4.2.3 Part 2: Hardware Checks: Algorithm



4.4.2.4 Part 2: Hardware Checks: Detailed Description

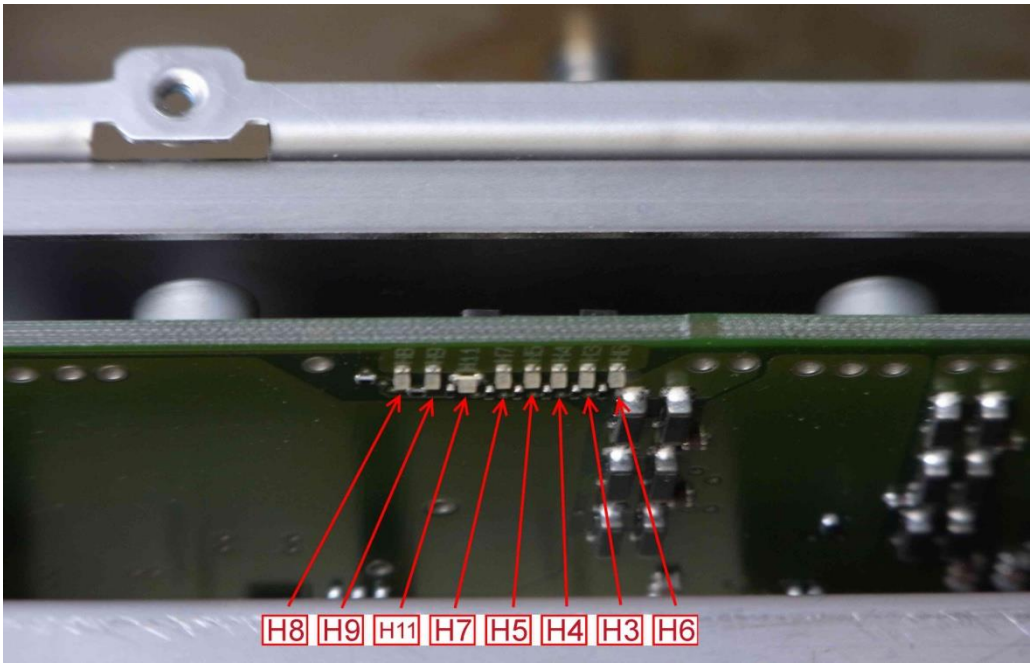
“Check fuses on digital motherboard”: The fuses are located on the upper end of the digital motherboard. You have to disassemble the upper cover (refer to 3.2.3.1) and the inner lid (refer to 3.2.3.2) to reach the fuses. In case of a blown fuse a LED near the fuse will light up in red to indicate the fuse is defective. For replacing the defective fuse refer to 3.3.10.2.





F1	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V A
F2	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V B
F3	2079.5994.00	7A FF	Power supply rail for DC/DC converter 3,3V, -6,5V, probe supply, 5V, 30V
F4	2079.5994.00	7A FF	Power supply rail for digital boards
F5	2079.5994.00	7A FF	Power supply rail for analog boards
F6	2079.5994.00	7A FF	Power supply rail for main fans
F7	2079.5994.00	7A FF	Power supply rail for microwave converter
F8	2079.5994.00	7A FF	Supply rail for detector extension board #1
F10	2079.5994.00	7A FF	Supply rail for CPU Board
F13	6100.7862.00	3A FF	Standby supply rail
F14	2079.5994.00	7A FF	Supply rail for detector extension board #2

“Check LEDs on digital motherboard”: The LEDs on the digital motherboard are located near the fuses on the upper end of the digital motherboard. You have to disassemble the instrument in the same way as for checking the fuses. The LEDs indicate the status of the FPGA on the motherboard.



The LEDs give the following information:

Designation	Function	Color
H3	Productive firmware version of motherboard FPGA is loaded. This LED lights up after start of firmware.	green
H4	PLL locked: The PLL of the FPGA is locked to the 128 MHz clock signal generated by the reference board	green
H5	Power good: All DC/DC converters on the digital motherboard are within their nominal output voltages	green
H6	Fan fail: one or both of the two main fans are not rotating	red
H7	For future use	
H8	For future use	
H9	For future use	
H11	For future use	

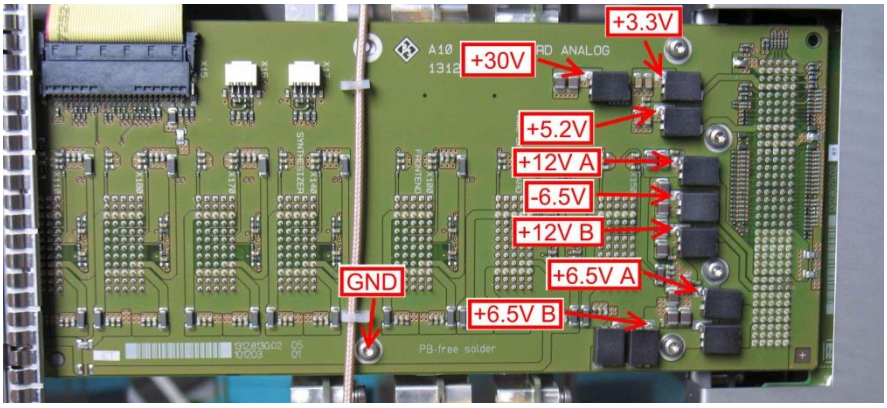
LED Power good is not lighting up: If this LED is staying dark one of the integrated DC/DC converters on the digital motherboard fails to supply the appropriate output voltage. This may be due to a short circuit or an overcurrent condition or due to a defect. Check the supply rails as described later.

LED PLL locked is not lighting up: If this LED is staying dark the FPGA is not supplied by a valid clock signal. Check the reference board for a missing SMP bullet first. If every bullet is installed properly this board or the digital motherboard might be defective.

LED Fan fail lights up: One or both of the main fans are not rotating. This may be due to a blocked fan or due to a defect. At first identify the fan which is not rotating. Then have a look if it is blocked. If the rotor is not blocked check the supply voltage on the connector on the digital motherboard: X322 and X321 pins 1+ 2 : rated value +11 V ±1V. If this is o.k. replace fan (refer to: Replacing the Fans).

LED productive firmware loaded is not lighting up after firmware is started: The productive version of the motherboard FPGA firmware cannot be loaded. Switch the instrument off and on again. If the LED is not lighting up after firmware starts check the digital motherboard.

“Check supply rails”: For this check you have to disassemble the lower cover (refer to 3.2.3.1). The output voltages of the DC/DC converters located on the digital motherboard can be measured on the analog motherboard. All voltages are referring to ground. Use the screw shown in the picture below as ground point.



Name	Value	Fuse
+30V	+30 V ± 0.6 V	F3
+3.3V	+3,4 V – 0.1 V + 0.2 V	F3
+5.2V	+5,2 V ± 0.2 V	F3
+12V A	+12 V ± 0.1 V	F7
-6.5V	-6,5 V ± 0.2 V	F3
+12V B	+12 V ± 0.1 V	F5
+6.5V A	+6,5 V – 0.1 V + 0.5 V	F1
+6.5V B	+6,5 V – 0.1 V + 0.5 V	F2
+12V Standby*	+12 V ± 0,1 V	F13

* The standby voltage can be measured at fuse F13 on the top of the instrument. This voltage is also referring to ground. Use the instrument housing as ground point.

If the measured voltage is not within the given range first check the supply chain fuse. If the fuse is o.k. check for a short circuit on this power rail. To do so unplug all boards separately and check the voltage after you have unplugged one of the modules. If there is no short circuit the digital motherboard might be defective.

4.4.3 Troubleshooting: Firmware Does not Start

Check the instrument display for displayed information. In the following chapter typical problems are shown with the startup sequence. Carefully read the instructions below before starting an attempt to repair the instrument.

4.4.3.1 Normal Sequence for Starting the Instrument Firmware

Following switch-on, the R&S FSWP first boots the computer BIOS. After successful initialization of the computer, the Windows 7 operating system starts up. Subsequently, the measurement application is loaded as start-up program. Simultaneously, self tests are performed and error messages, if any, are output. For troubleshooting, it is advisable to connect a keyboard to one of the USB sockets.

Operating system start

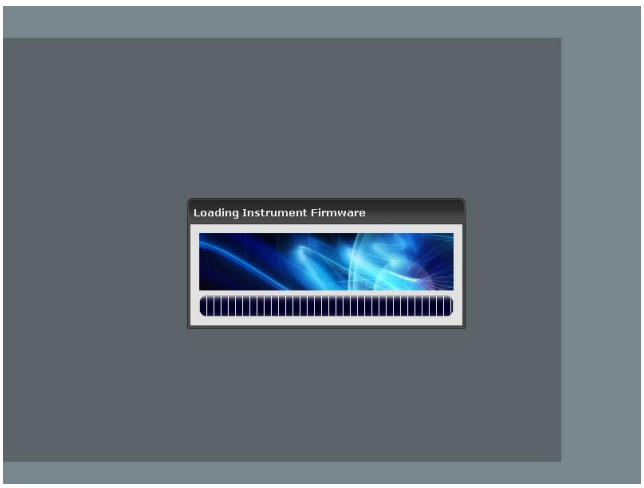
After these tests, the BIOS is loaded and the operating system is started.

If the message "No System Disk or Disk error..." is displayed at this point, the contents of the hard drive are not correct. Replace the hard drive.

If the operating system on the hard drive has been destroyed or cannot be loaded correctly, Windows 7 reacts by displaying a "blue screen". This blue screen contains all essential information on the internal states of the computer. Be sure to have properly installed the hard drive to the instrument. (see chapter Replacing SATA Hard Drive A91). If the hard drive is installed properly Windows 7 and the instrument firmware must be updated. Contact the R&S service to perform the update.

Application start

Subsequent to starting the operation system, the application for the R&S FSWP is loaded in a start-up program. The program start is initiated automatically and generates a window that displays information on the start-up procedure.



While starting the application the hardware information is read and the measurement hardware is initialized. After the startup phase the firmware is started completely and you see the measurement display.

4.4.3.2 Errors During Startup of the Instrument

Errors when Starting the BIOS:

Memory test is not finished or no memory is found or the recognized size of the memory does not match with the installed amount of memory:

Check system memory on the CPU Board.

The hard disk drive is not recognized by the BIOS

Check the hard disk drive, the CPU Board and the SATA ADAPTOR .

Errors when booting Windows:

- **A blue screen is displayed at startup**

  Check hard disk drive, CPU Board and SATA ADAPTOR .

Errors when booting the firmware:

- **The error message "ERROR: Can't open driver or driver did not detect the detector board!" or "Can't detect PCI Board!" or "Driver access error: check detector board and the driver" is displayed**

  With this error message displayed the firmware cannot be started!

  Check the detector board and the CPU Board for proper installation. The boards must be plugged in completely. If a failure of the CPU Board and the detector board is not applicable check the connectors on the digital motherboard. If there is no hardware defect prepare recover the windows installation and reinstall the firmware.

- **The error message "Detection of mandatory hardware component XX failed!" is displayed**

  This error message does not prevent the firmware from starting. However the instrument may not function properly after the firmware has come up.

  The board information of the corresponding board cannot be read. This error can have multiple reasons: the EPROM located on the corresponding board is defective; the information stored in the board EPROM is destroyed; if many of this messages occur at boot up there might be a problem with the serial bus. To check this remove the boards one after another and start up the firmware until the messages initially displayed disappear. Note: If you have removed a board then for this board also this message is displayed. Ignore this message and concentrate on the initially displayed message. You may not remove the detector board because it contains the host of the serial bus.

- **The error message “Init SERDES PCIE-FPGA - SA-FPGA failed” is displayed**

  With this error message displayed the firmware cannot be started!

  The communication link in the digital signal processing cannot be established. The reason for this error is probably a defective detector board.

- **The error message “Hardware error (PCIe FPGA-DCM not locked): Shutdown and restart device!” is displayed**

  With this error message displayed the firmware cannot be started!

  There is a problem with the reference clock of the detector board. Without this clock the detector board cannot work. Check the reference board (don’t forget to check the presence of the SMP bullet!). If the reference board is not the reason for the error check the detector board (check for presence of the SMP bullets!). If this board is not the reason for the error check the supply voltages as described in Part 2: Hardware Checks: Algorithm. If you have replaced the digital motherboard check the cabling on the motherboard.

- **The error message “Missing smartcard or smartcard not initialized!” is displayed**

  With this error message displayed the firmware cannot be started!

  The smart card located on the CPU Board cannot be recognized. This can be due to a missing or falsely installed smart card. Reinstall the smart card and start over the instrument. If the error persists the smart card may be defective or wrong initialized. Contact your Rohde & Schwarz service for a replacement.

- **The error message “Wrong or defective smartcard!” is displayed**

  This error message does not stop the booting of the firmware but the instrument may not function properly after the firmware has come up.

  The smart card located on the CPU Board cannot be read or the information stored on it is not correct. Contact your Rohde & Schwarz service for a replacement.

- **The error message “FAN is not running! …” is displayed**

  Shutdown the instrument and check the fans. One or both of the main fans are not rotating. This may be due to a blocked fan or due to a defect. At first identify the fan which is not rotating. Then have a look if it is blocked. If the rotor is not blocked check the supply voltage on the connector on the digital motherboard: X322 and X321 pins 1+ 2: rated value +11 V ±1V. If this is o.k. replace fan (refer to Replacing the Fans). If this is not o.k. check the fuse for the fans F6 (refer to Part 2: Hardware Checks: Detailed Description). If the fuse is o.k. replace the digital motherboard.

- **The error message: “This device needs the latest firmware version for correct operation. Do you want to update?**

  This error message is displayed when one or more boards are installed which needs a newer release of the firmware to function correctly. You can finish the start of the instrument firmware by selecting “NO” but the instrument function may fail in some parts and any attempt of self alignment will fail. In the lower left edge of the instrument screen “WRONG FW” is displayed.

  If you choose “YES” you will get to the instrument firmware update dialog. To update the firmware refer to the release notes of the corresponding firmware version.

4.4.4 Troubleshooting Errors on the Analog Hardware

4.4.4.1 Evaluating Selftest Results

The R&S FSWP has two selftest modes: The customer selftest and the factory selftest. For troubleshooting the R&S FSWP the factory selftest is recommended. The test limits are tighter and the error messages contain more details. To run the factory selftest switch into service mode by

[**SETUP** : Service : Service Function : Password = 894129]

and start it by

[**SETUP** : Service : Selftest : Start Selftest].

Error on “Spectrum Frontend Temperature [deg C]” (Option R&S FSWP-B1)

In case of under or over temperature the frontend module A100 shows a malfunction.

Error on “Spectrum Frontend Voltage [Volt]” (Option R&S FSWP-B1)

If there is an error on the supply voltages on the frontend board A100, this board is expected to be defective.

Hint: If supply voltages on more than one board are affected check the supply voltages and fuses on the digital motherboard.

If there is an error on the LO2 level, either the reference board or the frontend board may be defective. To exclude the reference board check the LO2 signal as described in Checking the LO2. When this error occurs and the signal level and the frequency of the LO2 signal are in range, then the frontend board is expected to be defective.

If there is an error on the supply current of the LO1 driver, this indicates that the frontend board is defective. If this error comes with an error on the supply voltages follow the instructions above.

If there is an error on the LO1 level on the frontend board either the LO1 level at the synthesizer board is out of range or the frontend board is defective. Follow “Checking the LO1” as described in 3.4.6.2 to find the reason for the error. If the LO1 signal is in range, then the frontend board is expected to be defective and needs to be replaced.

Error: RF detector on frontend out of range. Measured signal level too large.

With this test the plausibility of the RF detector on the frontend board is checked. The input attenuator is set to 70 dB and the RF level detector voltage is checked without input signal. When this test fails disconnect the RF-input cable on the frontend board at X101 and repeat the selftest. When this test point still fails, the frontend board is defective. Otherwise an error on the signal chain between the RF input connector and the frontend board is expected and it is recommended to perform the checks in Checking the RF Path from RF Input to the Frontend Board.

Error: Level at RF level detector on the frontend below limit.

For this test the internal calibration source feeds a signal into the frontend board and the RF level detector measures the received signal power on the frontend board. When this test fails check the signal fed into the RF input port of the frontend board at X101 as described in Checking the RF Path from RF Input to the Frontend Board. If the signal level and signal frequency are in range then the frontend board is expected to be defective.

Error on “PN Frontend Voltage [Volt]”

If there is an error on the supply voltages on the PN frontend board A110, this board is expected to be defective.

Hint: If supply voltages on more than one board are affected check the supply voltages and fuses on the digital motherboard.

Drain and Gate voltages are tested only if Option R&S FSWP-B60 and/or R&S FSWP-B64 is installed.

Error on “PN Frontend LO Level”

If there is an error on the LO level, check whether the synthesizer signals are cabled to the PN frontend board A110. If the signal level and signal frequency of the synthesizer(s) are in range then the PN frontend board is expected to be defective.

Error on “PN Digitizer”

If there is an error in the data transmission the PN digitizer A230 is expected to be defective. In rare cases the detector board A200 is defective.

Error on “Synthesizer1 Temperature [deg C]”

In case of under or over temperature the synthesizer 1 board A140 shows a malfunction.

Error on “Synthesizer1 Voltage [Volt]”

If there is an error on the supply voltages on the synthesizer 1 board A140, this board is expected to be defective.

Hint: If supply voltages on more than one board are affected check the supply voltages and fuses on the digital motherboard.

Check the LO1 as described in 3.4.6.2.

Error on “Synthesizer2 Temperature [deg C]” (Option R&S FSWP-B60, B61, B64)

In case of under or over temperature the synthesizer 2 board A180 shows a malfunction.

Error on “Synthesizer2 Voltage [Volt]” (Option R&S FSWP-B60, B61, B64)
If there is an error on the supply voltages on the synthesizer 2 board A180, this board is expected to be defective.

Hint: If supply voltages on more than one board are affected check the supply voltages and fuses on the digital motherboard.

Check the LO1 as described in 3.4.6.2.

Error on “Reference Board Supply Voltages [Volt]”

If there is an error on the supply voltages on the reference board A120, this board is expected to be defective.

Hint: If supply voltages on more than one board are affected check the supply voltages and fuses on the digital motherboard.

Error on “Reference Voltages [Volt]”

If there is an error, the reference board A120 is expected to be defective.

Error on “Reference Temperature 128MHz Crystal [deg C]”

In case of under or over temperature the reference board A120 shows a malfunction.

Error on “Reference 2 Board Supply Voltages [Volt]” (Option R&S FSWP-B60, B61, B64)

If there is an error on the supply voltages on the reference 2 board A150, this board is expected to be defective.

Hint: If supply voltages on more than one board are affected check the supply voltages and fuses on the digital motherboard.

Error on “Ch2 Reference 2 Temperature 128MHz Crystal [deg C]” (Option R&S FSWP-B60, B61, B64)

In case of under or over temperature the reference 2 board A150 shows a malfunction.

Error on “Microwaveconverter Voltages [Volt]” (only for FSWP26 / 50)

If there is an error on the supply voltages, either the microwave converter frontend board A161 or the microwave converter base board A170 is expected to be defective. Since all voltages but the temperature are detected on the microwave converter base board A170, this board has to be checked firstly.

In case of under or over temperature the microwave converter frontend board A161 shows a malfunction.

Error on “Motherboard Power Goods”

In case of an error, check the supply voltages and fuses on the digital motherboard A20.

Error on “Detector Board”

In case of an error, the detector boar A200 is expected to be defective.

Error on “DC Source”
In case of error in the supply, tune, and/or aux values either the EEPROM data of the PN frontend board A110 is incorrect or the PN frontend board is defective.

Check the DC sources as described in Checking the DC Sources.

4.4.4.2 Troubleshooting Baseband Inputs

Error: Missing baseband signal at channel 1 and/or channel 2

Switch the FSWP into the mode “Baseband”.

Connect a signal generator with a frequency of **fBB** = 15 MHz and a power level of **0 dBm** to the baseband inputs Ch1 and Ch2 of the FSWP.

Use a spectrum analyzer with start frequency 0 Hz and stop frequency 40 MHz with an RBW = 100 kHz for analyzing the baseband signals at f_{BB} = 15 MHz.

Check the output signal of the PN frontend board at X1113/X1114 for channel 1 and at X1117/X1118 for channel 2. If no signal is detectable check cabling W1109 at X1109 and W1110 at X1110 at the PN frontend board. If still no signal is present either cables are defect or PN frontend board A110 is defective.

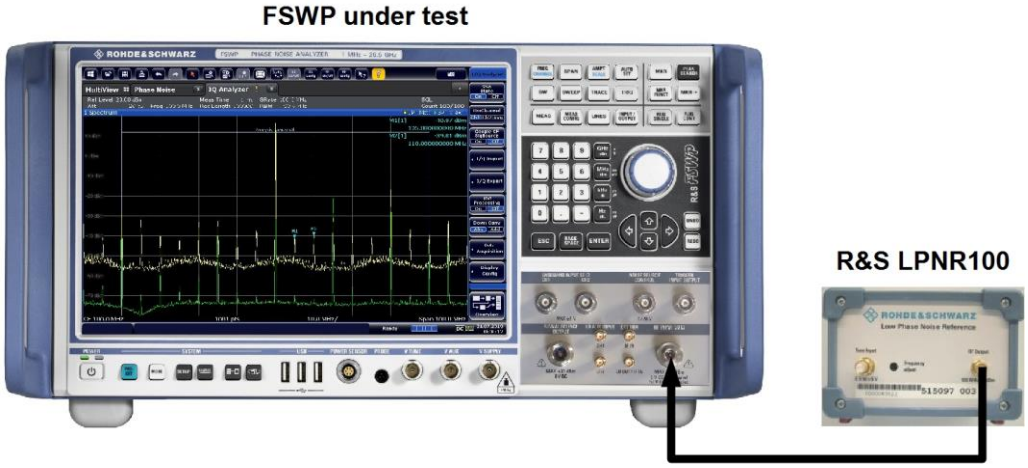
4.4.4.3 Checking PN-Digitizer Module

The following test checks the A/D conversion quality of the PN Digitizer module A230.

In case that the performance tests in Section 2.2.6 fail, the following check is recommended.

Test equipment: Low Phase Noise Reference R&S LPNR100 (see “Test Equipment”, item 23)
Signal frequency 100 MHz

Test Setup:



R&S FSWP settings:
- [PRESET]
- [SETUP : MORE : SERVICE : PASSWORD : 894129]
- [MODE IQ Analyzer]
- [SSA State : On]
- [HwChannel : <Ch1 | Ch2>]
- [SWEEP : SINGLE]
- [Sweep Count: 500]
- [Center Frequency: 100 MHz]
- [Display Config : Spectrum]
- [AMPT : Ref Level : 20 dBm]
- [Data Acquisition : Sample Rate : 100 MHz]
- [Data Acquisition : Analysis Bandwidth : 80 MHz]
- [Data Acquisition : Meas Time : 1 ms]
- [Data Acquisition : Record length : 100000]
- [Trace 1 : Mode : Max Hold]

Measurement:
- ➢ Start the Measurement (Run Single) of the R&S FSWP
- ➢ Read out Marker 1 @ 102 MHz in HwChannel Ch1
- ➢ Read out Marker 1 @ 102 MHz in HwChannel Ch2

Testlimits:

Marker 1	*Test Limit good*
HwChannel Ch1	≤ −65 dBm
HwChannel Ch2	≤ −65 dBm

In case that the test limit is violated, the FSWP PN-Digitizer must be replaced by a new module.

After replacement, please repeat this test.

Screenshot of test result after RUN SINGLE:

4.4.4.4 Troubleshooting RF Signal Paths for Phase Noise Measurements

Switch the R&S FSWP into the mode "*Phase Noise*" with "RUN CONT".

Connect a **signal generator** with a frequency of **frf** (see table below) and a power level of **0 dBm** to the RF input of the R&S FSWP.

Activate the IQ-Analyzer for phase noise measurements (PN digitizer) by entering the service password

System Setup → Service+Support → Service Function → Password 894129

Switch the FSWP into the mode "*IQ Analyzer*".

Meas Config → Signal Source State On → Signal Source HwChannel Ch1/Ch2

Meas Config → Display Config → Spectrum

Ampt → Ref Level +10 dBm

Ampt → RF Atten Manual 0 dB

BW → Data Aquisition → Analysis bandwidth (ABW) 80 MHz

Make sure that the center frequency of the IQ analyzer is always the same as the RF input frequency f_{rf} of the signal generator:

Freq → Center Frequency < frf >

The following screenshots show the spectrum in the IQ analyzer for an R&S FSWP in good working condition. Switch between channel 1 and channel 2 of the IQ analyzer in order to check **both** channels:

Meas Config → Signal Source State On → Signal Source HwChannel Ch1↔Ch2

The first screenshot shows the IF signals in the direct path ($f_{rf} \leq 40$ MHz) – real signal. The second screenshot shows the IF signals in the mixer path ($f_{rf} > 40$ MHz) – complex signal.

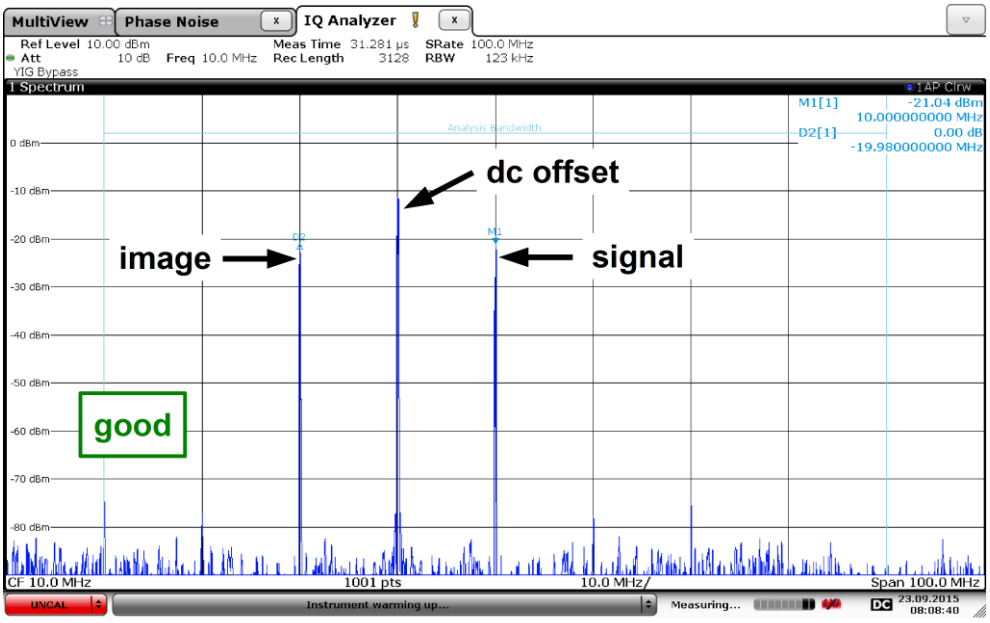
Table: Test frequencies and expected measurement values.

RF input signal f_{rf}	**signal power Ch1 – signal power Ch2** $\Delta CH = \lvert P_{signal,Ch1} - P_{signal,Ch2} \rvert$	**image rejection (each channel)** $IMR = P_{signal} - P_{image}$	**→ see screenshot**
10 MHz	< 2 dB	> 10 dB	1
100 MHz	< 2 dB	> 10 dB	2
1 GHz	< 2 dB	> 10 dB	2
2 GHz	< 2 dB	> 10 dB	2
5 GHz	< 2 dB	> 10 dB	2
*10 GHz	< 2 dB	> 10 dB	2
*20 GHz	< 2 dB	> 10 dB	2
**40 GHz	< 2 dB	> 10 dB	2

*additional frequencies for R&S FSWP26

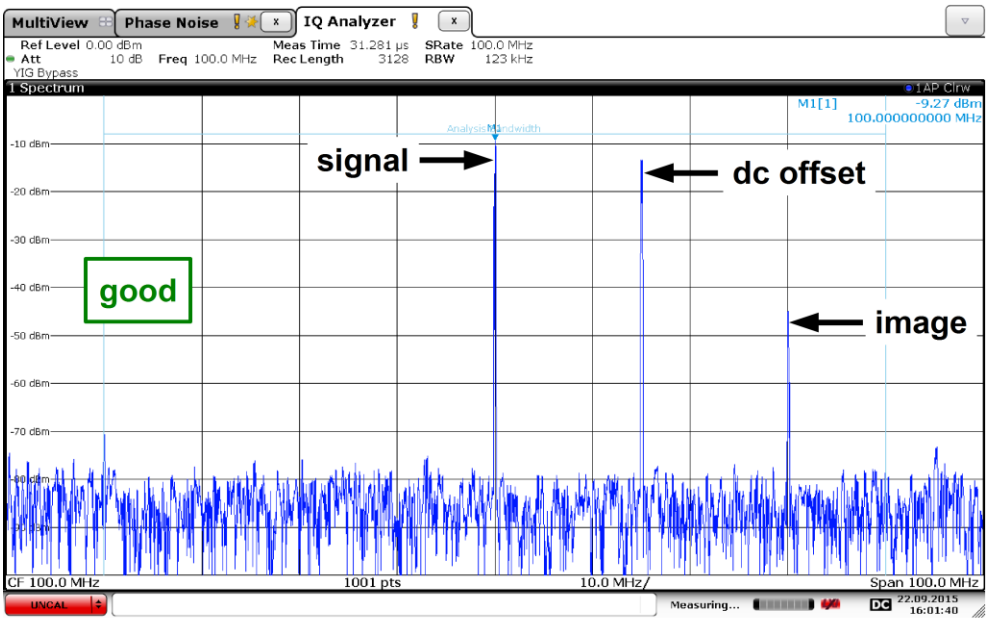
**additional frequency for R&S FSWP50

The value ΔCH is obtained by measuring the signal power in channel 1, then switching to channel 2, and measuring the signal power in channel 2. The magnitude of the difference should be smaller than 2 dB.
The value IMR is obtained for each channel by subtracting the image power from the signal power of the same channel. This measurement has to be performed for each channel.



Date: 23.SEP.2015 08:08:40

Screenshot 1: IQ analyzer signals in direct path ($f_{rf} \leq 40$ MHz) – real signal.



Date: 22.SEP.2015 16:01:40

Screenshot 2: IQ analyzer signals in mixer path ($f_{rf} > 40$ MHz) – complex signal.

Error: Noisy IF signal at any RF input frequency

In case the noise in the IQ analyzer is significantly high and/or pumping and the signal is not detectable, the LO signal on the corresponding channel is missing. See screenshot 3 for RF input frequencies ≤ 8GHz, and see screenshot 4 for RF input frequencies >8 GHz.

In order to identify whether the synthesizer signal LO1 is missing check the LO1 as described in 3.4.6.2. Check synthesizer A140 and synthesizer A180 (Option FSWP-B60/64).

- For RF input signals ≤8GHz:

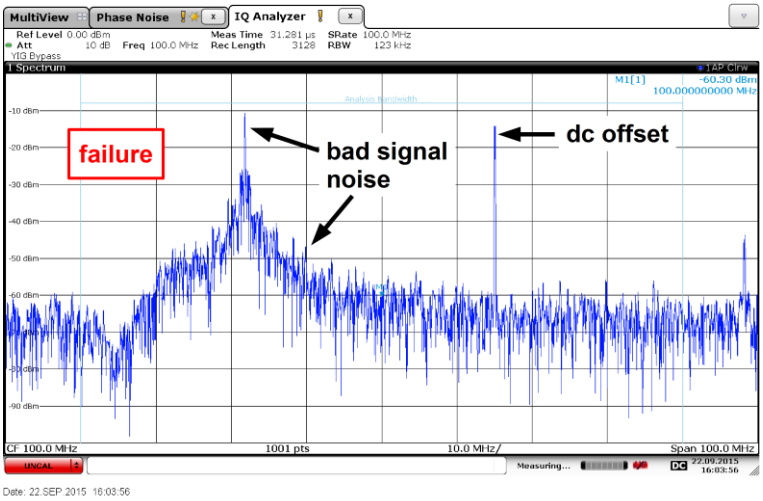
  In case the LO1 signal is present the PN frontend board is defective.

- For RF input signals >8 GHz (only R&S FSWP26):

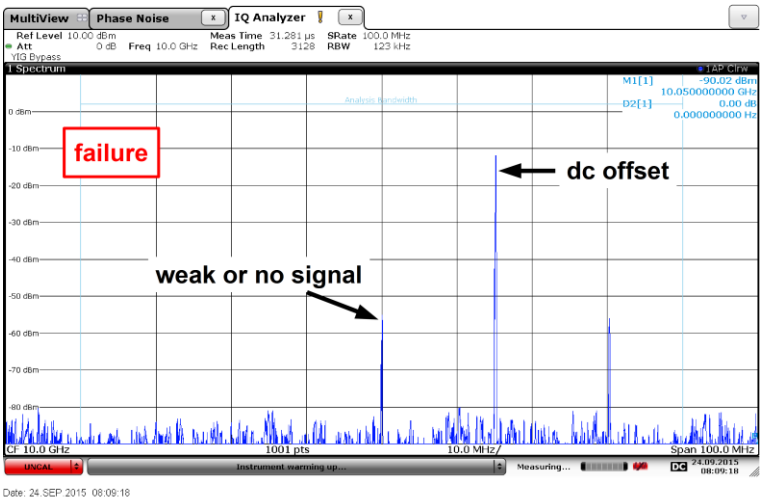
  In case the LO1 signal is present check the LO signal level at connectors X1102 and X1107 of the PN frontend board A110. These signals provide the LO signals for the microwave converter frontend. In case the LO signals at X1102 and/or X1107 are absent (power < −5 dBm) the PN frontend board is defective.

  If the LO signals are present check cabling W1102 to X1607 and cabling W1107 to X1606 of the microwave converter frontend A161.

  When the cabling is ok the microwave converter frontend is defective.



Screenshot 3: IQ analyzer signals with missing LO for RF input signals ≤ **8GHz**.



Screenshot 4: IQ analyzer signals with missing LO for RF input signals **> 8GHz (MWC)**.

Error: IF signal and IF image show same amplitude for f_{rf} > 40 MHz

When signal and image have the same amplitude at any RF input frequency f_{rf} > 40 MHz either the I-signal or the Q-signal in the corresponding channel is missing.

For all FSWP models: Check whether all SMP-cables between PN frontend board A110 and PN digitizer A230 are correctly connected.

For FSWP26 model: Check whether all SMP-cables between MWC frontend board A161 and PN frontend board A110 are correctly connected.

In case of correctly connected cables check the output signal of the PN frontend board at X1113/X1114 for channel 1 and at X1117/X1118 for channel 2.

Use a spectrum analyzer with start frequency 0 Hz and stop frequency 40 MHz with an RBW = 100 kHz for analyzing the IF signals at f_{IF} = 15 MHz.

- Failure for RF input signals ≤8GHz:

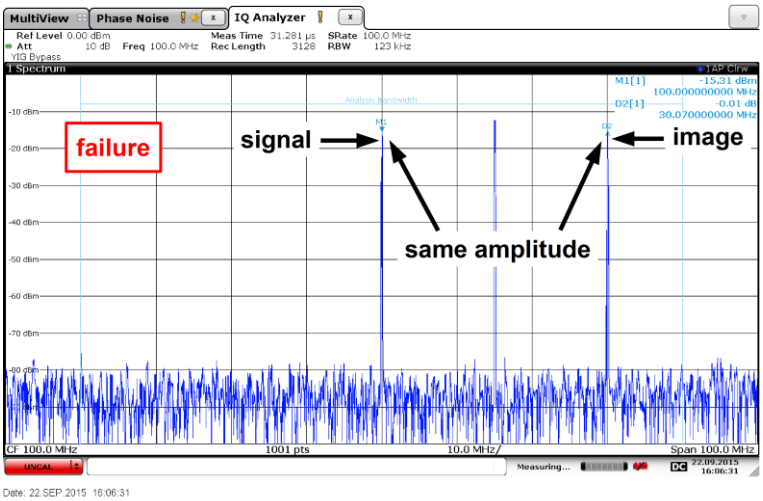
  In case the I-signal (X1113) ***or*** the Q-signal (X1114) of channel 1 and/or the I-signal (X1117) ***or*** the Q-signal (X1118) of channel 2 is missing the PN frontend board is defective. In case all signals are ok, the cabling is defective.

- Failure only for RF input signals >8 GHz (FSWP26) but good for ≤8 GHz:

  In case the I-signal (X1113) ***or*** the Q-signal (X1114) of channel 1 and/or the I-signal (X1117) ***or*** the Q-signal (X1118) of channel 2 is missing check the output IF-signals at X1608, X1609, X1610, and X1611.

RF input frequency	**level @ X1608 @ 15 MHz**	**level @ X1609 @ 15 MHz**	**|PX1608 – PX1609|**	**level @ X1610 @ 15 MHz**	**level @ X1611 @ 15 MHz**	**|PX1610 – PX1611|**
10 GHz	> −25 dBm	> −25 dBm	< 2 dB	> −25 dBm	> −25 dBm	< 2 dB
20 GHz	> −30 dBm	> −30 dBm	< 2 dB	> −30 dBm	> −30 dBm	< 2 dB

In case the I-signal (X1610) ***or*** the Q-signal (X1611) of channel 1 and/or the I-signal (X1608) ***or*** the Q-signal (X1609) of channel 2 is missing the microwave frontend board A161 is defective. In case all signals are ok, the cabling is defective.

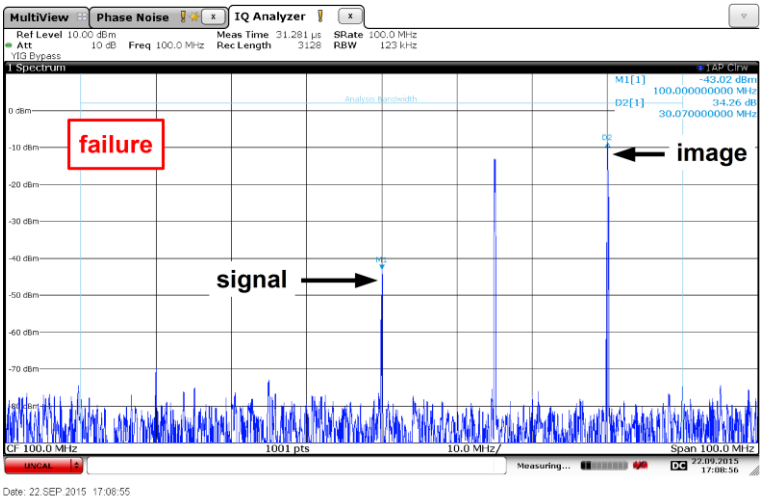


Screenshot 4: IQ analyzer signals with same amplitude.

Error: IF image level is higher than IF signal level for f_{rf} > 40 MHz

For all R&S FSWP *models*: When the image level is higher than the signal level check whether the cabling at X1113, X11114, X1117, and X1118 of the PN frontend board A110 is in correct order.

For R&S FSWP*26 model*: Additionally check whether the cabling at X1111, X1112, X1115, and X1116 of the PN frontend board A110 and the cabling at X1608, X1609, X1610, and X1611 of the MWC frontend A161 is in correct order.



Screenshot 5: IQ analyzer signals with low signal level and high image level.

Error: No IF signal at all or very weak IF signal

When there is no signal at all at any RF input frequency check the RF input signal at the input of the PN frontend board A110 for RF input frequencies ≤ 8 GHz and (FSWP26/50) at the input of the microwave converter frontend board A161 for RF input frequencies > 8 GHz:

- For R&S FSWP8 models **without** Option R&S FSWP-B1:

  Disconnect the RF cable at X1100 and check the RF signal power at the output of the disconnected cable. If there is no signal check the RF cable.

- For all other R&S FSWP models $f_{rf} \leq 8$ GHz:

  Disconnect the RF cable at X1101 and check the RF signal power at the output of the disconnected cable. If there is no signal check the RF cable and the RF attenuator A60 and relay A580 (R&S FSWP26/50).

- For all other R&S FSWP models **frf > 8 GHz**:

  Disconnect the RF cable at X1601 **ATTENTION: X1601 is a 2.4 mm connector – use an adapter if necessary!** and check the RF signal power at the output of the disconnected cable. If there is no signal check the RF cable and the RF attenuator A60 and relay A580 (R&S FSWP26/50) and triplexer A340 (R&S FSWP-B1).

RF input frequency	level @ X1100/1	level @ X1601
10 MHz	(0.0 ± 1) dBm	-
100 MHz	(−0.5 ± 1) dBm	-
1 GHz	(−1.0 ± 1) dBm	-
2 GHz	(−1.5 ± 1) dBm	-
5 GHz	(−2.5 ± 1) dBm	-
***10 GHz**	-	(−8 ± 2) dBm
***20 GHz**	-	(−12 ± 2) dBm
****40 GHz**	-	(−17 ± 3) dBm

***additional frequencies for FSWP26
**addtional frequency for FSWP50

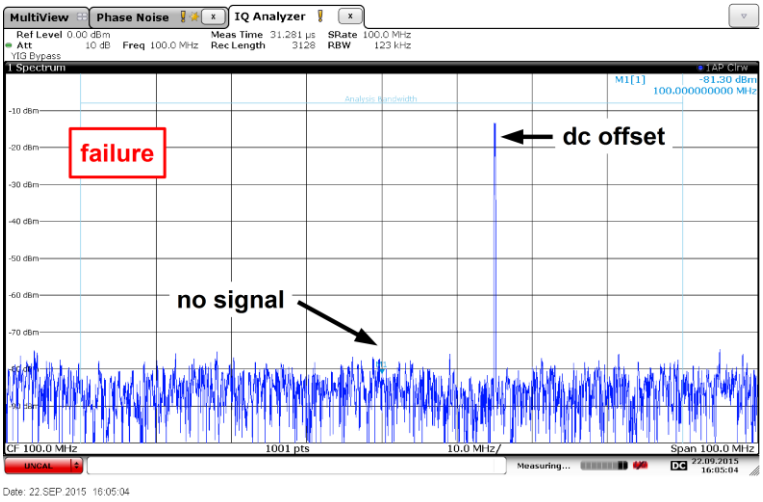
If the RF signal is present re-connect the cable and check the LO1 signal for synthesizer A140 and optional synthesizer A180 (Option R&S FSWP-B60/61/64) at connectors X142 as described in 3.4.6.2. If the LO1 signal is good re-connect the cable at X142.

Check whether all SMP-cables between PN frontend board A110 and PN digitizer A230 are correctly connected.

In case of correctly connected cables check the output signal of the PN frontend board at X1113/X1114 for channel 1 and at X1117/X1118 for channel 2.

Use a spectrum analyzer with start frequency 0 Hz and stop frequency 40 MHz with an RBW = 100 kHz for analyzing the IF signals.

If no IF signal is present at the connectors X1113/X1114 and X1117/X1118 the PN frontend board is defective.



Screenshot 6: IQ analyzer spectrum with missing IF signals.

4.4.4.5 Troubleshooting Signal Source (only Option R&S FSWP-B64)

Switch the R&S FSWP into the mode “Phase Noise”.

Meas → Additive Noise

Source Config → Level 0 dBm

Source Config → Frequency <fsigsource>

Source Config → Source Power On

Connect the Signal Source output to a spectrum analyzer with center frequency $f_{sigsource}$, span = 10 MHz an RBW = 100 kHz for analyzing the IF signals at $f_{sigsource}$. Check output frequency and output level according to the following table:

output frequency $f_{sigsource}$	**output level** $P_{sigsource}$
10 MHz	(0 ± 1) dBm
100 MHz	(0 ± 1) dBm
500 MHz	(0 ± 1) dBm
1 GHz	(0 ± 1) dBm
2 GHz	(0 ± 1) dBm
8 GHz	(0 ± 1) dBm
10 GHz	(0 ± 2) dBm
16 GHz	(0 ± 2) dBm

Error: No output signal at any frequency

When no output signal is measured check the output signal at X1106 of the PN frontend board A110. If there is no output signal at X1106 run the “**selftest**” and check the results described in Evaluating Self test Results under **“PN Frontend Voltage [Volt]”**. If drain and gate voltage are failed the PN frontend board is defective. If drain and gate voltage are passed check the cabling between synthesizer 2 board A180 and PN frontend board A110. Check LO1 signal at the output of synthesizer 2 board. If the LO1 signal is ok and cabling is correct and there is still no output signal at X1106 of the PN frontend board, it is defective.

If there is the correct output signal at X1106 check the cabling between PN frontend board, RF attenuator A570 and the front N-connector.

4.4.4.6 Troubleshooting RF Signal Paths for Spectrum Analysis (only Option R&S FSWP-B1 and R&S FSWP-B24)

Switch the R&S FSWP into the mode “*Spectrum*”.

Error: Input signals cannot be measured at any frequency

When input signals cannot be measured at any frequency, the checks described in this section should be carried out. When at least one of the signal path is functional follow the instructions below for failures at specific frequencies.

To check the signal paths on an R&S FSWP8 connect 10 MHz, 500 MHz and 2 GHz to the R&S FSWP and measure it with a span = 1 MHz and a resolution bandwidth = 10 kHz. On an R&S FSWP with a higher frequency range check e.g. 9 GHz and above additionally.

The frequency response of the R&S FSWP is aligned by the R&S FSW service tool (see Adjustment). When the frequency response correction is not successful perform the following steps:

1. Perform a selftest; if it fails follow the instructions in Evaluating Self test Results.
2. Execute a self alignment by

   [**SETUP** : Alignment : Start Self Alignment].

   When the self alignment passes then a defect RF input connector is expected (compare Checking the RF Path).
3. Check the intermediate frequency (IF3) fed into the detector board as described in Checking the IF Signal Path.

   If this test passes, the detector board is expected to be defective.

   When this check fails for any frequency the local oscillator signals generated in the reference board and in the synthesizer board don’t need to be checked. In the direct path (f < 40 MHz) the local oscillator signals are not used. For R&S FSWP26 / 50 check the triplexer on the microwave converter frontend unit.

   Note: The reference clock frequencies for the detector board are generated in the reference board.

Error: Input signals cannot be measured at specific frequencies

When frequencies at a specific range cannot be measured, the corresponding signal path may be defective. In this case follow the instructions depending on the type of error:

- **Error on frequencies below 40 MHz only**

  In this case the frontend board or the triplexer for R&S FSWP26 / 50 is defective. As higher frequencies can be measured an error on the detector board can be excluded. The LO frequencies from the synthesizer board and the reference board are not used for this signal path.

Note: Depending on frequency span and bandwidth the direct path might not be turned on by the firmware. To test the direct path apply a signal at e.g. 10 MHz and measure it with a span of 1 MHz and a resolution bandwidth = 10 kHz.

To check the diplexer/triplexer in an R&S FSWP containing a microwave converter follow the instructions in Checking the DC Input Resistance and Checking the RF Path from RF Input to the Frontend Board.

- **Error on frequencies > 40 MHz and < 8 GHz**

  If the R&S FSWP works in the direct path or for frequencies above 8 GHz then the detector board is functional. To localize the error perform the following checks:

  a) Perform a selftest; if it fails follow the instructions in Evaluating Self test Results.
  The power level of the first and the second local oscillator are checked on the frontend board by the selftest. The third local oscillator (LO3) needs to be checked manually.
  The LO3 signal is used in the frontend board for the RF path and for the microwave signal path. When the frequency range > 8 GHz is installed and is functional then the LO3 signal doesn't need to be checked.
  Otherwise the LO3 signal should be checked as described in Checking the LO3. When the third local oscillator signal is out of range, the reference board is defective.

  b) The selftest procedure switches a broadband comb signal in the attenuator to the RF detector in the frontend board. When this test passes, the signal path for the calibration signal is OK. To make sure that there is an error on the RF input connector run the self alignment by
  [**SETUP** : Alignment : Start Self Alignment].
  If the self alignment passes, the RF input connector needs to be checked (see Checking the RF Path from RF Input to the Frontend Board).

  c) Otherwise check the local oscillator signals manually described in 3.4.5.

- **Error on frequencies > 8 GHz**

  The troubleshooting procedure described here is applicable for R&S FSWP with a frequency range above 8 GHz only.

  a) The first step is to exclude an error on the YIG filter on the microwave converter frontend unit. By
  [**INPUT / OUTPUT** : YIG OFF]
  the YIG filter bypass path is activated. If input signals can be measured with this setting perform a YIG filter adjustment with the frequency response correction tool (see Adjustment). If the R&S FSWP is not functional after the YIG filter adjustment the YIG filter should be changed.

  b) Check the IF signal as described in Checking the IF Signal Path.

4.4.5 Troubleshooting Performance Test

For a successful performance test follow the instructions in chapter 1. The internal self-alignment is started by

[**SETUP** : Alignment : Start Self Alignment]

and is mandatory for all tests.

4.4.5.1 Troubleshooting Checking the PN-Digitizer

In case that the Phase Noise Performance of the R&S FSWP is poor, one or more of the following modules can be faulty: Reference (LN) board, Reference 2 board (Option B60, B61), Low Phase Noise Board, and/or PN-Digitizer Board. In order to check the performance of the PN-Digitizer, apply the procedure described in Section 4.4.4.3.

In case that the installed PN-Digitizer fails the test, it must be replaced by a new PN-Digitizer board as described in Section 4.3.14.

4.4.5.2 Troubleshooting Checking the Reference Frequency Accuracy

When the reference frequency accuracy is out of range:

1. Repeat the reference frequency adjustment described in 2.2.2 Adjustment Sequence or by using the adjustment tool described in Adjustment Tool.
2. When the error still exists then remove the option R&S FSWP-B4 if installed, repeat the frequency adjustment and carry out the test without the option.
3. If the error is not caused by the option R&S FSWP-B4 then most probable the reference board needs to be changed.

4.4.5.3 Troubleshooting Checking Immunity to Interference

2nd IF Image Frequency Rejection

Depending on the signal path causing the insufficient image rejection the defective board can be identified:

For f_{in} < 8 GHz a problem on the frontend board A100 is expected and changing the frontend board is recommended.

3rd IF Image Frequency Rejection

When the 3rd IF image rejection is not sufficient then a problem on the frontend board A100 is expected. Thus it is recommended to change this board.

1st IF Rejection

When the 1st IF rejection is not sufficient then a problem on the frontend board A100 is expected. Thus it is recommended to change this board.

2nd IF Rejection

This error may be caused by the following reason:

For f_{in} < 8 GHz a problem on the frontend board A100 is expected and changing the frontend board is recommended.

3rd IF Rejection

When the 3rd IF rejection is not sufficient then a problem on the frontend board A100 is expected. Thus it is recommended to change this board.

4.4.5.4 Troubleshooting Checking Nonlinearities

Third-Order Intercept Point

Note: The results of this test depend on the level accuracy of the R&S FSWP. When there is an error on the test 1.3.6 Checking the Level uncertainty and the Frequency Response then the third order intercept point cannot be measured accurately.

Note: When an error in the third-order intercept point appears together with an error in the noise display then follow the steps described in Troubleshooting Checking Noise Display first.

Depending on the error frequency the following checks should be done:

1. For an error below 8 GHz
   a) Check the IF3 signal at the frontend board output as described in Checking the IF Signal Path for the frequency of interest.
   b) Check the level of the LO-signals fed into the frontend board as described in 3.4.6.2, Checking the LO2 and in Checking the LO3.
   c) When these checks do not indicate any other failure then it is recommended to change the frontend board.

   Note: On an R&S FSWP comprising a microwave converter the third order intercept point could be caused also by a damaged triplexer A340 for R&S FSWP26. When changing the triplexer for R&S FSWP26 does not solve the problem repeat the test for f_{in} below 8 GHz by feeding the input signal directly to X1601 on the microwave converter frontend board A161 to verify if the error is caused in the signal path between the RF input connector and the microwave converter frontend board.
2. For an error above 8 GHz
   a) Check the LO1 signal fed into the microwave converter frontend as described in 3.4.6.2.
   b) When the LO1 signal is in range it is recommended to change the microwave converter frontend.

Second-Order Harmonic Distortion

The second-order harmonic distortion of the R&S FSWP can only be measured when the input signal is clean enough. When an error exists the input signal should be verified by:

1. Setup the test as described in 1.3.6 Checking the Level uncertainty and the Frequency Response.
2. Change the input attenuation of the R&S FSWP to 10 dB by
   [AMPT : RF Atten Manual : 10 dB].
3. Repeat the measurement. With this setting the recommended harmonic suppression must be reached. If the level of the second-order harmonic is too high a lowpass filter needs to be added.

When the error occurs for 2 x fin below 8 GHz either the frontend board or the triplexer for R&S FSWP26 is defective. For an error at 2 x fin > 8 GHz the microwave converter frontend is defective.

4.4.5.5 Troubleshooting Checking IF Filters

The IF filters on the R&S FSWP- are realized by digital filters. When an error exists repeat the self-alignment by

[**SETUP** : Alignment : Start Self Alignment]

and check the result.

4.4.5.6 Troubleshooting Checking Spurious Response

Spurious responses exceeding the limits may have different reasons. The following steps may help for troubleshooting:

1. Make sure that the upper and lower cover and the inner lid are mounted correctly (see 3.2.3 Disassembling the Instrument).
2. Check whether all RF cable connectors within the R&S FSWP are tightened correctly.
3. Check the RF-input connector and the 50 Ohm resistor connected. If necessary clean the connectors carefully.
4. Make sure that no electronic devices around the R&S FSWP under test inject the spurious signal.

4.4.5.7 Troubleshooting Checking Noise Display

Note: The results of this test depend on the level accuracy of the R&S FSWP. When there is an error on the test 1.3.6 Checking the Level uncertainty and the Frequency Response then the noise display cannot be measured accurately.

Depending on the error frequency follow the instructions below:

1. For an error below 8 GHz

   a) Check the IF3 signal at the frontend board output as described in Checking the IF Signal Path for the frequency of interest.
   b) Check the level of the level of the LO-signals fed into the frontend board as described in Checking the LO1, Checking the LO2 and in Checking the LO3.
   c) When these checks do not indicate any other failure then it is recommended to change the frontend board.

   Note: A failure in the performance test of the displayed average noise level can also be caused by an increased attenuation between the RF input connector and the frontend board. When changing the frontend board does not solve the problem measure the insertion loss of the following components at the frequency of interest with the instrument settings describe of the performance test

   – Attenuator A60 with
   maximum insertion loss: 1 dB for f < 3 GHz, 1.5 dB for f < 8 GHz

   – Preamplifier B24
   maximum insertion loss: 1 dB for f < 8 GHz

2. For an error above 8 GHz

   Note: When the error occurs with the activated YIG-filter only, perform a YIG filter alignment by the R&S FSWP service tool (see Adjustment) and a self-alignment. If this doesn't solve the problem, the YIG filter may be the reason for the error.

   a) Check the LO1 signal fed into the microwave converter frontend as described in Checking the LO1.
   b) When the LO1 signal is in range it is recommended to change the microwave converter frontend.

4.4.5.8 Troubleshooting Checking the Level accuracy and the Frequency Response

Absolute Level accuracy

When the level accuracy at 64 MHz is out of range perform a frequency response correction by means of the R&S FSW service tool (see Adjustment).

Frequency Response

When the frequency response is out of range also a frequency response correction with the R&S FSW service tool (see Adjustment) may be helpful.

When there problem still remains the troubleshooting steps described in may help to identify the reason for the error.

4.4.5.9 Troubleshooting Checking the Display Nonlinearity

When the check “display nonlinearity” is out of specification verify the step attenuator (see chapter 2.1, item 9) used.

When the step attenuator is functional then change the detector board A200.

4.4.5.10 Troubleshooting Checking the RF Attenuator Accuracy

When an error in the RF attenuator accuracy appears together with an error in the return loss at the RF input follow the steps described in Troubleshooting Checking the Return Loss at the RF Input.

The exact attenuation of the RF attenuator is corrected by the R&S FSW service tool. Thus executing a frequency response correction may be helpful.

Otherwise check the accuracy of the step attenuator (see 2.1, item 9) used.

When these measures do not solve the problem, the RF attenuator needs to be changed.

4.4.5.11 Troubleshooting Checking the Phase Noise of Option B1

The phase noise can only be measured accurately when the performance test of the level accuracy, and of the noise display do not show any failure.

Note: Follow the instructions described in 2.3.9 Checking the Phase Noise carefully.

An insufficient phase noise performance may be caused either by the synthesizer board or the reference board. An error in the detector board could also cause a bad phase noise performance; however it is quite unlikely.

When the error occurs on offset frequencies

below 1 kHz: most probable the reference board causes the error.

from 1 kHz up to 100 kHz: most probable the synthesizer board causes the error.

above 1 MHz: most probable the frontend board causes the error.

4.4.5.12 Troubleshooting Checking the Return Loss at the RF Input

When the return loss of the R&S FSWP is below the specification consider the following cases:

1. The return loss is too low at any attenuator setting:

   An error on the RF input connector X1 or on the mechanical attenuator A60 is expected.

2. The return loss is too low for a R&S FSWP ≤ 10 dB only:

   Disconnect the cable at the attenuator output and connect a 50 Ohm termination (chapter "3.4.1 Measuring Equipment and Accessories", item 5) instead. Repeat the measurement.

   If the return loss shows valid results with this resistor the faulty device is behind the attenuator. Repeat this check by connecting the 50 Ohm termination on the output of the preamplifier (R&S FSWP-B24) and on the output of the microwave converter frontend (X167) if these modules are available.

   Note: On an R&S FSWP with a microwave converter frontend installed, the input signal is fed into the frontend board at X112 when the instrument is set a frequency below 40 MHz.

3. The return loss is too low for higher attenuations only:

   In this case a defect on the attenuator is expected.

4.4.6 Troubleshooting Tests

This chapter describes the tests required for troubleshooting the analog hardware of an R&S FSWP.

4.4.6.1 Checking the DC Sources

Test equipment:
- DC multimeter (voltage -10 V ... +28 V, current 0 ... 2 A)

Test setup:
► Connect the DC multimeter (voltage) on X301 for Vsupply, on X302 for Vaux, and on X303 for Vtune, all on the front panel. Check the voltage.

R&S FSWP settings:
- *Meas Config* → *DC Source Config* → *Signal Frequency* **1 GHz**
- *DC Power* **On**
- *State Vsupply* **On**
- *State Vaux* **On**
- *State Vtune* **On**
- Enter value for voltages as defined below in the table.

Evaluation

Check all three voltages according to the following table.

Vsupply		***Vaux***		***Vtune***	
defined value	*expected value*	***defined value***	*expected value*	***defined value***	*expected value*
0 V	(0 ± 0.05) V	**−10 V**	(−10 ± 0.05) V	**−10 V**	(−10 ± 0.05) V
8 V	(8 ± 0.05) V	**0 V**	(0 ± 0.05) V	**0 V**	(0 ± 0.05) V
16 V	(16 ± 0.05) V	**+10 V**	(+10 ± 0.05) V	**+28 V**	(+28 ± 0.05) V

a) No voltage level at all

→ Check whether flat ribbon cable W1120 between PN frontend board A110 and Frontconnector board A30 is connected.

b) Voltage levels exceed tolerances

→ Perform a DC source alignment using the "***Frequency Alignment Tool***". The "Frequency Alignment Tool" guides step by step the DC source alignment procedure. If one or more voltage values cannot be reached the PN frontend board is expected to be defective.

4.4.6.2 Checking the LO1

Test equipment: Spectrum analyzer (chapter "3.4.1 Measuring Equipment and Accessories", item 1):

- center frequency: 14.72 GHz
- frequency span: 100 MHz
- reference level: +20 dBm
- resolution bandwidth: auto

Signal generator (chapter "3.4.1 Measuring Equipment and Accessories", item 2):

- power level: +10 dBm
- RF signal frequency: 100 MHz

Test setup:

► Disconnect the RF cable on X141 on the synthesizer board A140 and check the signal with a spectrum analyzer.

► When there is an error in the frequency range above 8 GHz repeat the check on the LO1 signal for the microwave path on X142 on the synthesizer board.

R&S FSWP settings:

- *Mode* → *IQ Analyzer*
- *Freq* → *Center* **100 MHz**

Evaluation

Check frequency and level of the signal on the spectrum analyzer.

Expected frequency: 14.72 GHz ± 30 MHz

Expected signal level: > +8 dBm

a) Signal level is out of range

→ The synthesizer board is expected to be defective.

b) Signal frequency is out of range

→ Check the LO3 signal at 1280 MHz as described in Checking the LO3. If the LO3 signal is within the limits, the synthesizer board is expected to be defective.

Note: The exact LO frequency depends on the actual IF frequency of the R&S FSWP. Therefore with the settings above a deviation of ± 30 MHz is possible. The measured signal must be a CW signal without modulation.

4.4.6.3 Checking the LO2

Test equipment: Spectrum analyzer (chapter "3.4.1 Measuring Equipment and Accessories", item 2):

- center frequency: 7680 MHz
- frequency span: 1 MHz
- reference level: +20 dBm
- resolution bandwidth: 100 kHz

Test setup: ► Disconnect the RF cable on X108 on the frontend board and check the signal fed in by the reference board with a spectrum analyzer.

R&S FSWP settings:
- *Preset*

Evaluation: Check frequency and level of the signal on the spectrum analyzer.

Expected frequency range: 7680 MHz ± 100 Hz

Expected signal level: > +8 dBm

► Signal level is too low

In this case the reference board is defective.

► Signal frequency is out of range

If the option B4 is installed remove it from the instrument and check the LO2 signal without the option R&S FSWP-B4.

When the measured frequency is still out of range while the option R&S FSWP-B4 is not installed, the reference board is defective.

Note: The frequency accuracy depends on the reference frequency accuracy of the DUT and the spectrum analyzer. When the references of the R&S FSWP and the test equipment are connected, the frequency should be exactly 7680 MHz.

The LO2 signal is not used in the microwave signal path.

4.4.6.4 Checking the LO3

Test equipment: Spectrum analyzer (chapter 3.4.1 Measuring Equipment and Accessories", item 2):
- center frequency: 1280 MHz
- frequency span: 1 MHz
- reference level: +20 dBm
- resolution bandwidth 100 kHz

Test setup:
- ► Disconnect the RF cable on X106 on the frontend board and check the signal fed in by the reference board with a spectrum analyzer.
- ► When a failure on the synthesizer board exists then measure the signal fed into X143. Here, the LO3 signal is used as a reference signal.

R&S FSWP settings:
- *Preset*

Evaluation: Check frequency and level of the signal on the spectrum analyzer.

Expected frequency range: 1280 MHz ± 100 Hz

Expected signal level: +7 dBm .. 11 dBm

- ► Signal level is too low

  In this case the reference board is defective.

- ► Signal frequency is out of range

  If installed, check the reference frequency output of the option R&S FSWP B4. If the reference frequency is in range, the reference board is defective.

Note: The frequency accuracy depends on the reference frequency accuracy of the DUT and the spectrum analyzer. When the references of the R&S FSWP and the test equipment are connected, the frequency should be exactly 1280 MHz.

The synthesizer board uses the LO3 signal as a reference.

4.4.6.5 Checking the DC Input Resistance

Input signals exceeding the R&S FSWP maximum input power of the R&S FSWP may destroy the triplexer for R&S FSWP26 or the input section on the frontend board.

When signals below 8 GHz cannot be measured perform the following test:

Test equipment: Multimeter (chapter 3.4.1 Measuring Equipment and Accessories", item 15):

Test setup:
- ► Connect an RF cable on the RF input of the R&S FSWP and check the DC input resistance R_{IN} with the multimeter.
- ► **Note:** Use the RF-cable for measuring the resistance in order to protect the RF input connector.

R&S FSWP settings:
- [PRESET]
- [AMP : RF Atten Manual : 0 dB]
- [FREQ : CENTER : f_{IN}] (f_{IN} see below
- [FREQ : SPAN : 0 Hz]
- [BW : Res BW manual: 10 kHz]
- [INPUT/OUTPUT : Input Source Config : DC]

Evaluation

On a R&S FSWP8:

Measure the DC input resistance R_{IN} for

f_{IN} = {10 MHz, 500 MHz, 2 GHz, 4.5 GHz, 6 GHz}

The expected input resistances are

for f_{IN} = 10 MHz: 40 Ω < R_{IN} < 80 Ω

for f_{IN} > 100 MHz: 500 Ω < R_{IN} < 2000 Ω

If the input resistance R_{IN} is out of range, the frontend board is expected to be defective.

On a R&S FSWP26 / 50:

Measure the DC input resistance R_{IN} for

f_{IN} = {10 MHz }

The expected input resistances are

for f_{IN} = 10 MHz: 40 Ω < R_{IN} < 80 Ω

If the input resistance R_{IN} is out of range, the microwave converter frontend is expected to be defective.

4.4.6.6 Checking the RF Path from RF Input to the Frontend Board

If you expect a defect on the RF path between RF-input and the frontend board you should check the RF input connector first visually.

As a second step the return loss at the RF input may be checked as described in Troubleshooting Checking the Return Loss at the RF Input. If the test fails follow the troubleshooting guideline described in Troubleshooting Checking the RF Attenuator Accuracy.

For checking the path manually perform the following test:

Test equipment: Spectrum analyzer (chapter "3.4.1 Measuring Equipment and Accessories", item 2):
- Center frequency: 64 MHz
- Frequency span: 128 MHz
- Reference level: +10 dBm
- Resolution bandwidth: auto

Signal Generator (chapter "3.4.1 Measuring Equipment and Accessories", item 3)
- Frequency: 64 MHz
- Level: 0 dBm

Test setup:
► Disconnect the RF cable on X101 on the frontend board and check the signal fed into the frontend board.

R&S FSWP settings:
- [PRESET]
- [FREQ : 64 MHz]
- [FREQ : SPAN : 0 Hz]
- [AMP : REF LEVEL : -20 dBm] (in this case the RF attenuator is set to 0 dB)
- [BW : Res BW Manual : 10 kHz]

Evaluation: Check frequency and level of the signal on the spectrum analyzer.

Expected frequency: Generator frequency

Expected signal level: -3 dBm … 0 dBm

If the signal level is too low perform the following checks:

► Check the signal at the input of the step attenuator. If the signal level is too low, the RF input connector is expected to be defective.
► Check the signal at the output of the step attenuator. If the signal level is too low, the attenuator is expected to be defective.
► When a preamplifier (R&S FSWP-B24) is installed check the signal level at the output of the preamplifier. If the signal level is too low, the preamplifier is expected to be defective.
► Check the signal at the RF-input (X101) of the frontend board. If the signal level is too low on an R&S FSWP with a frequency range > 8 GHz the triplexer for R&S FSWP26 is expected to be defective.

Note: This test may be repeated at any other frequency with the same R&S FSWP settings. For frequencies > 2 GHz an insertion loss up to 5 dB is expected.

For frequencies > 8 GHz the R&S FSWP needs to be set to a frequency > 8 GHz. In this case the signal can be checked on the input and output of the attenuator, on the output of the preamplifier and on the input of the microwave converter frontend unit but not on the input of the frontend board.

When the input frequency of the R&S FSWP is set to a frequency below 40 MHz then the direct path will be activated. With this setting on an R&S FSWP with microwave converter, the input signal is fed via X112 into the frontend board.

4.4.6.7 Checking the IF Signal Path

Test equipment: Spectrum analyzer (chapter "3.4.1 Measuring Equipment and Accessories", item 2):
- center frequency: 50 MHz
- frequency span: 100 MHz
- reference level: +10 dBm
- resolution bandwidth auto

Signal generator (chapter "3.4.1 Measuring Equipment and Accessories", item 3).
- Frequency f_{IN} MHz
- Level -20 dBm

Test setup:
- ► Disconnect the RF cable on X102 and X103 on the frontend board and check the signal output on these connectors with the spectrum analyzer.
- ► Connect the signal generator to the RF input of the R&S FSWP.
- ► Perform the measurement for the frequencies listed below.

R&S FSWP settings:
- [PRESET]
- [FREQ : f_{IN}]
- [FREQ : SPAN : 0 Hz]
- [AMPT : REF LEVEL : -40 dBm] (to set all attenuators to the minimum)
- [BW : Res BW Manual : 10 kHz]

Evaluation: Check frequency and level of the signals output at X102 and X103 with the spectrum analyzer.

Expected frequency: 10 MHz up to 90 MHz

f_{IN}	10 MHz	64 MHz	800 MHz	2 GHz	4 GHz	7.9 GHz
min level in dBm	-25	-16	-16	-8	-8	-8

On an R&S FSWP comprising a microwave converter use the additional test frequencies (if applicable):

f_{IN}	10 GHz	13.5 GHz	17 GHz	26.4 GHz
min level in dBm	-15	-15	-15	-15

If the measured signal level is too low make sure that there is no error in the RF path from the RF input to the frontend board (see Checking the RF Path from RF Input to the Frontend Board).

An error in the frequency range up to 8 GHz indicates a defect frontend board, while an error above 8 GHz indicates a defect on the microwave converter frontend unit.

Compare the signal level of the two output signals at X102 and X103. If the output powers differ by more than 3 dB then the error is on the frontend board

When the R&S FSWP under test contains a microwave converter and the error is in the direct path (f_{IN} < 40 MHz) then the direct path input signal on the frontend board at X112 should be checked.

4.4.6.8 Checking the IF Signal Path for Input Frequencies > 8 GHz

Test equipment: Spectrum analyzer (chapter "3.4.1 Measuring Equipment and Accessories", item 2):

- center frequency: 1330 MHz
- frequency span: 100 MHz
- reference level: 10 dBm
- resolution bandwidth auto

Signal generator (chapter "3.4.1 Measuring Equipment and Accessories", item 3).

- Frequency f_{IN} MHz
- Level -20 dBm

Test setup:

► Disconnect the RF cable on X1604 on the microwave converter frontend board and check the signal output with the spectrum analyzer.
► Connect the signal generator to the RF input of the R&S FSWP.
► Perform the measurement for the frequencies listed below.

R&S FSWP settings:

- [PRESET]
- [FREQ : f_{IN}]
- [FREQ : SPAN : 0 Hz]
- [AMPT : REF LEVEL : -40 dBm] (to set all attenuators to the minimum)
- [BW : Res BW Manual : 10 kHz]

Evaluation

Check frequency and level of the signal at X1604 with the spectrum analyzer.

Expected frequency: 1290 MHz up to 1370 MHz

f_{IN}	10 GHz	13.5 GHz	17 GHz	26.4 GHz	30 GHz
min level in dBm	-15	-15	-15	-15	-15

If the measured signal level is too low make sure that there is no error in the RF path from the RF input to the input connector of the frontend board X101 (see Checking the RF Path from RF Input to the Frontend Board).

An error in the frequency range up to 8 GHz indicates a defect on the frontend board, while an error above 8 GHz indicates a defect on the microwave converter frontend unit.

Compare the signal level of the two output signals at X102 and X103. If the output powers differ by more than 3 dB then the error is on the frontend board

When the R&S FSWP under test contains a microwave converter and the error is in the direct path (f_{IN} < 40 MHz) then the direct path input signal on the frontend board at X112 should be checked.

5 Software Update / Installing Options

This chapter contains information on updating software, restoring the operating-system installation and installing options to the R&S FSWP. Additional manuals obtained together with a software/firmware update or with subsequently acquired options can be filed here.

5.1 Installation of new R&S FSWP Software

For information on updating software refer to the release notes. The most recent version is provided on our Internet site at www.rohde-schwarz.com. You can also follow the link on the CD supplied with the instrument.

5.2 Installing Options

A list of all available hardware and software options is provided on our Internet site at www.rohde-schwarz.com. You can also follow the link on the CD supplied with the instrument.

For retrofitting, note the mounting instructions enclosed with the options.

WARNING

Shock hazard

Before opening the housing, ensure that the instrument is switched off and disconnected from the power supply by removing the plug from the AC and DC power connector.

Read all safety instructions at the beginning of this manual carefully!

NOTICE

Risk of electrostatic discharge

Protect the operational site against electrostatic discharge to avoid damage to electronic components of the modules. For details refer to the safety instructions at the beginning of this manual.

When installing hardware options, note:

1. Switch off the instrument and disconnect the power supply cables.
2. Open the instrument at the necessary parts (refer to 3.2.1 and 3.2.3)
3. Plug in the option and fix it, if required, using the screws previously removed.
4. Complete the instrument as described in 3.2.4
5. Switch on the R&S FSWP.
6. Install additional software, if required, according to the instructions enclosed with the option.
7. If an adjustment is required for this option, the appropriate notes can be found in the installation instructions for the option.

6 Documents

This chapter provides information on the ordering of spare parts and contains the spare part list and the documents for the complete R&S FSWP8/26 unit.

6.1 Spare Parts

The stock numbers necessary for ordering replacement parts and modules can be found in the spare part list further down.

NOTICE

Risk of damaging a module

When shipping a module, observe the instructions provided in the section titled “Procedure in Case of Service and Ordering of Spare Parts” at the beginning of this document.

6.2 Available Power Cables

Stock No.	Earthed-contact connector	Preferably used in
DS 0006.7013.00	BS1363: 1967' 10 A, 250 V complying with IEC 83: 1975 standard B2	Great Britain
DS 0006.7020.00	Type 12, 10 A, 250 V complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 0006.7036.00	Type 498/13, 10 A, 250 V complying with US-regulation UL 498, or with IEC 83	USA/Canada
DS 0041.4752.00	GB2099, GB1002, 10 A, 250 V approvals CCC	China
DS 0041.6232.00	JIS C 8303, 7A, 125 V AC approvals PSE (JET)	Japan
DS 0006.7107.00	Type SAA3, 10 A, 250 V, complying with AS C112-1964 Ap.	Australia
DS 0025.2365.00 DS 0099.1456.00	DIN 49 441, 10 A, 250 V, angular DIN 49 441, 10 A, 250 V, straight approvals VDE, ÖVE, CEBEC, KEMA, S, D, N, FI, LCIE, IMQ, UCIEE	Europe (except Switzerland)

Item No.	Designation	Stock No.
	Basic Device FSWP (1322.8003.01)	
0050	EV 119X119X38 67L/S 12V PWM L240	1313.0155.00
0130	ED MOTHERBOARD DIGITAL FSWX	1325.3625.02
0150	ZN HOLDER MOTHERBOARD DIGITAL	1313.7889.00
0160	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
0180	ED MOTHERBOARD ANALOG FSWT/P	1322.8761.03
0230	NJ PSU600 1X 600W 12V 50A NOBACKPLANE	1321.5400.00
0235	ZN SPACER PLATE PSU600	1321.5000.00
0240	KB BACKPLANE PSU600 LABELED	1321.5052.00
0250	VS 965/ISR M2.5 X 6 A4 PA	1148.3288.00
0270	NR IPC11/4	1206.3216.00
0280	MZ SCREENING SHIELD PROCESSOR IPC11	1322.8155.00
0300	ZN MODULE BACKPLANE IPC11	1322.8661.00
0310	KB BACKPLANE IPC11 LABELED	1321.6136.00
0350	VS SPRING LOCK WASHER DIN 127	0082.4786.00
0361	VS 7985/ISR M2.5 X 8 A4 PA	1148.2730.00
0362	VS WASHER DIN125	0082.4663.00
0363	VS WASHER DIN125	0088.3146.00
0364	VS NUT DIN934 M2.5 A4	0088.3146.00
0370	FP SATA ADAPTOR WEARLESS	1308.0280.00
0380	MB SPECIAL SCREW M3	1304.9199.00
0390	DG SATA DATACABLE 265	1091.3440.00
0400	DS SATA POWER CABLE 100 IPC10	1313.0103.00
0410	ZM WIN7-64GB-SSD MIT FSWP-SW IPC11	1312.9336.10

0470	ZE 6-STEP ATTENUATOR 75DB 26GHZ C	1170.0107.02
0480	ZE 6-STEP ATTENUATOR 75DB 67GHZ C	1170.0107.03
0495	AZ INSULATING	3587.8225.00
0510	DY EICHLEITUNGSKABEL	1312.9607.00
0520	EE SYNTHESIZER 18G	1322.7671.02
0530	FJ PROTECTION CAP	1066.2095.00
0540	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
0560	EE DETECTORBOARD	1313.7050.02
0570	EE REFERENCE (LN)	1325.2193.02
0630	EE DIGITIZER BOARD	1313.7195.02
0640	EE LOW PHASE NOISE BOARD	1313.7420.03
0641	EE LOW PHASE NOISE BOARD 2	1331.6439.03
	DX GROUND CABLE W1150	1338.5967.00
	VS COMBI SCREW 6900/ISR M3.0 X 6 A2	0041.1682.00
0650	EE MWC50 BASEBOARD	1313.4215.10
0660	DY CABLE W14	1313.0010.00
0670	DG IPASS CABLE 26 PIN	1313.1680.00
0730	DY FRONT CABLE W40	1312.9588.00
0750	ED GS RF CONNECTOR BOARD FSWP 8GHZ	1322.7988.02
0760	ED GS RF CONNECTOR BOARD FSWP 26 50GHZ	1322.8010.02
0780	DV RF-CABLE W50	1312.9388.00
0790	DV RF-CABLE W46	1322.8149.00
0800	FJ ADAPTOR SMA / SMA	0513.1734.00
0830	FJ ADAPTOR	0343.0257.00
0835	FJ ADAPTOR PC3.5	1127.9512.00

0840	FJ ADAPTER RPC-1.85F-M	3589.1292.00
0850	DW RF CABLE W1 (26GHZ)	1325.2793.00
0860	DW RF CABLE W1 (50GHZ)	1325.1622.00
0870	DW RF-CABLE W3	1312.9465.00
0880	DV RF CABLE W7	1312.9507.00
0890	DW RF-CABLE W580 26GHZ	1325.2835.00
0900	DW RF-CABLE W580 50GHZ	1325.2841.00
0930	DV RF CABLE W19	1313.0290.00
0940	DY CABLE W34	1313.5286.00
0950	DW RF-CABLE W1100 FSWP8	1325.2764.00
0970	DW RF CABLE W1101	1322.8349.00
0980	DW RF-CABLE W582 26GHZ	1322.9200.00
0990	DW RF-CABLE W582 50GHZ	1322.9939.00
1000	DY CABLE W1120	1325.1997.00
1005	DW RF CABLE W1102 (26/50GHZ)	1322.8355.00
1010	DW RF CABLE W1107	1322.8403.00
1020	DW RF CABLE W1103	1322.8361.00
1030	DW RF CABLE W1104	1322.8378.00
1040	DW RF CABLE W1105	1322.8384.00
1050	DV RF CABLE W1109	1322.8426.00
1060	DV RF CABLE W1110	1322.8432.00
1062	DV RF CABLE W1111	1322.8449.00
1065	DV RF CABLE W1112	1322.8455.00
1070	DV RF CABLE W1113	1322.8461.00
1080	DV RF CABLE W1114	1322.8478.00

1083	DV RF CABLE W1115	1322.8484.00
1085	DV RF CABLE W1116	1322.8490.00
1090	DV RF CABLE W1117	1322.8503.00
1100	DV RF CABLE W1118	1322.8510.00
1110	KB REAR PANEL FSWP PRINTED	1325.2287.00
1150	KB REAR PANEL COVER 1 PRINTED	1322.7571.00
1170	KB REAR PANEL COVER 3 PRINTED	1313.0432.00
1180	KB REAR PANEL COVER 4 PRINTED	1313.0449.00
1190	KB REAR PANEL COVER 5 PRINTED	1313.0455.00
1210	MZ COVER ANALOG 2	1322.7920.00
1220	MZ FAN COVER FSW T450	1313.6918.00
1280	OS INLAYLABEL KEYBOARD FSWP	1322.7836.00
1290	OS INLAYLABEL JACKPANEL FSWP WITHOUT ATT	1325.3925.00
1300	OS INLAYLABEL JACKPANEL FSWP	1322.8032.00
1320	MM BW2010 5U FRONT GRIP	1174.3981.00
1330	VS SCREW M4 X 20 ISR PA	1096.5005.00
1340	MM CAP	1174.5378.00
1350	MF PROFILE STRIP	1325.3831.00
1360	MZ COVER STRIP	1325.3825.00
1370	VS 965/ISR M3 X 6 A4 PA	1148.2781.00
1380	MM BW2010 HOLDER BASE	1174.0353.00
1390	VS 7985/ISR M4 X 10 A4 PA	1148.2669.00
1400	MM BW2010 5HU REAR FOOT COMPL.	1174.6522.00
1410	MZ BW2010 5U D450 SIDE PANEL	1176.3672.00
1420	MM BW2010 3E HANDLE T450	1174.6322.00

1430	MM BW2010 3E COVER HANDLE	1174.6397.00
1440	ZNCOVER TOP	1322.8303.00
1450	ZN COVER BOTTOM	1322.8284.00
1530	ZN SUPPORT RAIL	1313.3790.00
1550	FJ TERMINATION 50 OHM	0249.7823.00
1600	EE MWC X-CORRELATION BD. 26 GHZ	1322.7842.26
1610	EE MWC X-CORRELATION BD. 50 GHZ	1322.7842.50
1620	ZE RELAY UNIT 2-1	1325.3060.02
1630	ZE RELAY UNIT 2-1	1325.3060.03
1640	ZN BASIC PLATE FSWP	1325.3202.00
1690	DW RF-CABLE W581 26GHZ WITHOUT OPTION	1325.2858.00
1700	DW RF-CABLE W581 50GHZ WITHOUT OPTION	1325.2864.00
1710	VS 7985/ISR M3 X 16 A4 PA	1148.2898.00
1800	EM ROTARY PULSE ENCODER	0852.2876.00
1810	SF RUBBER KEYPAD SET	1312.8523.00
1820	MM KNOB RD30 WFA	0852.0921.00
1830	ZM DISPLAY WITH TOUCHSCREEN 12.1 INCH	1313.1268.00
1840	EE FRONTPANEL KEYBOARD FSWT	1321.5617.02
1850	ED GS FRONTCONNECTORBOARD FSWP	1322.8749.02
1860	KB FRONTCOVER FSWP (PRINTED)	1325.2529.00
1900	ZM HOLDER HARDDISK	1313.1200.00
1950	ZM CHIPCARD SERVICE KIT	1201.5610.03
None	LITHIUM BATTERY CR2032	0858.2049.00
None	HS SYSTEM DRIVE WITH SOFTWARE FSW	1312.9336.10
	Drawing R&S FSWP-B1 (1322.9997.01)	

3510	EE FRONTEND 8 GHZ	1312.8046.02
3515	ZE ATTENUATOR 6-STEP	1137.0599.03
3517	DY ATTENUATOR CABLE	1312.9607.00
3520	ZE YIG-FILTER 3-30GHZ	1301.1022.07
3525	ZE YIG-FILTER 7-50GHZ	1300.9007.50
3530	ZE TRIPLEXER 50	1301.0503.03
3535	EE TRIPLEXER BOARD 43GHZ	1313.4844.02
3555	DW RF CABLE W2 (8GHZ)	1312.9536.00
3560	DWRF CABLE W1 (8GHZ) FSWP	1322.9851.00
3565	DW RF CABLE W1101	1322.9239.00
3570	DW RF-CABLE W3	1312.9636.00
3575	DW RF CABLE W4	1312.9471.00
3580	DV RF CABLE W5	1312.9642.00
3585	DV RF CABLE W6	1312.9659.00
3590	DV RF CABLE W22	1313.0755.00
3595	DV RF CABLE W8	1312.9513.00
3600	DW RF CABLE W9 (LO2)	1312.9520.00
3605	DW RF CABLE W10 FSWP	1325.4567.00
3610	DV RF CABLE W11 (43GHZ)	1313.5870.00
3615	DV RF-CABLE W18	1313.0003.00
3620	DV RF-CABLE W134	1325.1816.00
3635	DW RF CABLE W17 YIG26GHZ	1325.1845.00
3640	DW RF CABLE W17 (50GHZ)	1322.9816.00
3645	DW RF CABLE W30 (YIG 26GHZ)	1325.1822.00
3650	DW RF CABLE W30 YIG 50GHZ	1325.2087.00

3655	DV RF CABLE W1100	1322.8332.00
3660	DW RF CABLE W31	1322.9922.00
3662	DW RF CABLE W581 26GHZ OPTION	1325.3119.00
3663	DW RF CABLE W581 50GHZ OPTION	1325.3154.00
3715	DZ GROMMET 8X10X15	0099.3536.00
3720	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
3780	OS INLAYLABEL JACKPANEL FSWP08 WITH B1	1325.4621.00
	Drawing R&S FSWP-B4 (1325.3890.01)	
-	OCXO-OPTION BOARD	1312.8230.05
	Drawing R&S FSWP-B8 (1325.5028.01)	
370	DETECTOR BOARD	1313.7050.26
	Drawing R&S FSWP-B21 (1325.3848.01)	
2620	FJ ADAPTOR SMA/SMA	0513.1734.00
2630	VS 965/ISR M2.5x6 A4 PA	1148.3288.00
2640	DW RF CABLE W20	1325.3931.00
2650	DV CABLE W21	1313.1068.00
	Drawing R&S FSWP-B24 (1325.3725.01)	
2300	EE MW PREAMP 8/13GHZ	1313.0184.02
2310	EE MW PREAMP 26.5GHZ	1313.4609.02
2320	ZE RELAIS UNIT 13GHZ	1164.6113.13
2330	ZE RELAIS UNIT 26.5GHZ	1164.6113.26
2360	DW RF CABLE W24 (8/13.6GHZ)	1313.0532.00
2370	DW RF CABLE W25 (8/13.6GHZ)	1313.0549.00
2380	DW RF CABLE W24	1313.0478.00
2390	DW RF CABLE W25	1313.0484.00

2214	ZE PREAMP UNIT 50GHZ	1313.4967.49
2230	DW RF CABLE W23 (8/13.6GHZ)	1313.0526.00
2240	DW RF CABLE W27 (8GHZ)	1313.0490.00
2260	DW RF CABLE W23 FSWP26	1325.4580.00
2262	DW RF CABLE W23 FSWP50	1325.4596.00
2270	DW RF CABLE W27 FSWP26	1325.4544.00
2274	DW RF CABLE W27 FSWP50	1313.5134.00
2280	DY CABLE PREAMP	1313.0849.00
2281	DY CABLE W271 PREAMP 50GHZ	1313.5805.00
2282	DV RF-CABLE W275 FSWP	1325.4550.00
2283	DV RF-CABLE W276	1325.3254.00
	Drawing R&S FSWP-B60 (1322.9800.01)	
3110	EE SYNTHESIZER 18G	1322.7671.02
3111	EE SYNTHESIZER 18G	1322.7671.03
3115	EE LOW PHASE NOISE BOARD	1313.7420.02
3116	EE LOW PHASE NOISE BOARD	1313.7420.04
3117	EE LOW PHASE NOISE BOARD 2	1331.6439.04
3120	EE 2ND REFERENCE	1325.1968.03
3130	DW RF CABLE W1108	1322.8410.00
3160	DV RF-CABLE W155	1325.2358.00
3170	DV RF-CABLE W156	1325.2364.00
3180	DV RF-CABLE W157	1325.2370.00
3190	DV RF-CABLE W158	1325.2387.00
3200	DV RF-CABLE W159	1325.2393.00
3210	FJ TERMINATION 50 OHM	0249.7823.00

3225	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
3230	ZE RELAY UNIT 2-1	1325.3077.02
3240	FJ ATTENUATOR 6DB	3583.1610.00
3245	DW RF CABLE W591	1325.5057.00
3250	DW RF CABLE W1106 FLEX	1331.4342.00
3260	DW RF-CABLE W590	1325.4496.00
3265	DW RF CABLE W590 VAR08	1331.4359.00
3266	DV RF-CABLE W77	1331.4959.00
	Drawing R&S FSWP-B61 (1325.3719.01)	
	EE SYNTHESIZER 18G	1322.7671.03
	EE LOW PHASE NOISE BOARD	1313.7420.02
	EE LOW PHASE NOISE BOARD	1313.7420.04
	EE LOW PHASE NOISE BOARD 2	1331.6439.04
	EE 2ND REFERENCE	1325.1968.04
3940	DW RF CABLE W1108	1322.8410.00
3990	DV RF CABLE W155	1325.2358.00
4030	DV RF CABLE W159	1325.2393.00
4035	DV RF CABLE W77	1331.4959.00
4040	FJ TERMINATION SMA	0249.7823.00
4050	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
4060	ZE RELAY UNIT 2-1	1325.3077.02
4080	FJ ATTENUATOR 6DB	3583.1610.00
4090	DW RF CABLE W591	1325.5057.00
4100	DW RF CABLE W1106 FLEX	1331.4342.00
4110	DW RF CABLE W590	1325.4496.00

4115	DW RF CABLE W590 VAR08	1331.4359.00
4140	GM FSWP-B4 HIGH STABILITY OCXO	1325.3890.02
	Drawing R&S FSWP-B64 (1322.9900.01)	
3310	ZE ATTENUATOR 70DB 20GHZ S	1170.0136.02
3320	RELAY UNIT 2-1	1325.3077.02
3330	DW RF CABLE W1106	1322.8390.00
3340	DW RF CABLE W571	1325.1616.00
3350	DW RF CABLE W590 8GHZ	1325.3160.00
3360	DW RF CABLE W591	1325.3083.00
3370	DW RF CABLE W592	1325.3125.00
3372	DW RF CABLE W1103	1322.8361.00
3375	DW RF CABLE W1105	1322.8384.00
-	FJ ADAPTOR SMA/SMA	0513.1734.00
3380	DW RF CABLE W1101	1322.8349.00
3390	DY CABLE W60 FSWP 2ND RF ATTENUATOR	1325.4880.00
3392	OS INLAYLABEL JACKPANEL FSWP OPTION	1322.8049.00
3395	OS INLAYLABEL JACKPANEL FSWP WITHOUT ATT	1325.3919.00
3397	OS INLAYLABEL JACKPANEL FSWP08 W. B1/B64	1325.4638.00
3440	FJ ADAPTOR	0343.0257.00
3455	AZ INSULATING	3587.8225.00

Detail
D 1322.8003.01 D 10

131 130
151 150
60
80
70
50
160 230 235 240 260 170
250
380
370 310 320 410
745
747
740
200
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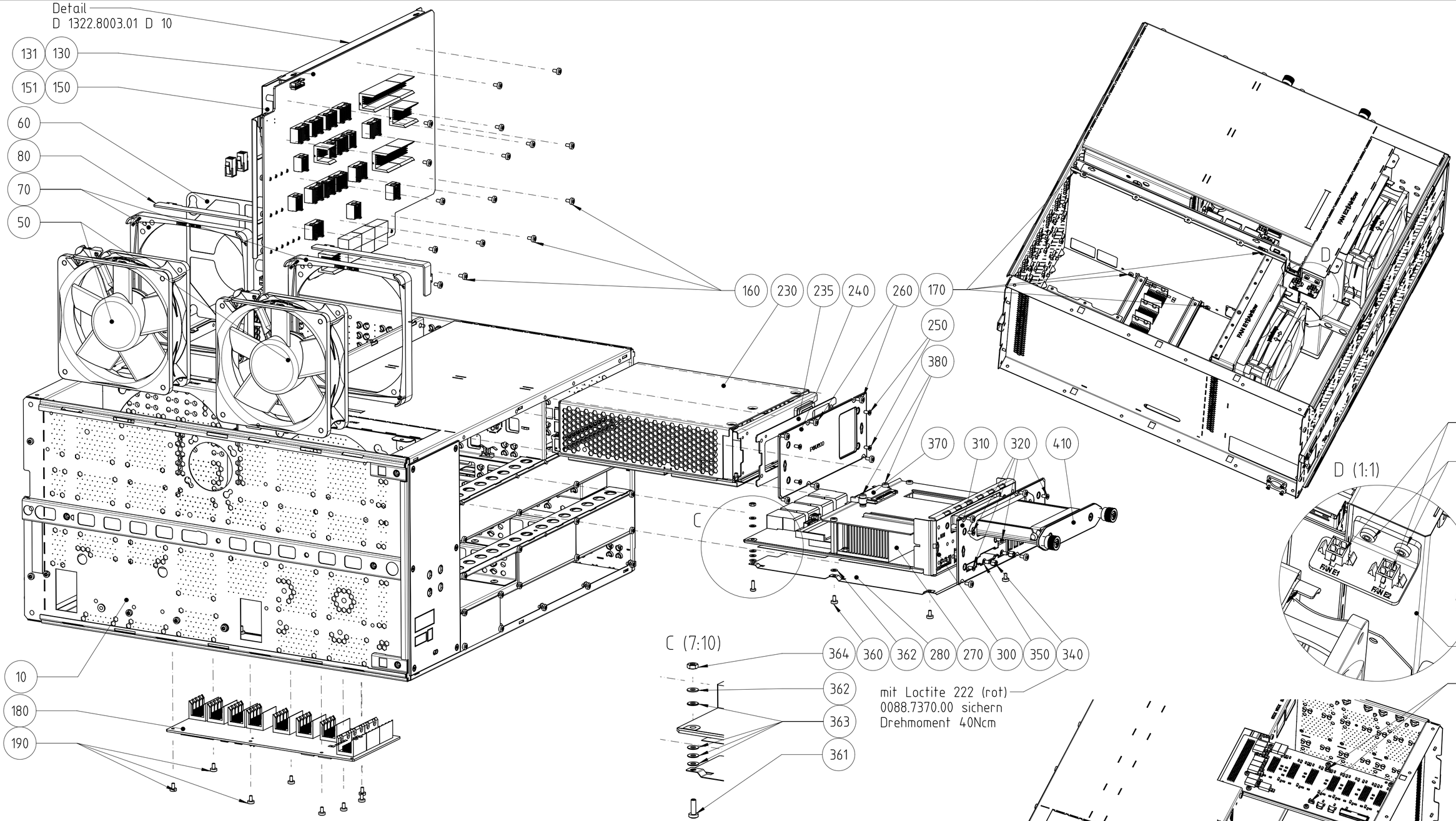
180
190
364 360 362 280 270 300 350 340
362
363
361

C (7:10)

D (1:1)

mit Loctite 222 (rot)
0088.7370.00 sichern
Drehmoment 40Ncm

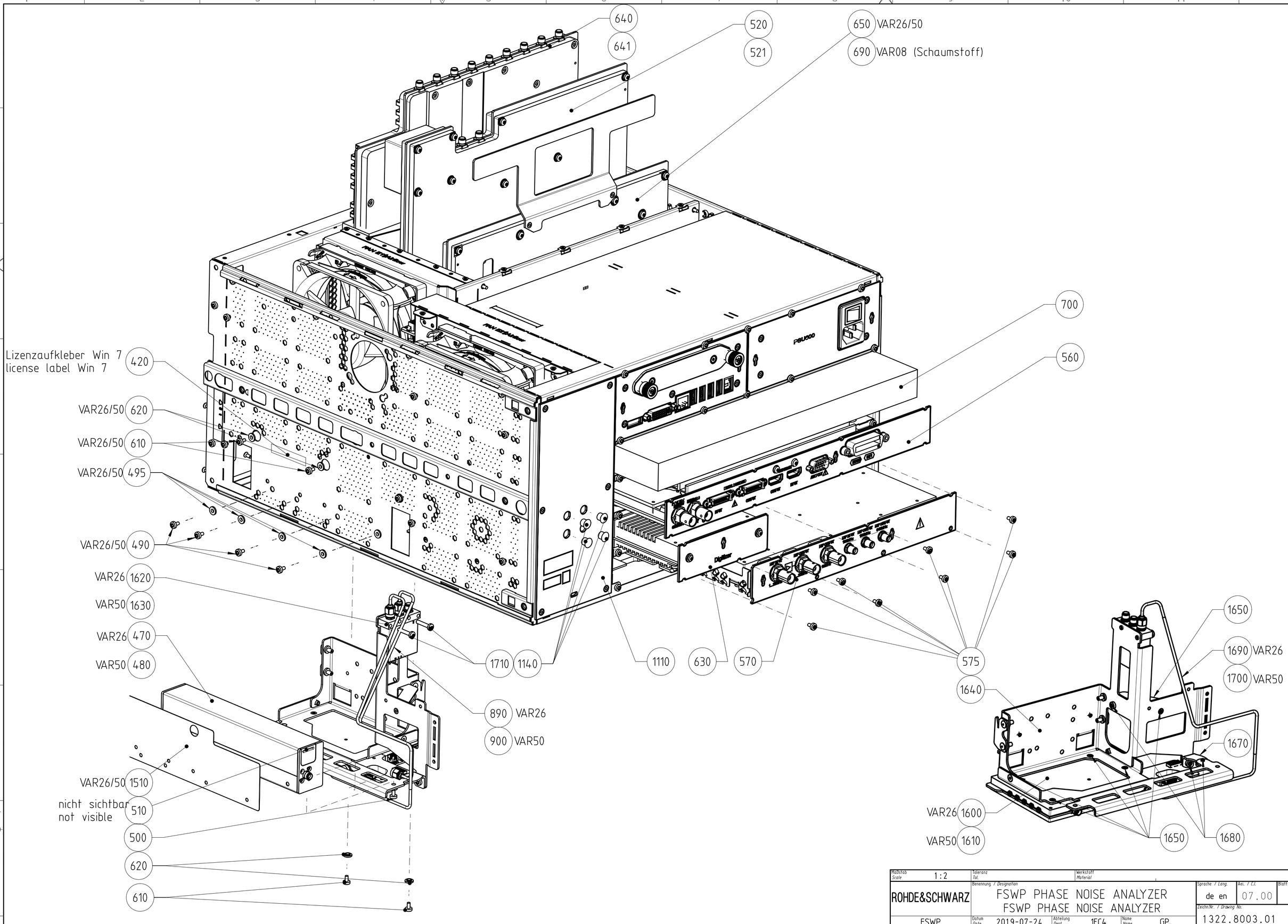


Maßeinheit
Measuring Unit
[mm]

Projektions-methode
Projection Method

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER			Sprache / *Lang.* de en	Aei. / *C.I.* 07.00	Blatt / *Sh.* 1
FSWP	Datum *Date* 2017-02-20	Abteilung *Dept.* 1ENK	Name *Name* AN	Zeichn.Nr. / *Drawing No.* 1322.8003.01 D		

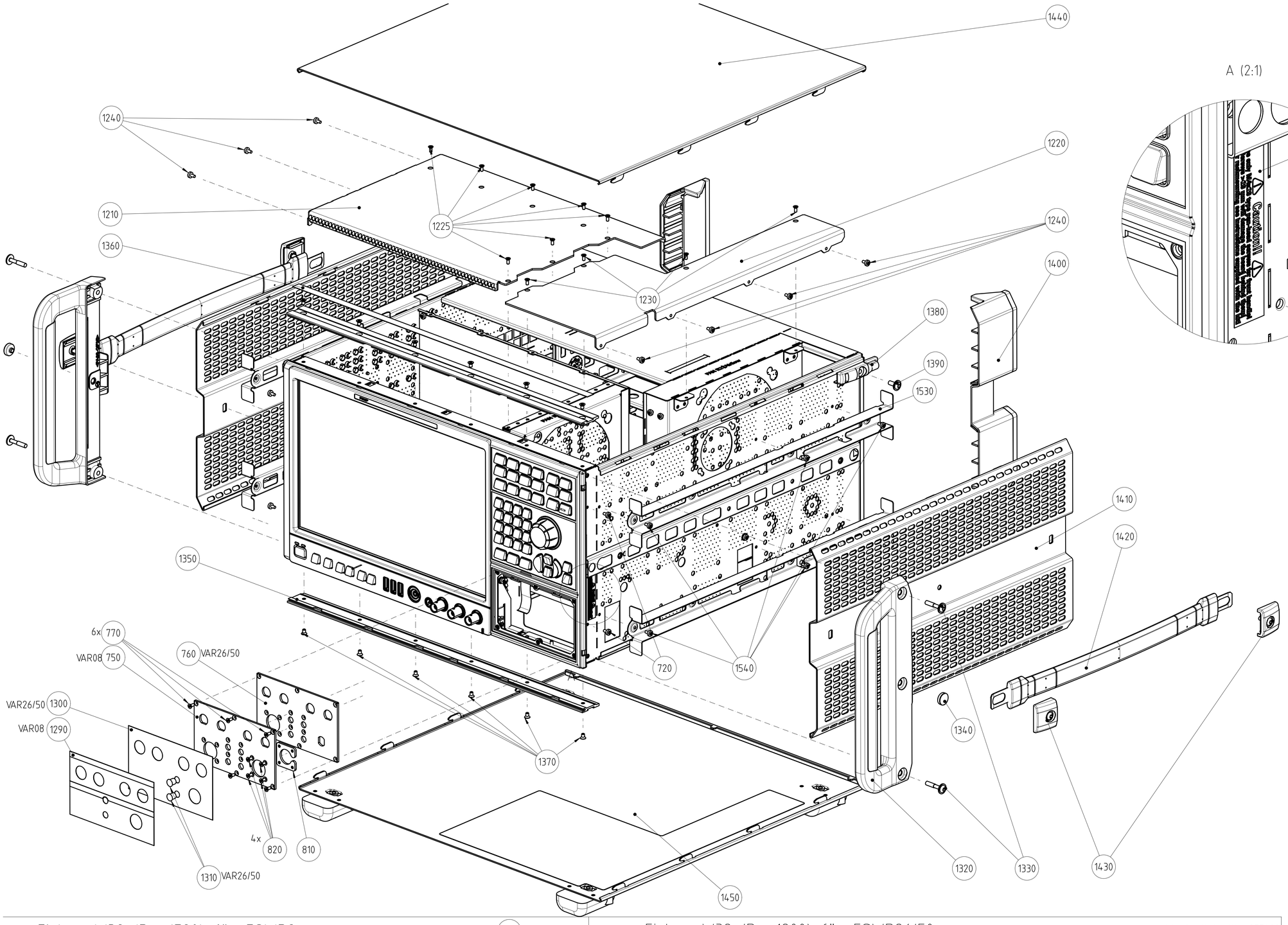
A2



Projektions-methode
Projection Method

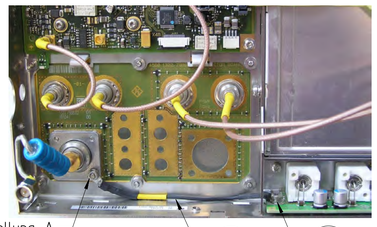
Maßstab / Scale 1:2	Toleranz / Tol.	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER			Sprache / Lang. de en	Aei. / Cl. 07.00
				Zeichn.Nr. / Drawing No. 1322.8003.01	Blatt / Sh. 2 D
FSWP	Datum / Date 2019-07-24	Abteilung / Dept. 1EC4	Name / Name GP		

A2

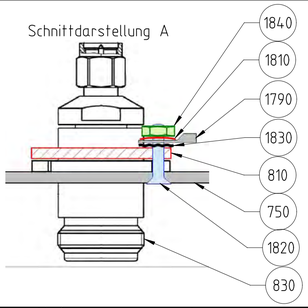


A (2:1)

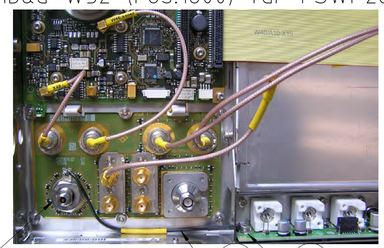
Einbau W32 (Pos.1790) für FSWP8



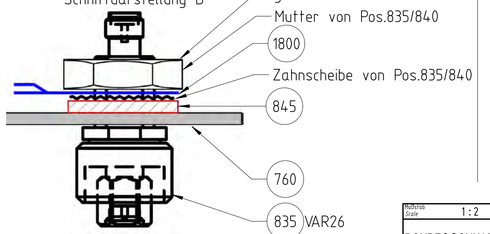
Schnittdarstellung A



Einbau W32 (Pos.1800) für FSWP26/50



Schnittdarstellung B

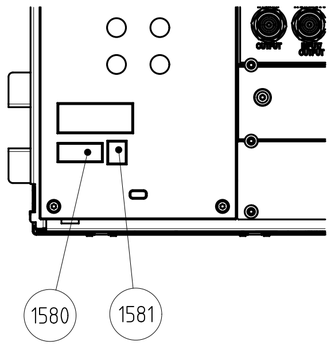


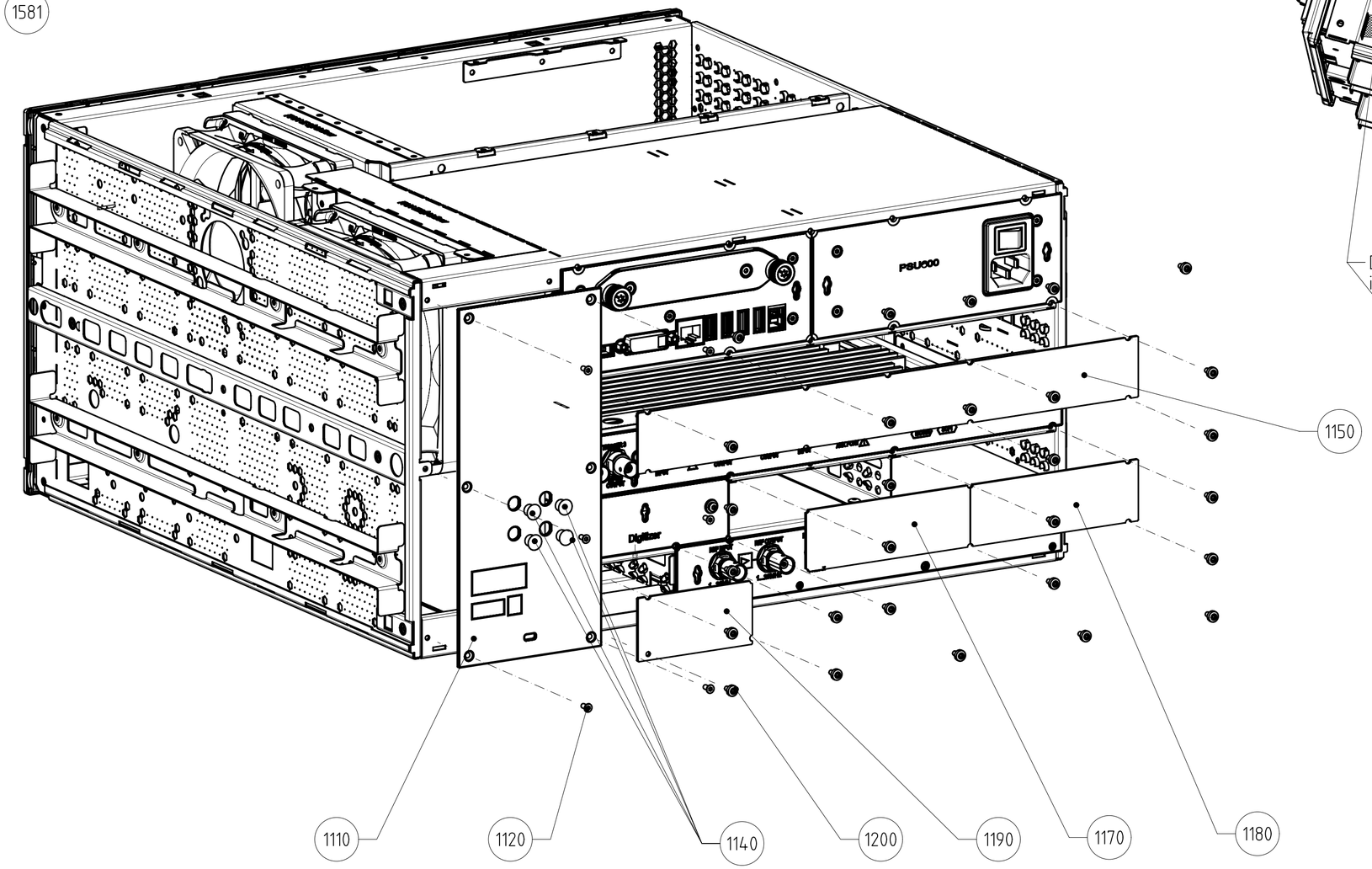
Maßstab / Scale 1:2	Toleranz / Tol.	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER		Sprache / Lang. de en	Ers. f. / Ers.	Blatt / Sh. 3
FSWP	Datum / Date 2018-10-17	Abteilung / Dept. 1EC4	Name / Name Wn	Zeichnung- / Drawing No. 1322.8003.01	D

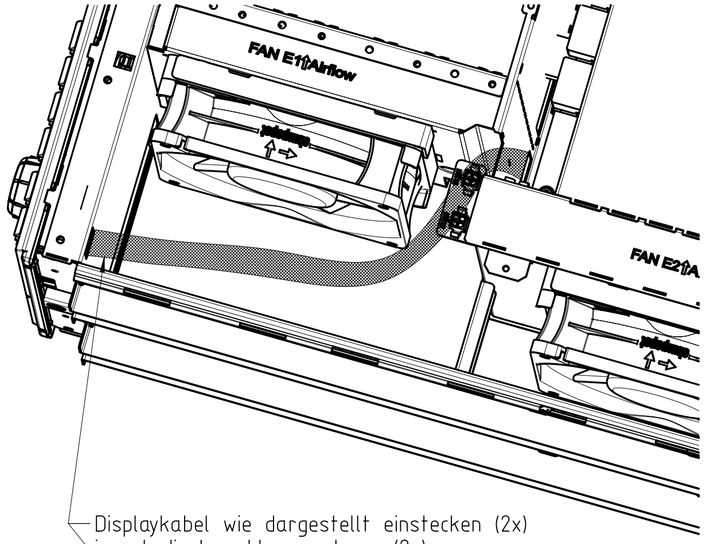
Maßeinheit Measuring Unit [mm]

Projektionsmethode Projection Method

A1







Displaykabel wie dargestellt einstecken (2x)
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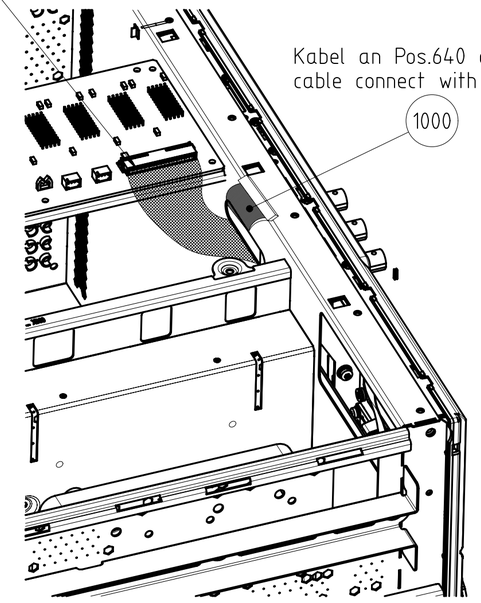


Kabel an Pos.640 anschließen
cable connect with pos.640

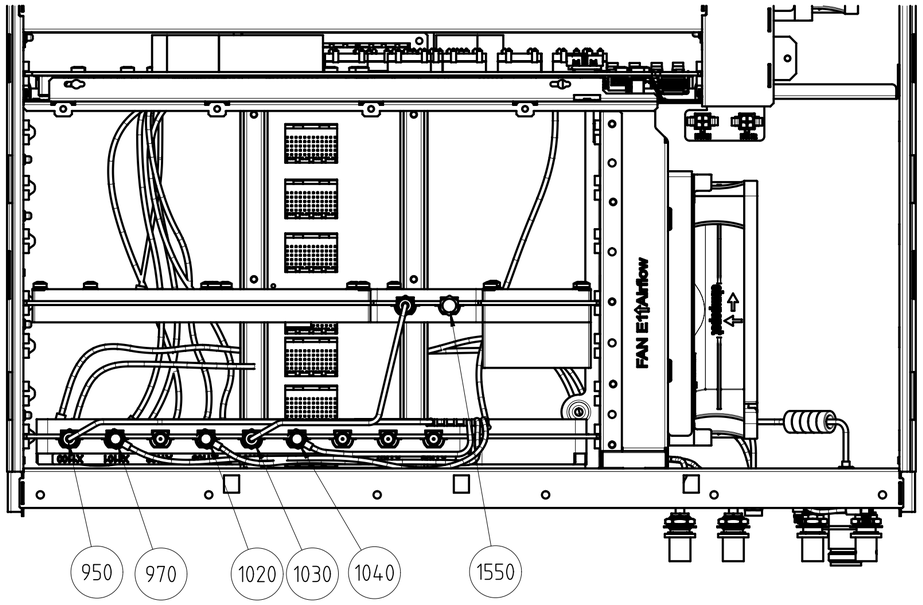
Projektions-methode
Projection Method

Maßstab *Scale* 1:2	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER			Sprache / *Lang.* de en	Aei. / *Cl.* 04.00 / Blatt / *Sh.* 4
FSWP	Datum *Date* 2016-06-10	Abteilung *Dept.* 1ENK	Name *Name* BUAN	Zeichn.Nr. / *Drawing No.* 1322.8003.01	D

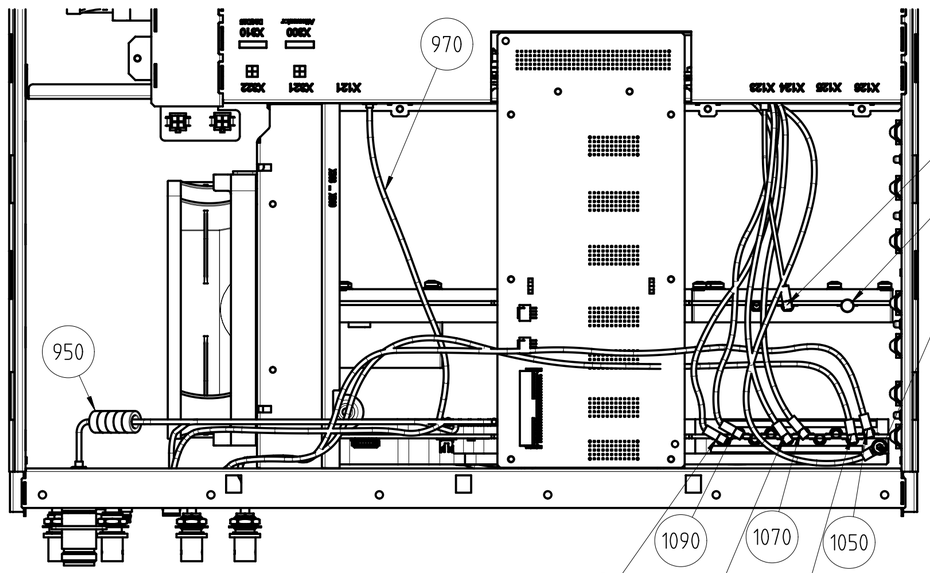
A2

VAR08

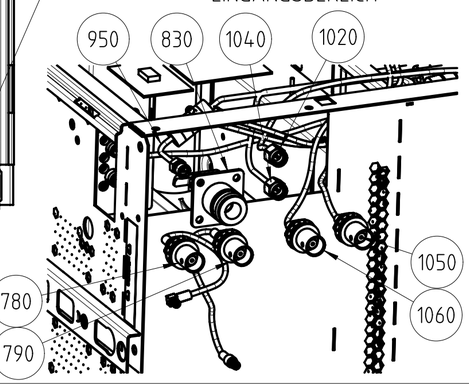
ANSICHT VON OBEN



ANSICHT VON UNTEN

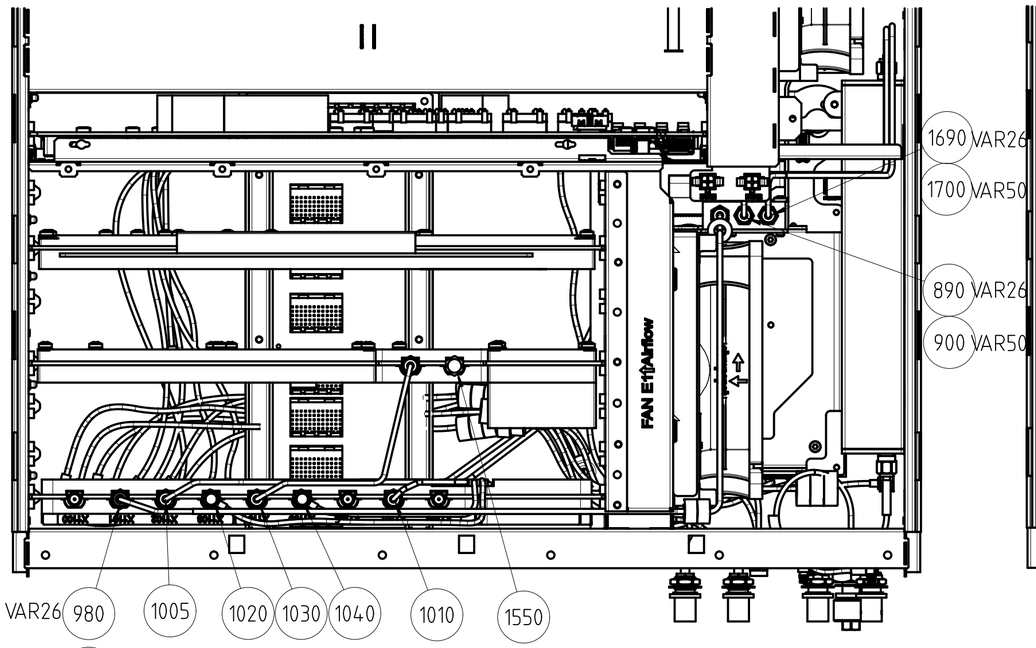


EINGANGSBEREICH

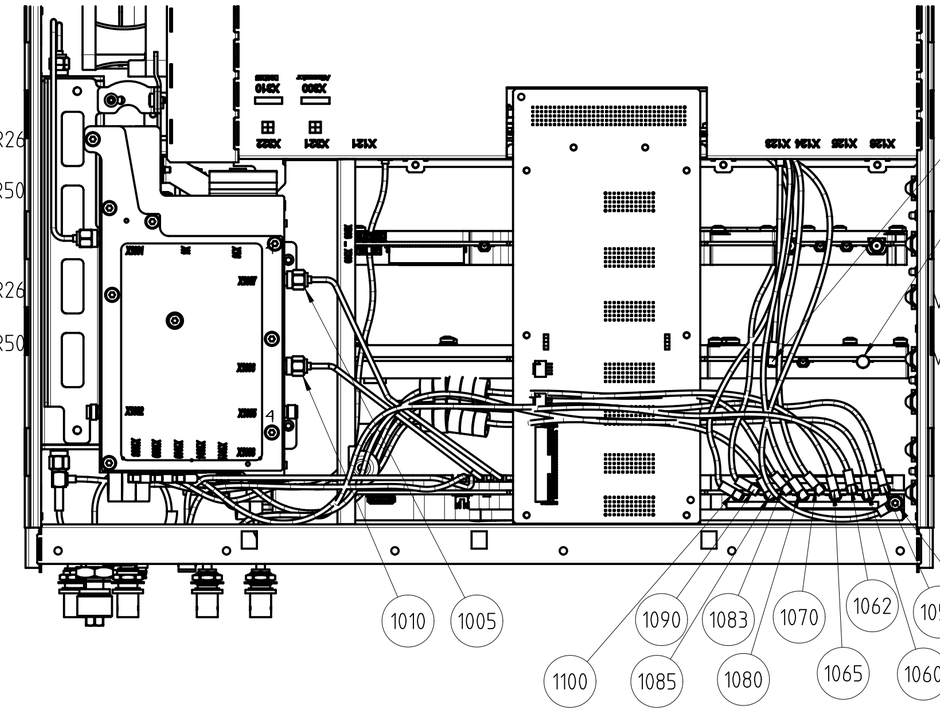


VAR26/50

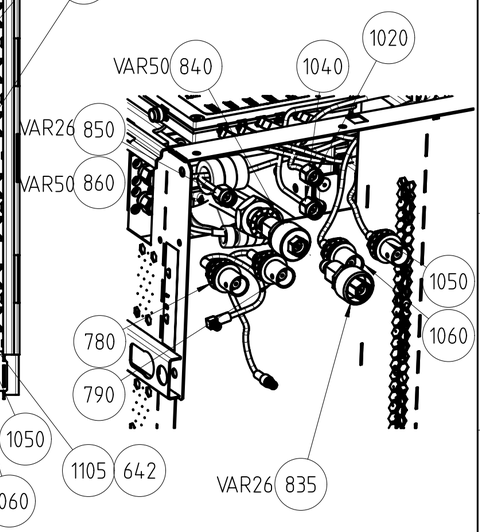
ANSICHT VON OBEN



ANSICHT VON UNTEN



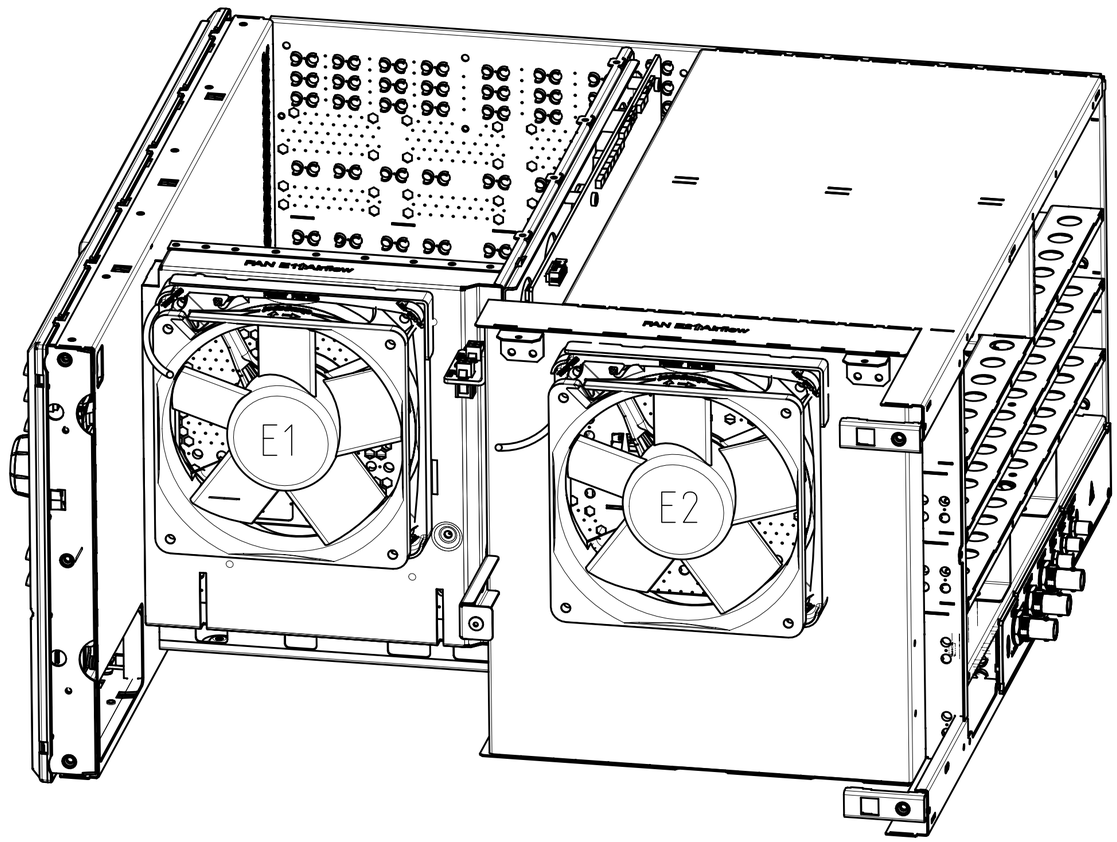
EINGANGSBEREICH

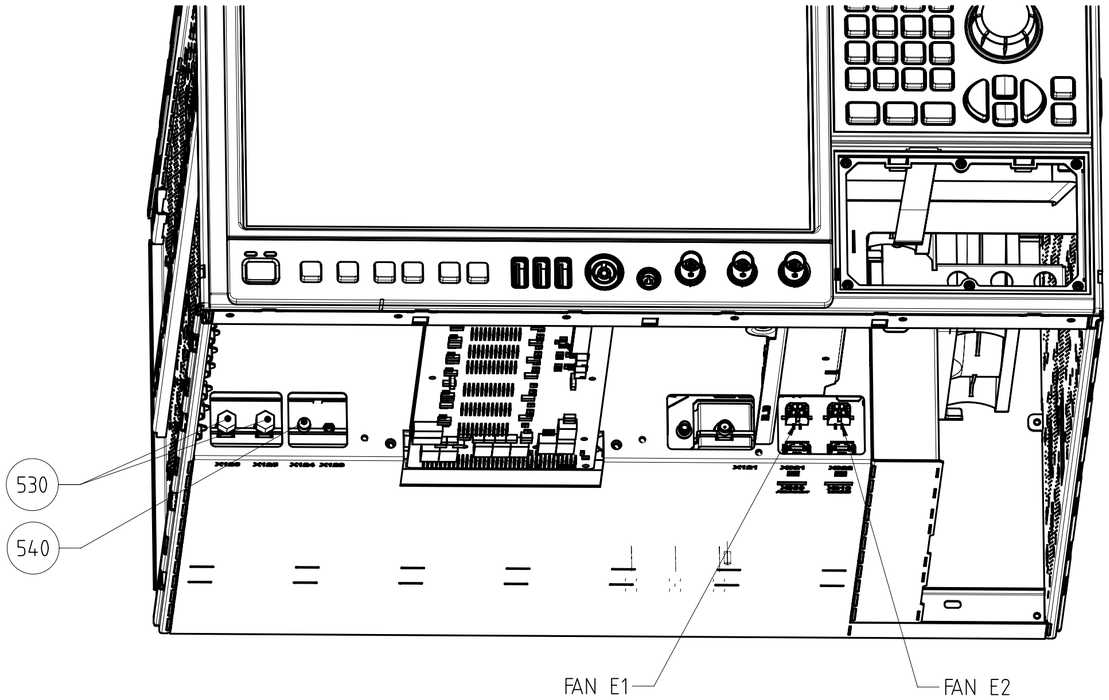


Projektions-methode
Projection Method

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*					
ROHDE&SCHWARZ	Benennung / *Designation* FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER				Sprache / *Lang.* de en	Aei. / *C.I.* 05.00	Blatt / *Sh.* 5
FSWP	Datum *Date* 2019-07-24	Abteilung *Dept.* 1EC4	Name *Name* GP		Zeichn.Nr. / *Drawing No.* 1322.8003.01		D

A2





Projektions-methode
Projection Method

Maßstab *Scale* 1:2	Toleranz *Tol.*	Werkstoff *Material*					
ROHDE&SCHWARZ	Benennung / *Designation* FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER				Sprache / *Lang.* de en	Aei. / *Cl.* 04.00	Blatt / *Sh.* 8
FSWP	Datum *Date* 2015-08-07	Abteilung *Dept.* 1ESK	Name *Name* An/Bu		Zeichn.Nr. / *Drawing No.* 1322.8003.01		D

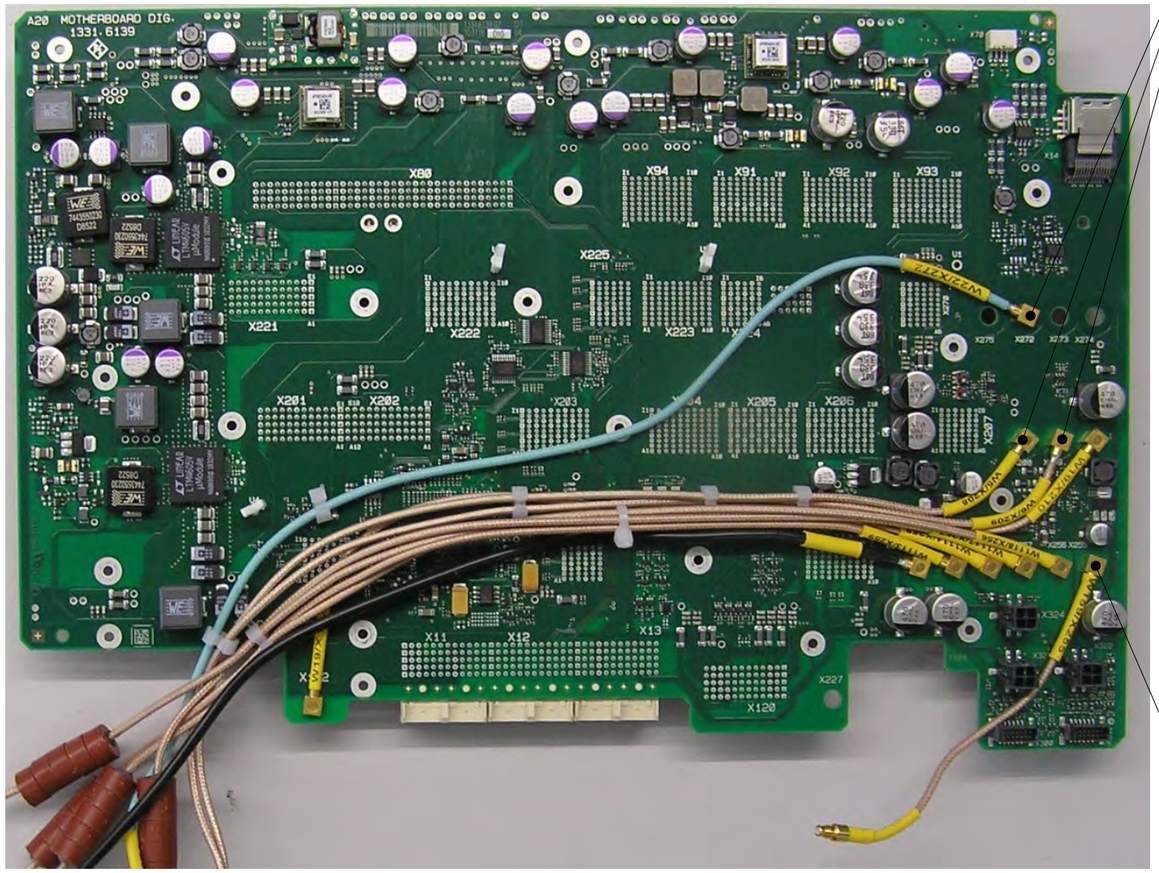
A2

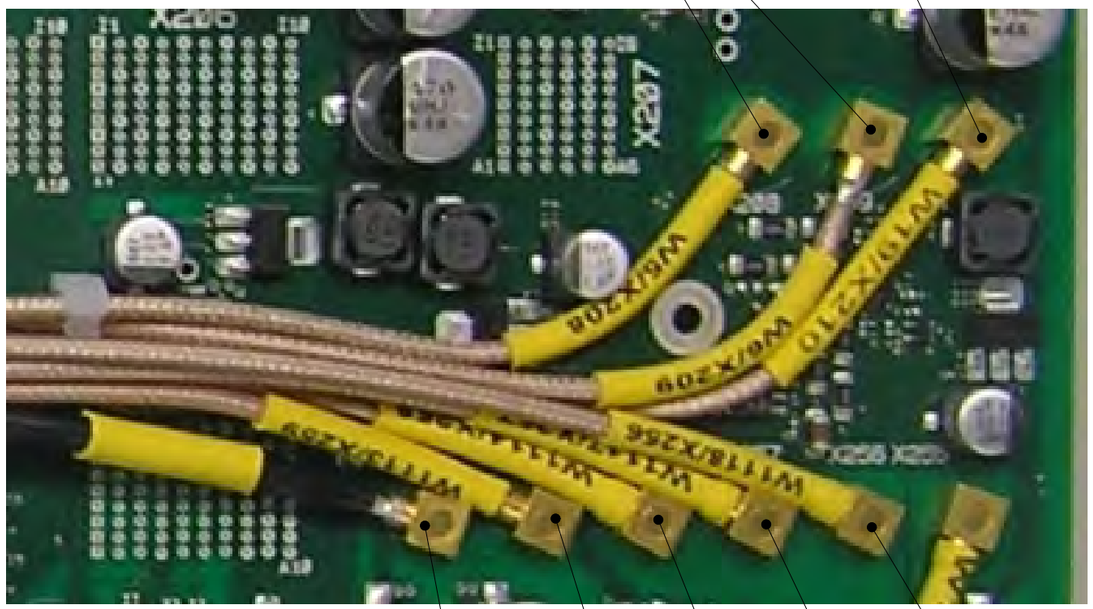
Maßeinheit
Measuring Unit
[mm]

Projektions-methode
Projection Method

NX

Motherboard Dig.
1325.3625.XX
1331.6139.XX





FSWP (B1)

FSWP (B1)

930

FSWP (B60/B61)

1105

1070

1080

1090

1100

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*					
ROHDE&SCHWARZ	Benennung / *Designation* FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER				Sprache / *Lang.* de en	Aei. / *C.I.* 02.00	Blatt / *Sh.* 10
FSWP	Datum *Date* 2019-07-15	Abteilung *Dept.* 1EC4	Name *Name* GP		Zeichn.Nr. / *Drawing No.* 1322.8003.01		D

A3

FSWP8 ***without*** Option FSWP-B1

In order to install Option FSWP-B64 either option FSWP-B60 or FSWP-B61 must be already installed!

A Firmware update is ***not*** required for a functional Option FSWP-B64.

For installing this Option refer to the figures on the next page of this assembly instruction (1325.2129.00) and the schematic in the service manual.

Step 1: Remove the following items of FSWP-B60/61:

- 6dB-attenuator (3583.1610.00) connected to relay A590
- cable W1106 (1331.4342.00)
- cable W590 Var.08 (1331.4359.00)
- and cable W591 (1325.5057.00)

Step 2: Mount N-connector (3340) with plate (3460) and four screws (3445) to the rf frontconnector board A560. Mount adaptor SMA/SMA (3450), holder ext. mixers B21(3452), and screws (3445). Add the new inlay label (3395).

Step 3: Mount the mechanical attenuator A570 (3310) with three screws (3410) on the fixing plate. Note: Fixing plate (1325.3448.00) and relay A590 (3370) are already mounted with option FSWP-B60/61!

Step 4: Connect rf cables W1106 (3330), W571 (3340), W590 (3350), W591 (3360), W592 (3370), W1101 (3380), W1103 (3372), and W1105 (3375).

Step 5: Connect flat ribbon cable W60 (1325.4880.00) to attenuator A570 (3310) and X300 on the digital motherboard A20.

Step 6: Perform a „auto select“ correction with the R&S®FSW Service tool.

Step 7: Carry out a performance test according to the service manual.

FSWP8 ***with*** Option FSWP-B1

In order to install Option FSWP-B64 either option FSWP-B60 or FSWP-B61 must be already installed!

A Firmware update is ***not*** required for a functional Option FSWP-B64.

For installing this Option refer to the figures on the next page of this assembly instruction (1325.2129.00) and the schematic in the service manual.

Step 1: Remove the following items of FSWP-B60/61:

- 6dB-attenuator (3583.1610.00) connected to relay A590
- cable W1106 (1331.4342.00)
- cable W590 Var.08 (1331.4359.00)
- cable W591 (1325.5057.00)
- and cable W60 (1312.9607.00) of FSWP-B1 Var.08

Step 2: Mount N-connector (3340) with plate (3460) and four screws (3445) to the rf frontconnector board A560. Mount adaptor SMA/SMA (3450), holder ext. mixers B21(3452), and screws (3445). Add the new inlay label (3397).

Step 3: Mount the mechanical attenuator A570 (3310) with three screws (3410) on the fixing plate. Note: Fixing plate (1325.3448.00) and relay A590 (3370) are already mounted with option FSWP-B60/61!

Step 4: Connect rf cables W1106 (3330), W571 (3340), W590 (3350), W591 (3360), W592 (3370), W1101 (3380), W1103 (3372), and W1105 (3375).

Step 5: Connect flat ribbon cable W60 (1325.4880.00) to attenuator A570 (3310) and attenuator A60 and X300 on the digital motherboard A20.

Step 6: Perform a „auto select“ correction with the R&S®FSW Service tool.

Step 7: Carry out a performance test according to the service manual.

FSWP26 and FSWP50

In order to install Option FSWP-B64 either option FSWP-B60 or FSWP-B61 must be already installed!

A Firmware update is ***not*** required for a functional Option FSWP-B64.

For installing this Option refer to the figures on the next page of this assembly instruction (1325.2129.00) and the schematic in the service manual.

Step 1: Remove the following items of FSWP-B60/61:

- 6dB-attenuator (3583.1610.00) connected to relay A590
- cable W1106 (1331.4342.00)
- and cable W60 (1312.9607.00) of basic unit

Step 2: Mount N-connector (3340) with plate (3460) and four screws (3445) to the rf frontconnector board A560. Mount adaptor SMA/SMA (3450), holder ext. mixers B21(3452), and screws (3445). Add the new inlay label (3392).

Step 3: Mount the mechanical attenuator A570 (3310) with three screws (3410) on the fixing plate. Note: Fixing plate (1325.3448.00) and relay A590 (3370) are already mounted with option FSWP-B60/61!

Step 4: Connect rf cables W1106 (3330), W571 (3340), W590 (3350), W591 (3360), W592 (3370), W1101 (3380), W1103 (3372), and W1105 (3375).

Step 5: Connect flat ribbon cable W60 (1325.4880.00) to attenuator A570 (3310) and attenuator A60 and X300 on the digital motherboard A20.

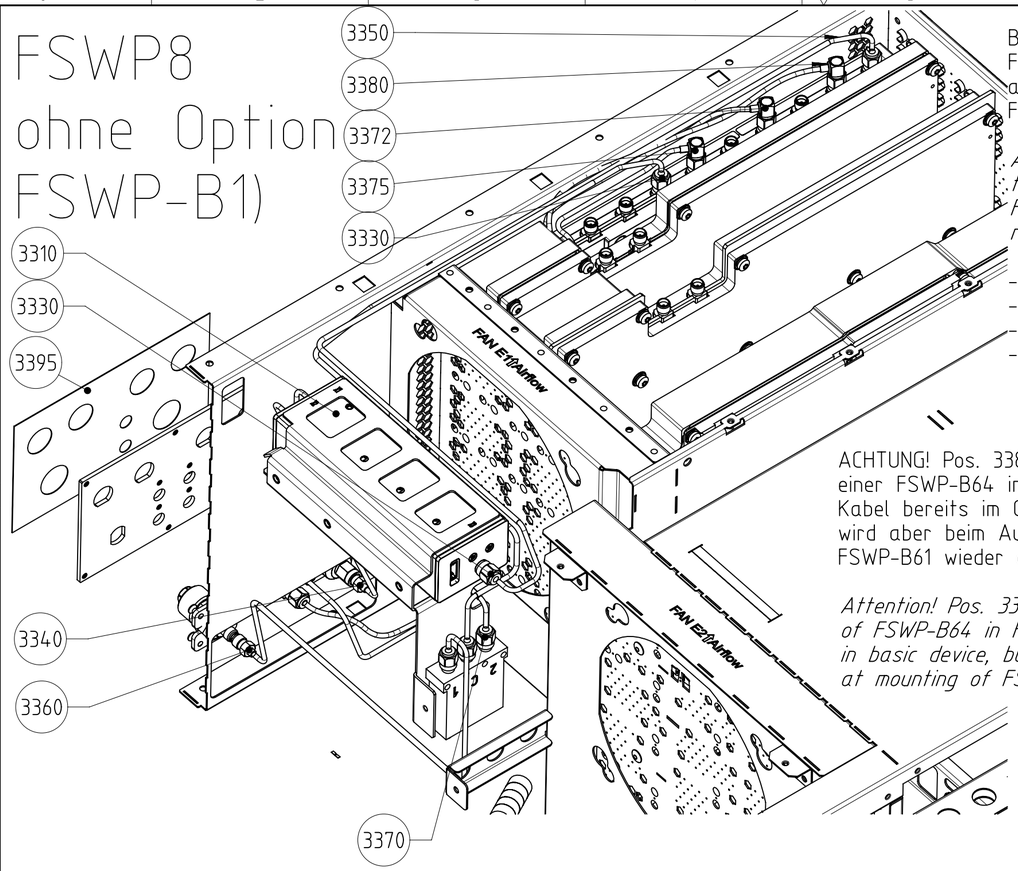
Step 6: Perform a „auto select“ correction with the R&S®FSW Service tool.

Step 7: Carry out a performance test according to the service manual.

PAD-T-M: 3575.3530.03/02.00/RU/1/DE/

ROHDE&SCHWARZ	**Benennung/Designation** EINBAUANWEISUNG FSWP-B64 ASSEMPLY INSTRUCTION FSWP-B64			Sprach./Lang de en	Ä.I. / C.I 09.00	**Blatt/Sheet** 1 of 2
	Datum/ Date 12.10.2018	Abt. / Dept. 1EC4	Name / Name Wn	**Dokument Nr. / Document No.** 1325.2129.00		

FSWP8 ohne Option FSWP-B1)



Beim Einbau einer FSWP-B64 für den FSWP8 müssen folgende Sachnummern aus der Option FSWP-B60 bzw. FSWP-B61 entfernt werden:

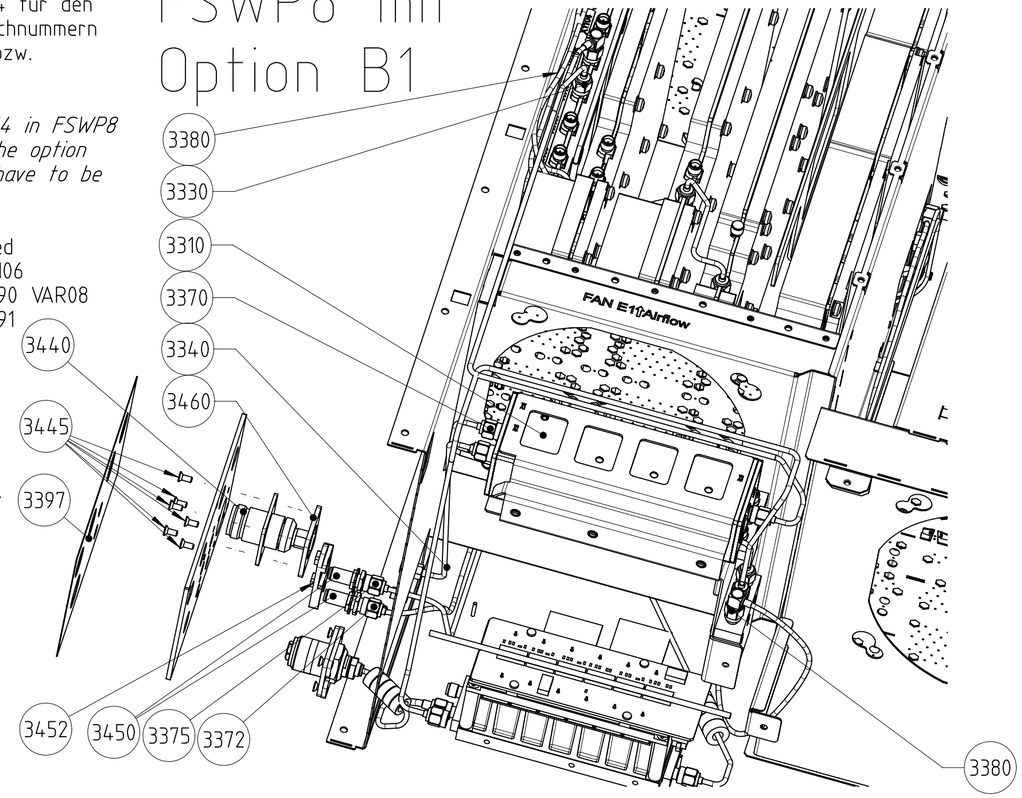
At installation of FSWP-B64 in FSWP8 the following numbers of the option FSWP-B60 bzw. FSWP-B61 have to be removed:

- 3583.1610.00 Dämpfungsglied
- 1331.4342.00 HF-Kabel W1106
- 1331.4359.00 HF-Kabel W590 VAR08
- 1325.5057.00 HF-Kabel W591

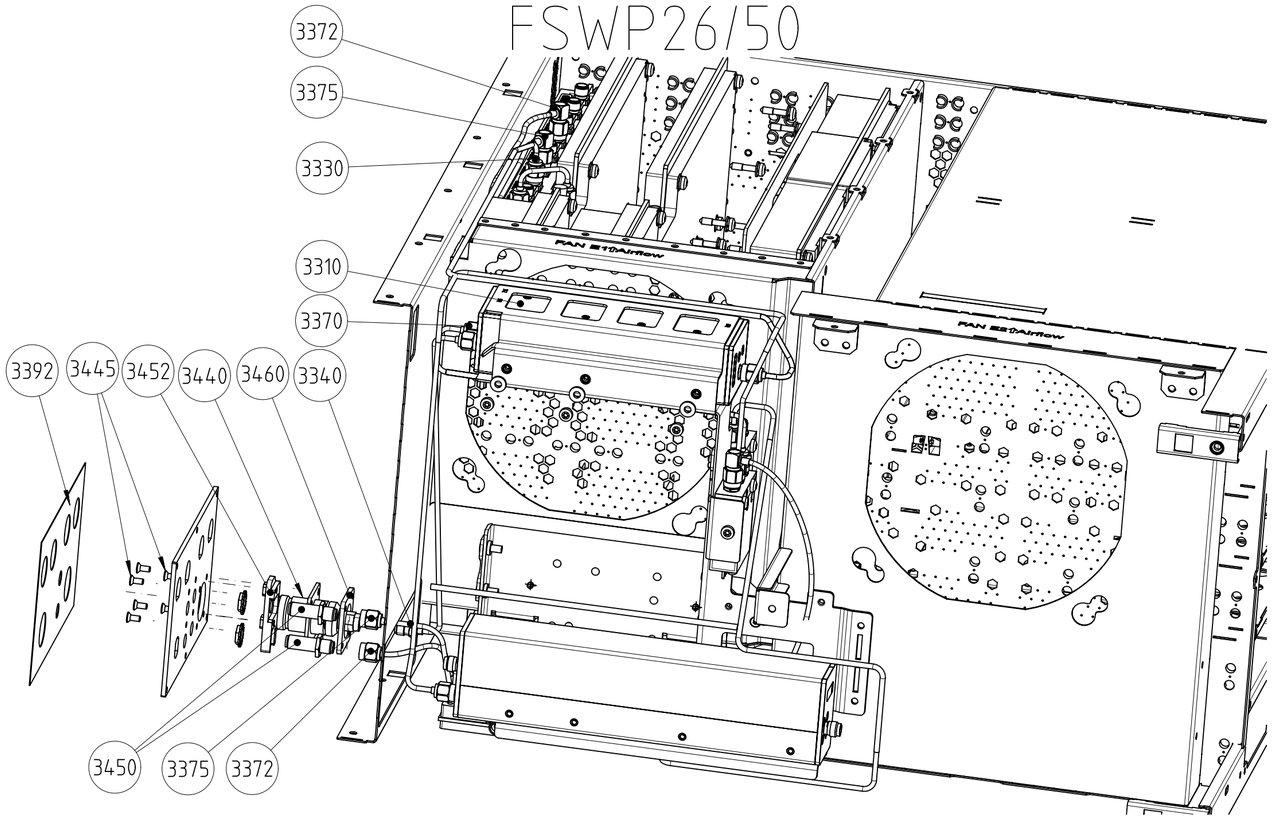
ACHTUNG! Pos. 3380 nur für Nachrüstungen einer FSWP-B64 in einem FSWP8!
Kabel bereits im Grundgerät enthalten, wird aber beim Aufbau einer FSWP-B60 oder FSWP-B61 wieder ausgebaut.

Attention! Pos. 3380 only for backfitting of FSWP-B64 in FSWP8! cable is included in basic device, but it have to be removed at mounting of FSWP-B60 or FSWP-B61!

FSWP8 mit Option B1



FSWP26/50

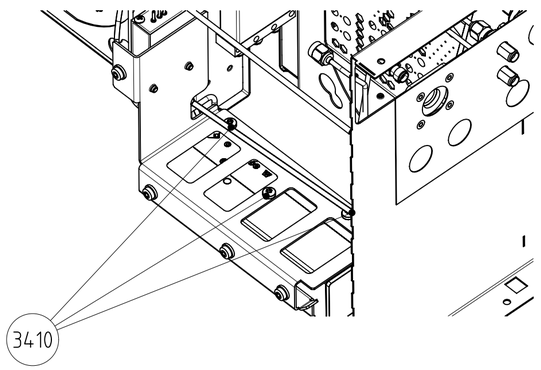


Beim Einbau von FSWP-B64 VAR26/50 müssen folgende Sachnummern aus der Option FSWP-B60 bzw. FSWP-B61 entfernt werden:

At installation of FSWP-B64 VAR26/50 the following numbers of the option FSWP-B60 bzw. FSWP-B61 have to be removed:

- 3583.1610.00 Dämpfungsglied
- 1331.4342.00 HF-Kabel W1106

Ansicht der Eichleitung von unten
view of the attenuator bottom side



ACHTUNG! FSWP-B64 nur in Kombination mit FSWP-B60 oder FSWP-B61 möglich!
attention! FSWP-B64 is only possible in combination with FSWP-B60 or FSWP-B61!

Maßeinheit *Measuring Unit* [mm]

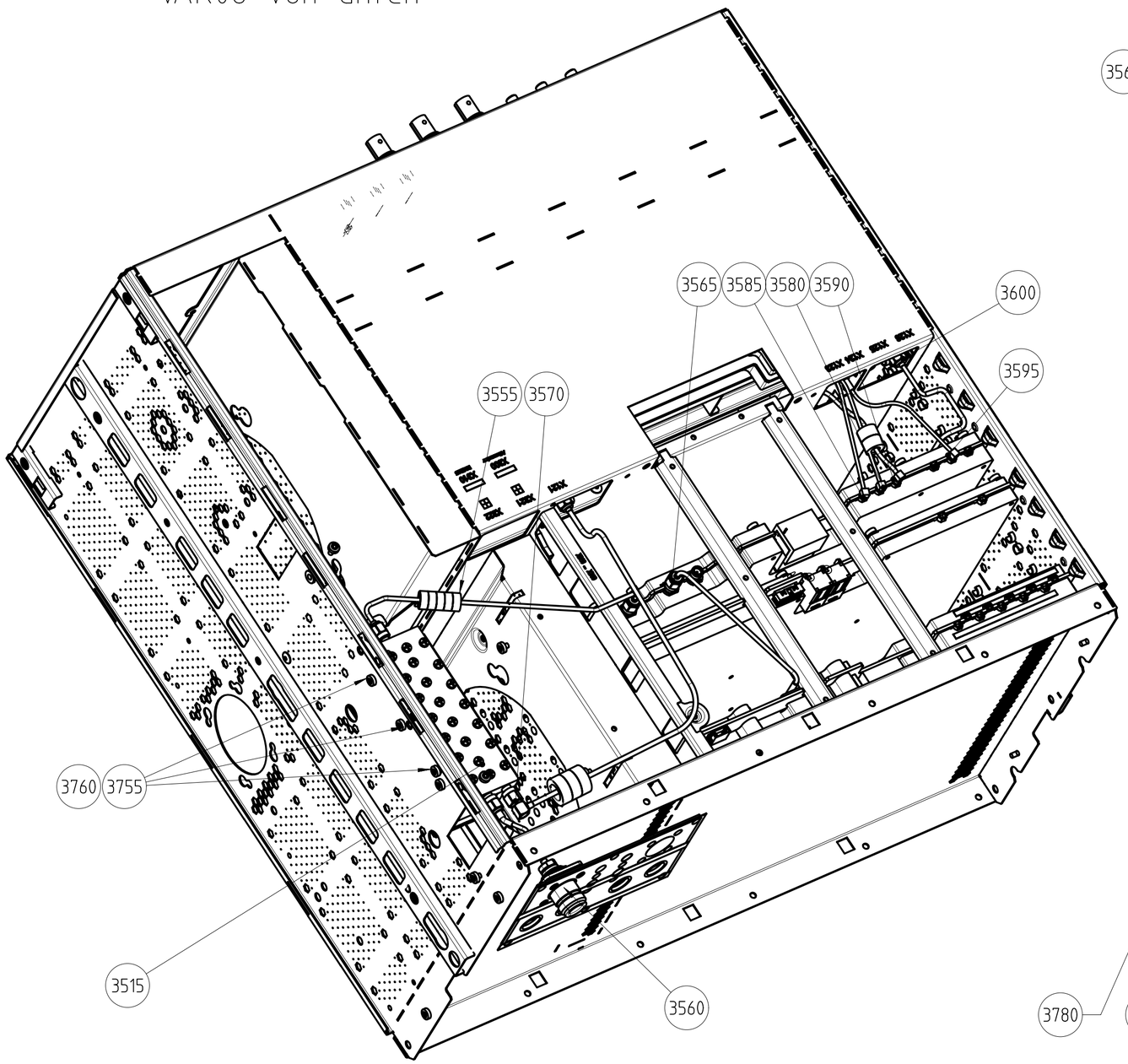
Projektionsmethode *Projection Method*

Maßstab *Scale* 1:2	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* EINBAUANWEISUNG FSWP-B64 ASSEMBLY INSTRUCTION FSWP-B64			Sprache / *Lang.* de en	Aei. / *Cl.* 04.00	Blatt / *Sh.* 2
FSWP-B64	Datum *Date* 2018-10-12	Abteilung *Dept.* 1EC4	Name *Name* Wn	Zeichn.Nr. / *Drawing No.* 1325.2129.00		D

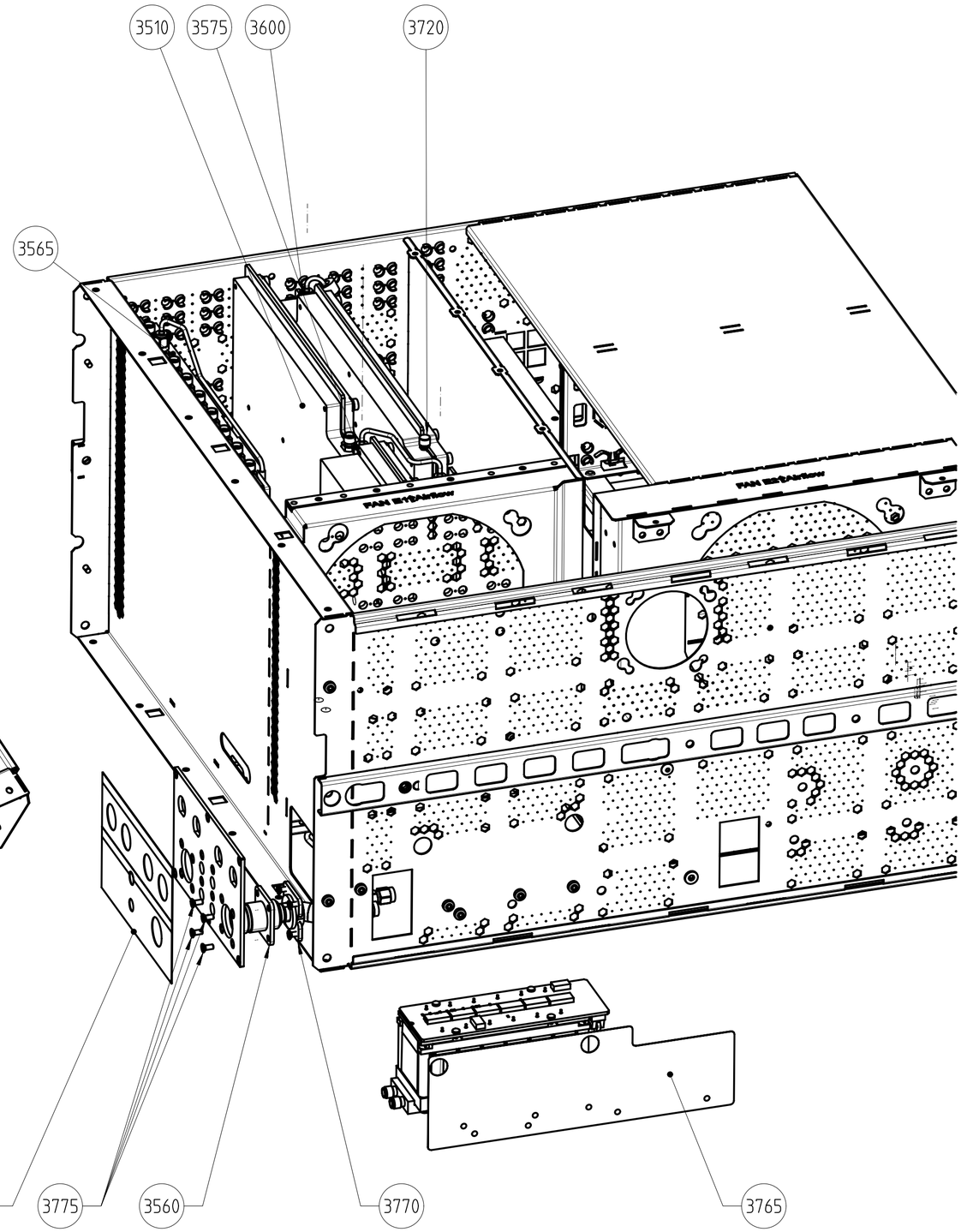
A2

VAR 08

VAR08 von unten



Ansicht von oben



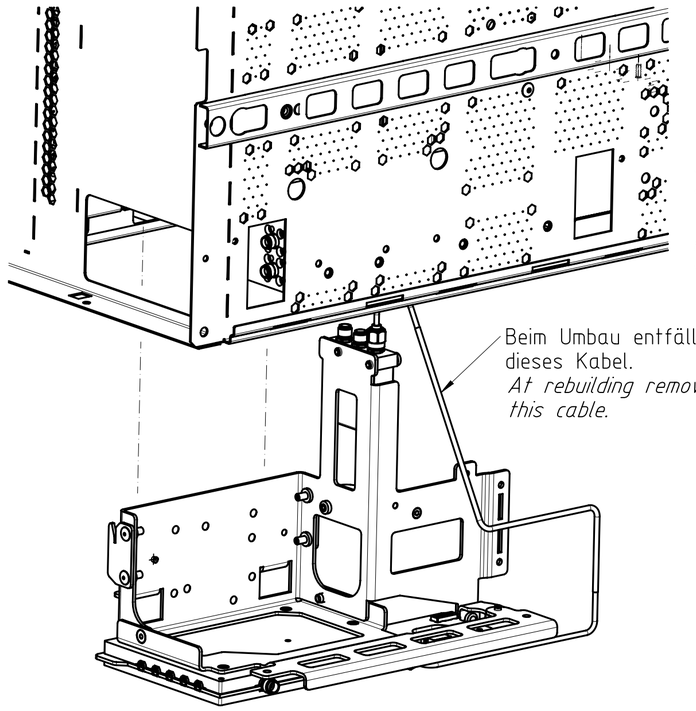
Projektions-methode
Projection Method

Maßstab *Scale* 1:2	Toleranz *Tol.*		Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* EINBAUANWEISUNG FSWP-B1 ASSEMBLY INSTRUCTION FSWP-B1				Sprache / *Lang.* de en	Aei. / *Cl.* 04.00	Blatt / *Sh.* 1
FSWP-B1	Datum *Date* 2015-09-23	Abteilung *Dept.* 1ENK	Name *Name* BUAN		Zeichn.Nr. / *Drawing No.* 1325.2135.00		D

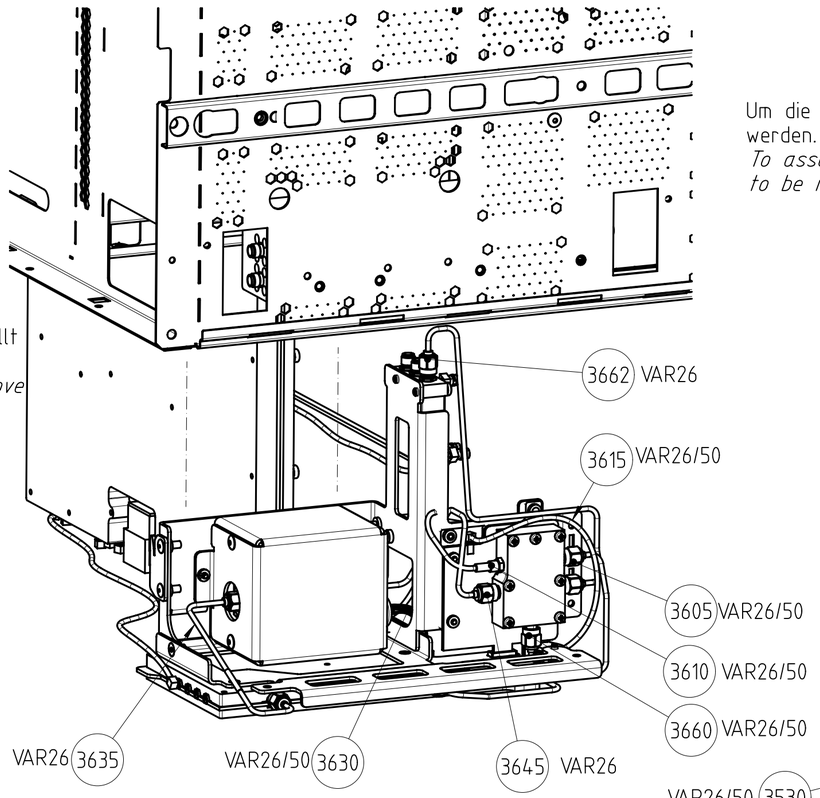
A2

VAR26

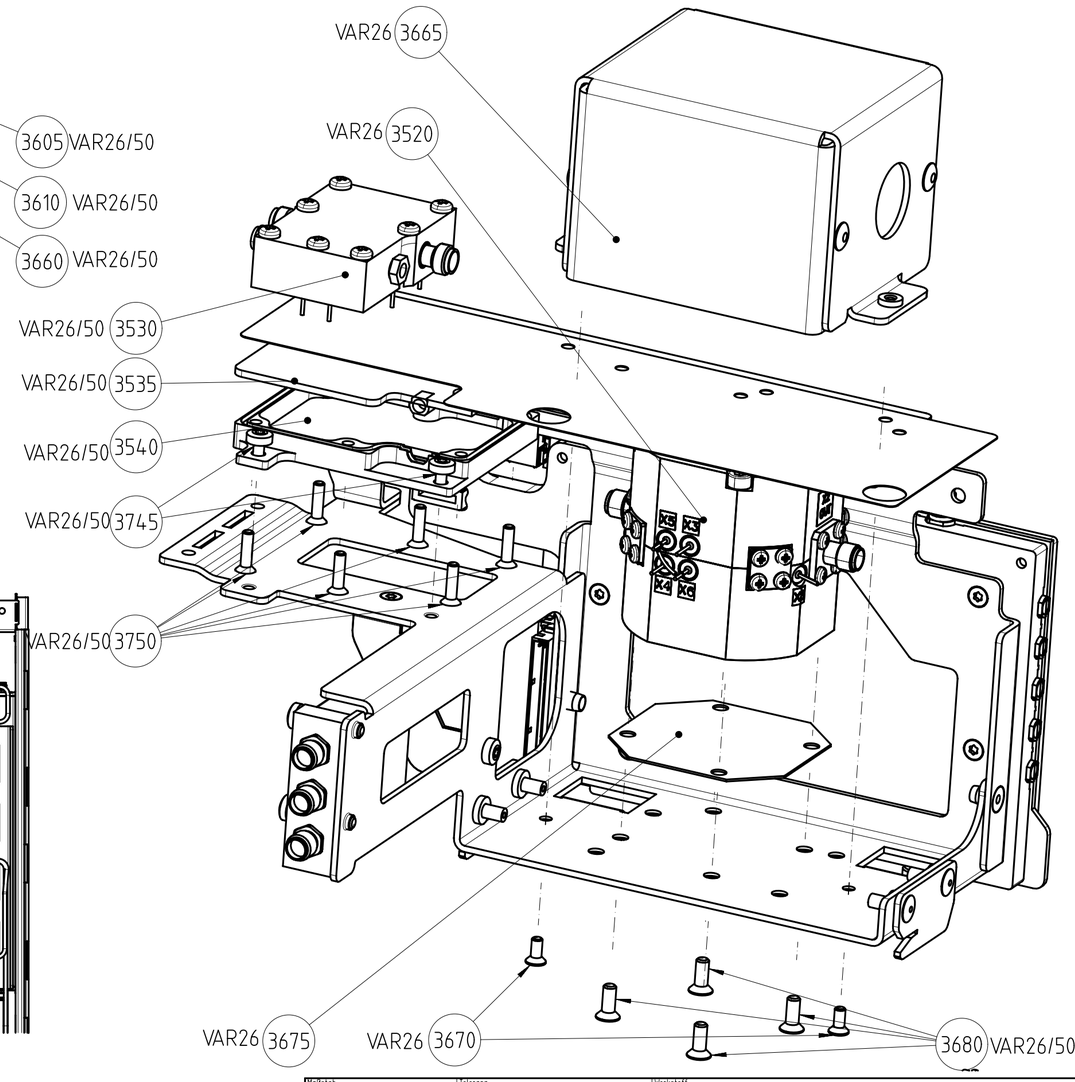
Gesamtgerät ohne Option



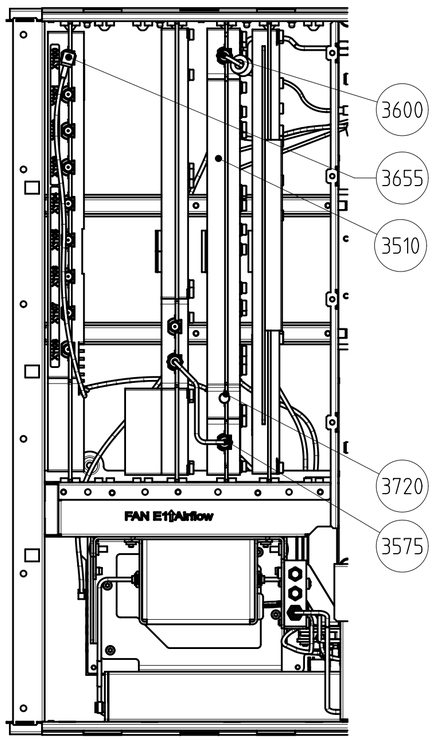
mit Option FSWP-B1



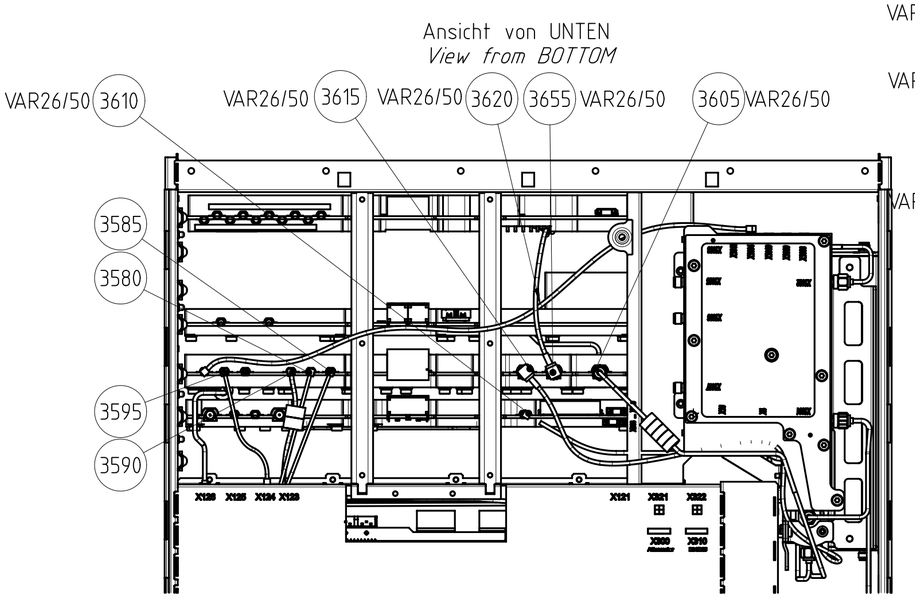
Um die Teile der Option FSWP-B1 einzubauen, muss das Basisblech mit Relais und GS ausgebaut werden. Teile werden wie folgt an das Basisblech montiert:
To assemble the parts of the option FSWP-B1, the basic sheet with relay and GS have to be removed. Parts have to be assemble on the basic sheet:



Ansicht von OBEN
View from TOP



Ansicht von UNTEN
View from BOTTOM



Maßeinheit *Measuring Unit* [mm]

Projektionsmethode *Projection Method*

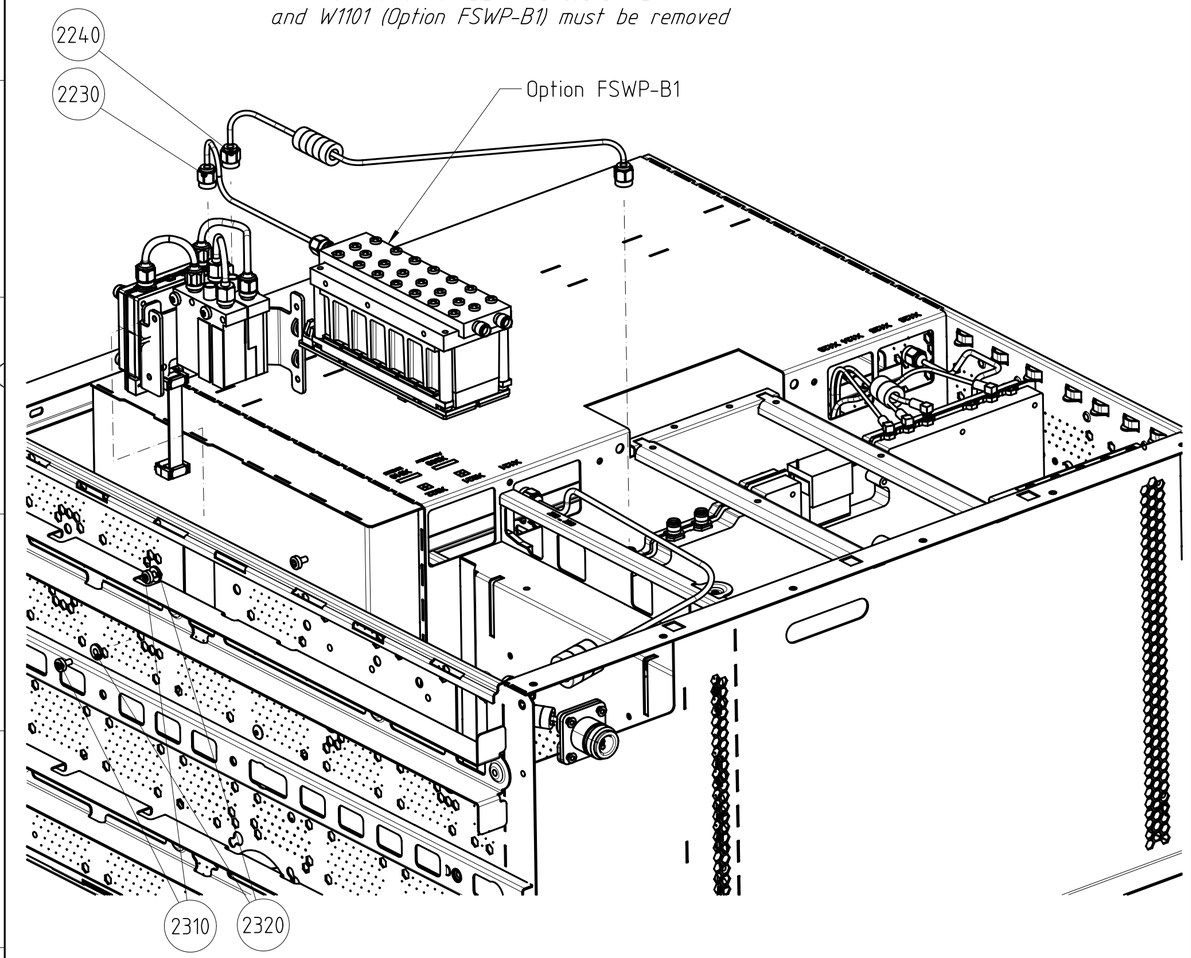
Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*					
ROHDE&SCHWARZ	Benennung / *Designation*	EINBAUANWEISUNG FSWP-B1 ASSEMBLY INSTRUCTION FSWP-B1			Sprache / *Lang.* de en	Aei. / *C.I.* 03.00	Blatt / *Sh.* 2
FSWP-B1	Datum *Date* 2015-02-06	Abteilung *Dept.* 1ESK	Name *Name* BU/AN		Zeichn.Nr. / *Drawing No.* 1325.2135.00		D

A2

VAR08

-Bei Montage von B24 müssen die Kabel W2
und W1101(von der Option FSWP-B1) entfernt werden

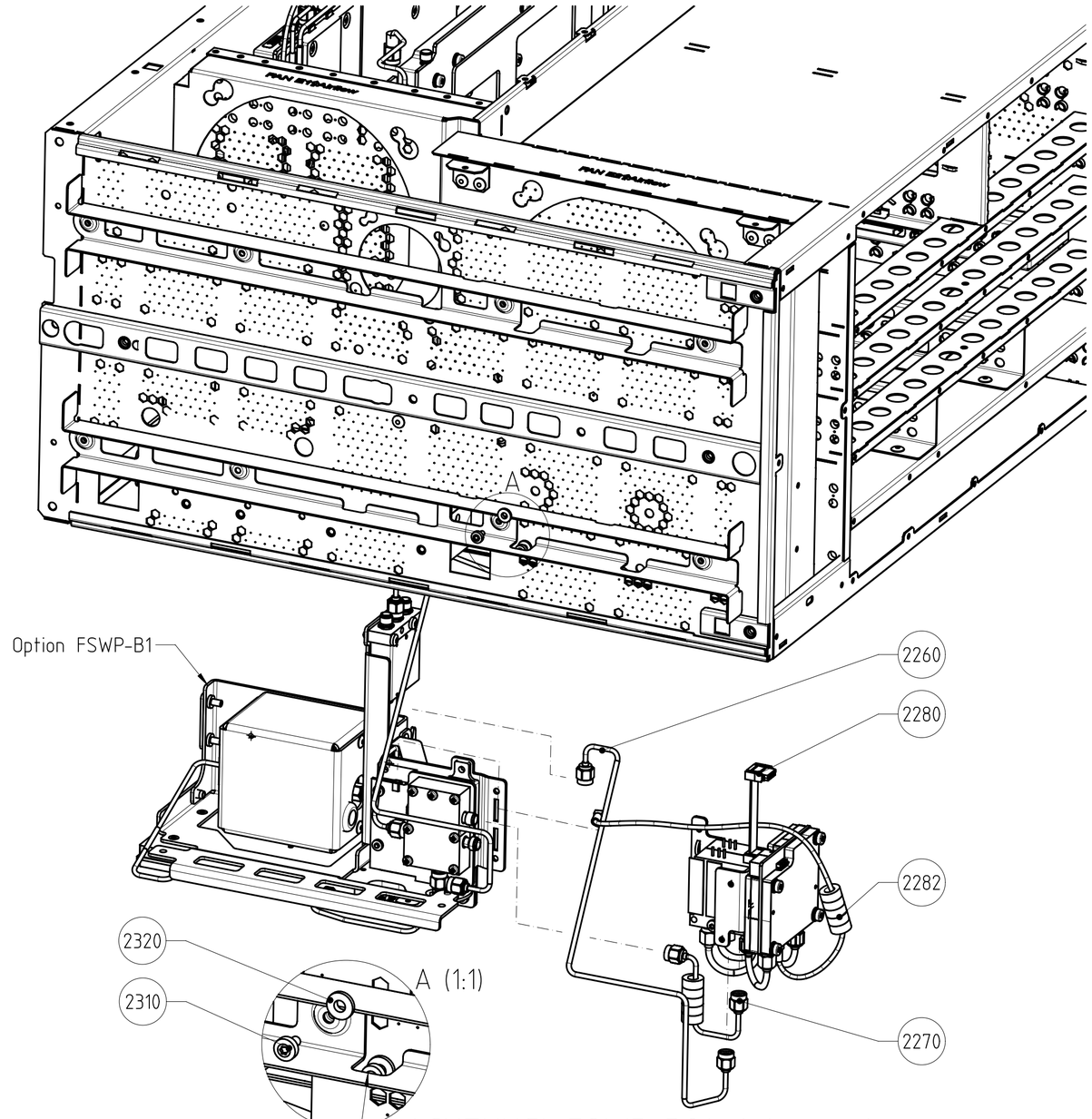
-At installation of B24 the cable W2
and W1101 (Option FSWP-B1) must be removed

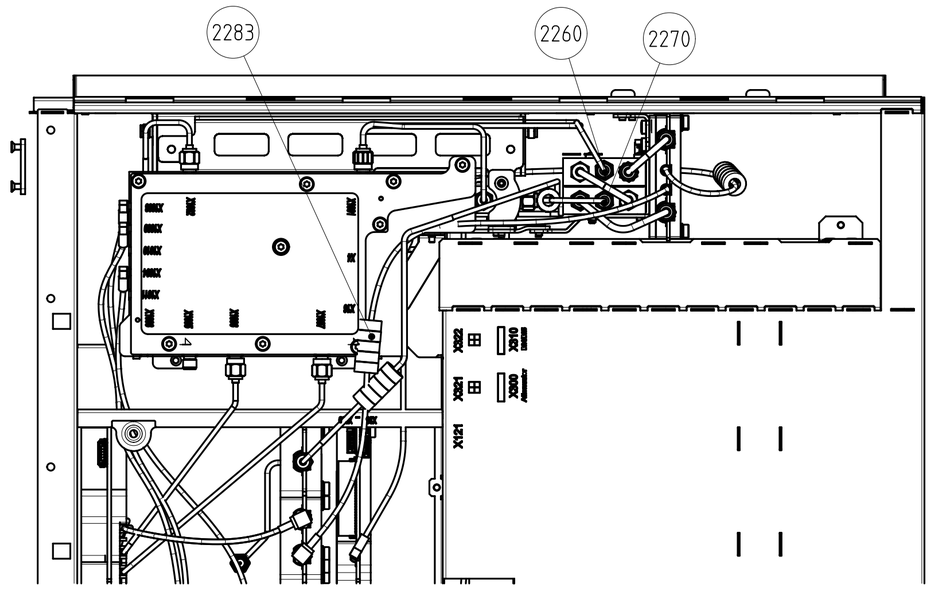


VAR26

-Bei Montage von B24 müssen die Kabel W581
und W18(von der Option FSWP-B1) entfernt werden

-At installation of B24 the cable W581
and W18 (Option FSWP-B1) must be removed





-Beim Einbau oder Service der Option B24
ist die Stützleiste nachzuarbeiten
(ausfeilen für die Schrauben der B24)
wenn die Schraube nicht montiert werden kann

-at installation or service of the option B24
you have to rework the stilt-stay
(file for screw of the option B24)
if the screw cannot be mounted

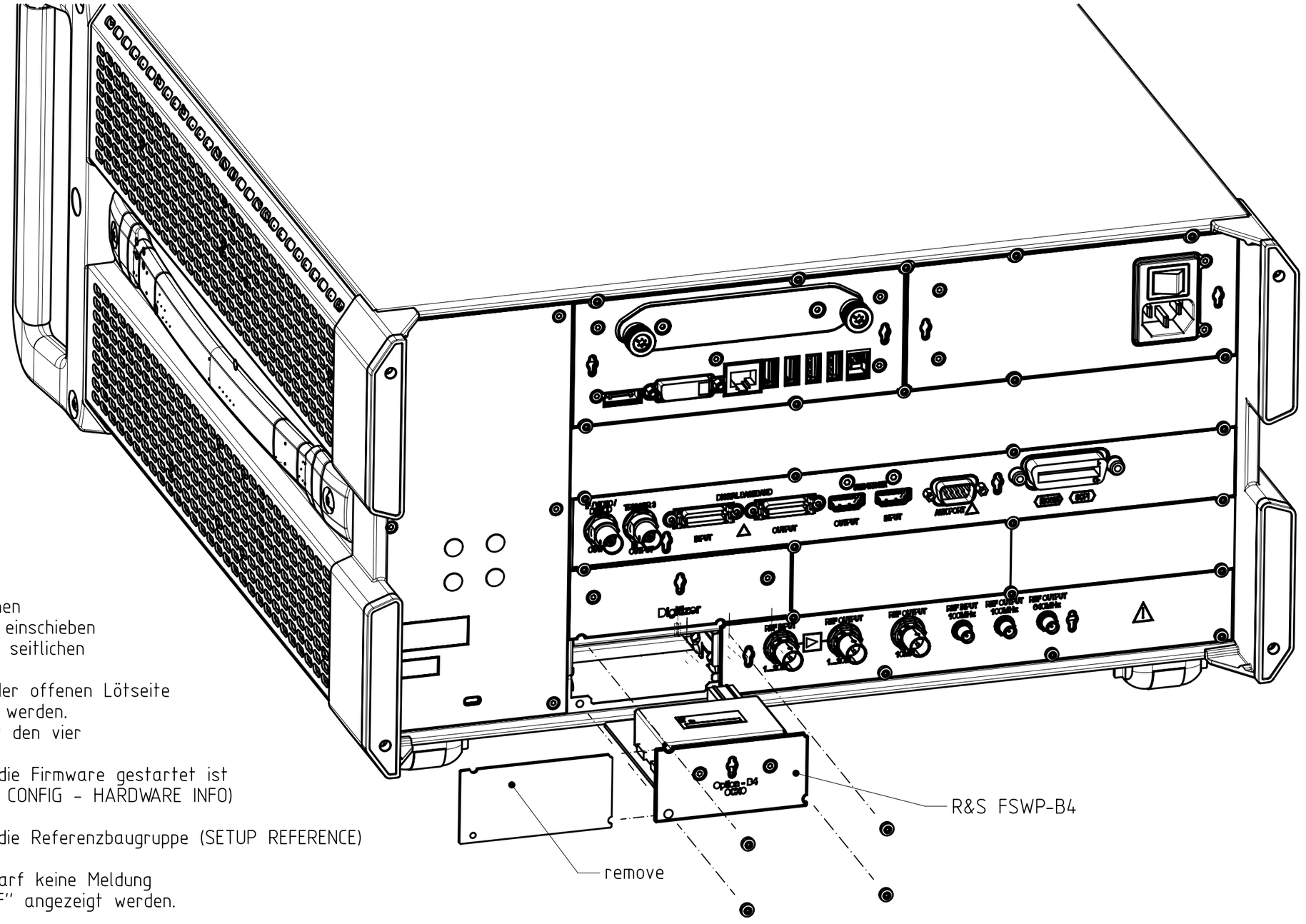
ACHTUNG! FSWP-B24 ist nur in
Kombination mit FSWP-B1 möglich!
ATTENTION! FSWP-B24 is only
possible in combination with FSWP-B1!

Maßstab / Scale: 1:2	Toleranz / Tol.	Werkstoff / Material					
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSWP-B24 / ASSEMBLY INSTRUCTION FSWP-B24				Sprache / Lang.: de en	Aei. / Cl.: 02.00	Blatt / Sh.: 1
FSWP-B24	Datum / Date: 2015-05-06	Abteilung / Dept.: 1ESK	Name / Name: BU/AN		Zeichn.Nr. / Drawing No.: 1325.3877.00		D

Maßeinheit / *Measuring Unit*: [mm]

Projektionsmethode / *Projection Method*

A2



Die OCXO-Baugruppe 1325.3890.XX
kann nachträglich vom Kunden als
Option B4 eingebaut werden.
- Gerät ausschalten und Netzstecker ziehen
- Rückwandblech lösen und die Option B4 einschieben
- Beim Einschieben darauf achten das die seitlichen
Führungen getroffen werden
Ansonsten kann es passieren, dass von der offenen Lötseite
der Optionsbaugruppe Bauteile abgeschert werden.
- Nach dem Einschieben die Baugruppe mit den vier
Rückwandschrauben festschrauben
- Das Gerät einschalten und warten bis die Firmware gestartet ist
- In der Hardwareliste (SETUP - SYSTEM CONFIG - HARDWARE INFO)
nach dem Eintrag OCXO suchen
- Sicherstellen, dass im Einstellmenü für die Referenzbaugruppe (SETUP REFERENCE)
auf "Internal Referenz" geschaltet ist
In der Statusleiste (Display links unten) darf keine Meldung
"LO UNLOCK", "REF UNLOCK" oder "NO REF" angezeigt werden.

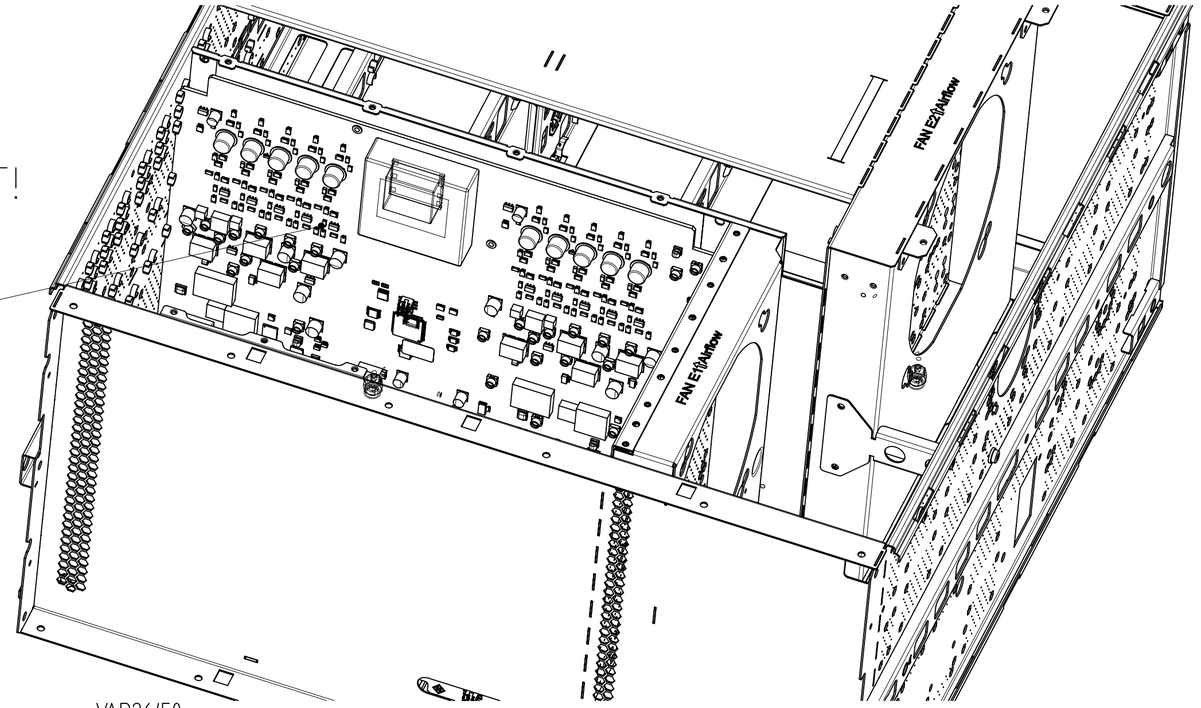
The OCXO assembly 1325.3890.XX can subsequently be installed by the customer as an option B4.
- switch off the instrument and disconnected the power plug
- unscrew the rear panel and insert the option B4
- when pushing in make sure that the slides are met
Otherwise there is a risk that assembly components are sheared off from the open solder side of the option.
- after inserting, fix the module with the four rear screws
- switch on the instrument and wait until the firmware is started
- search in the hardware list (SETUP - SYSTEM CONFIG - HARDWARE INFO) for the entry OCXO
- make sure that the setting of the reference module (SETUP REFERENCE)
is set to "Internal Reference"
In the statusbar (on the left bottom side of the display), check that the messages
"LO UNLOCK", "REF UNLOCK" and "NO REF" are not displayed.

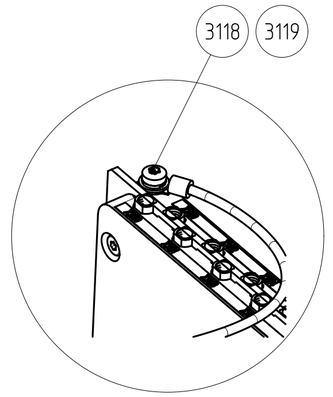
Projektions-methode
Projection Method

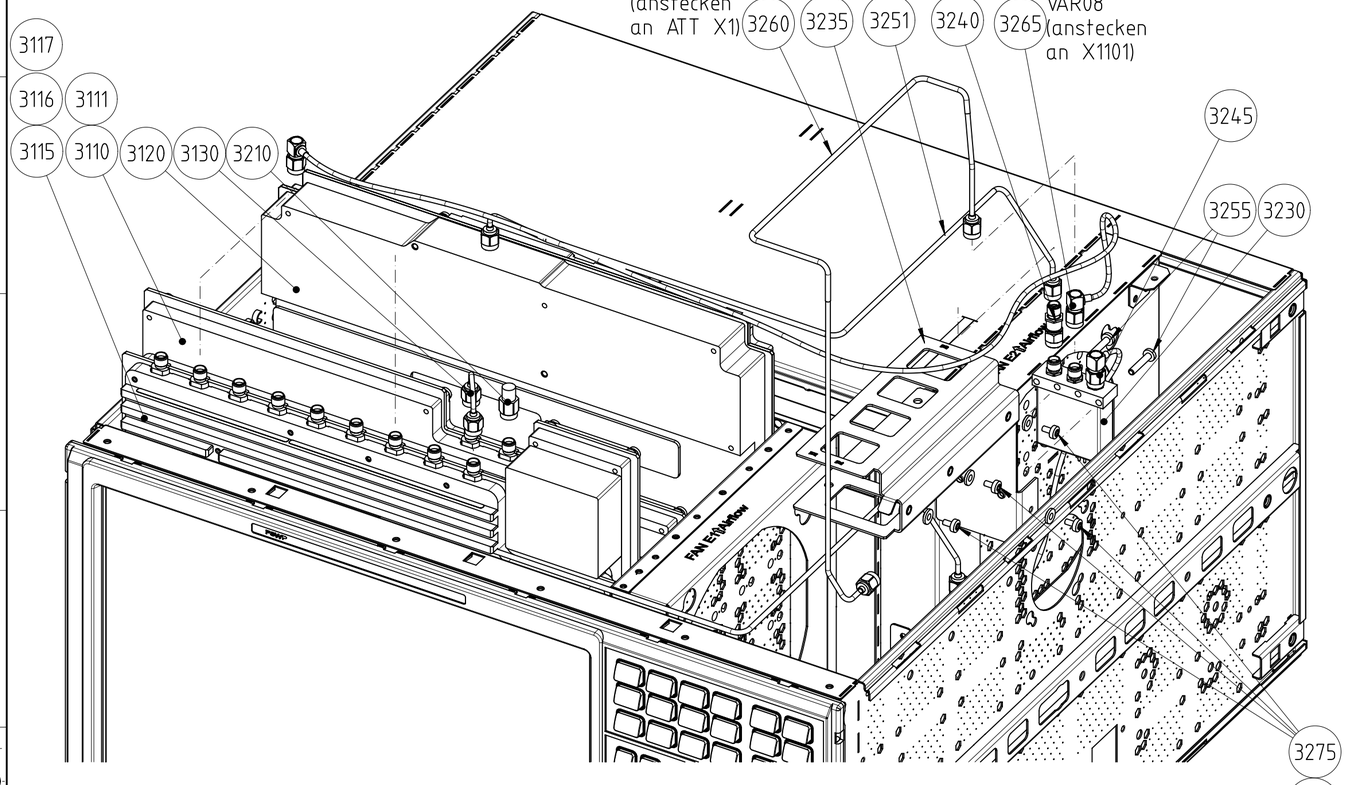
Maßstab *Scale* – ROHDE&SCHWARZ	Toleranz *Tol.*	Werkstoff *Material*	Benennung / *Designation* EINBAUANWEISUNG FSWP B4 ASSEMBLY INSTRUCTION FSWP B4	Sprache / *Lang.* de en	Aei. / *C.I.* 01.00	Blatt / *Sh.* 1
FSWP-B4	Datum *Date* 2015-01-29	Abteilung *Dept.* 1ESK	Name *Name* BUAN	Zeichn.Nr. / *Drawing No.* 1325.4309.00		D

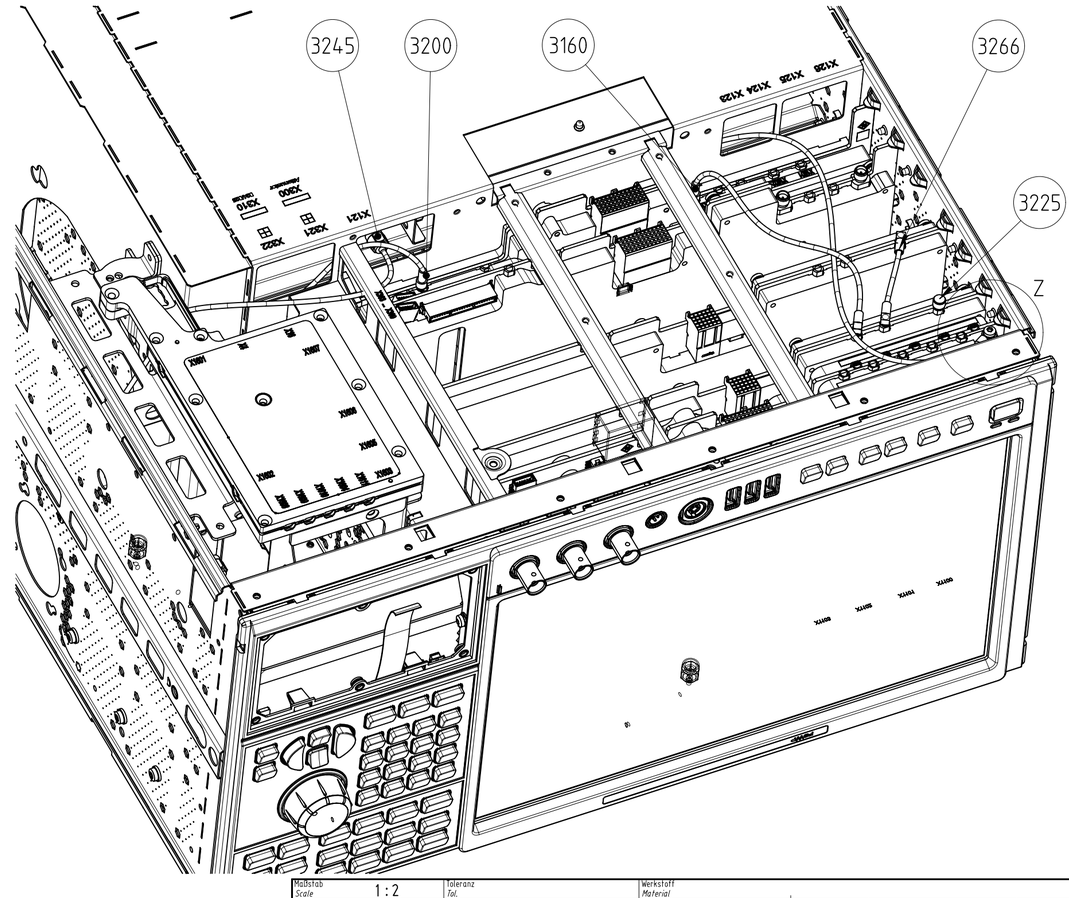
ERSTER SCHRITT!
Folie aufkleben!
(horizontal mittig
vertikal Oberkante)

FIRST STEP!
fix foil
(centered horizontally,
vertically top)









Beim Einbau von Option FSWP-B60 in das Grundgerät FSWP8
muss das Kabel W1101 (1322.8349.00) ausgebaut werden.

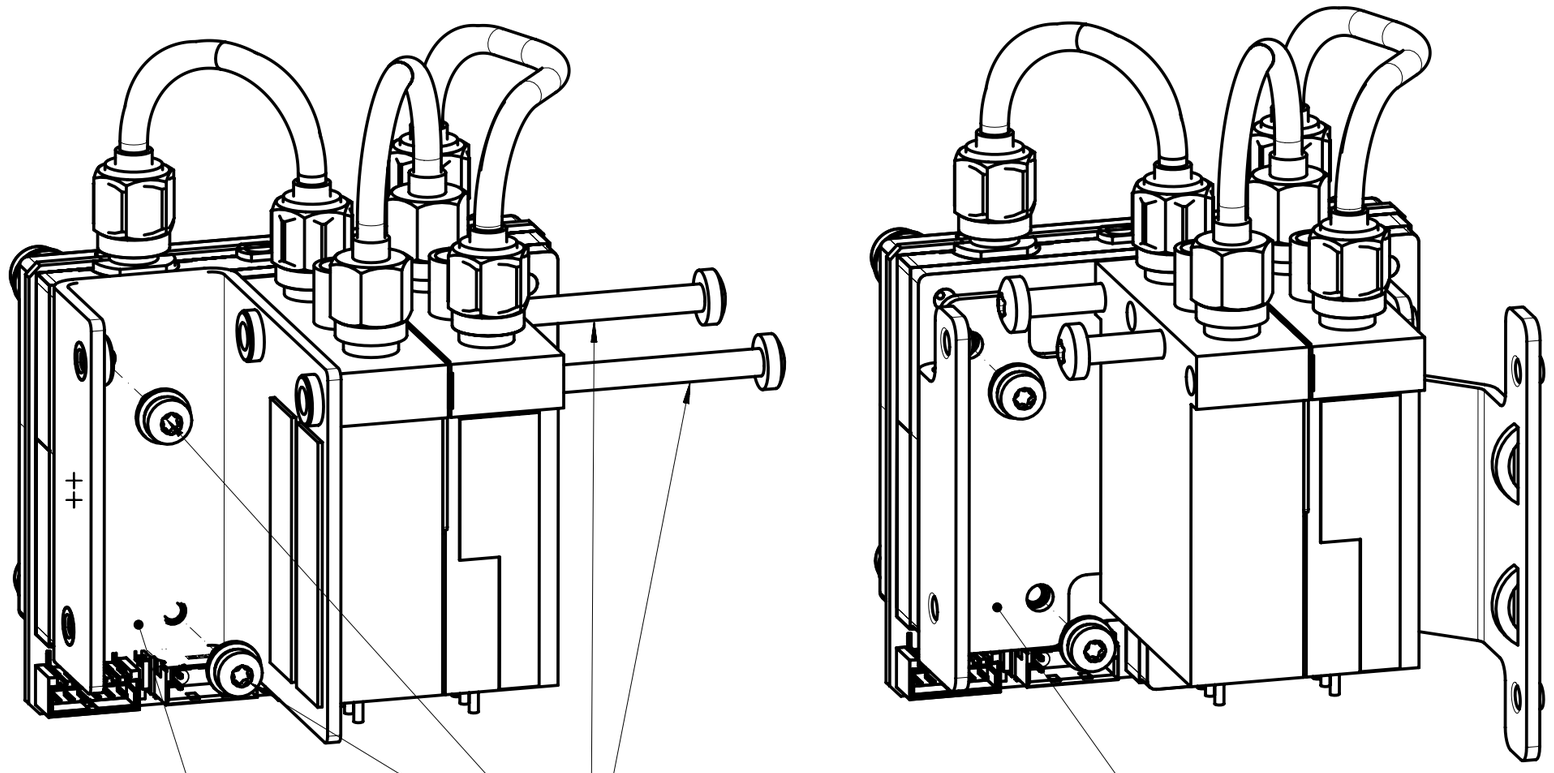
At installation of option FSWP-B60 into FSWP8,
the cable W1101 (1322.8349.00) have to be removed.

Maßstab / Scale 1:2	Toleranz / Tol.	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSWP-B60 / ASSEMBLY INSTRUCTION FSWP-B60			Sprache / Lang. de en	Aei. / Ct. 07.00	Blatt / Sh. 1
FSWP-B60	Datum / Date 2019-12-13	Abteilung / Dept. 1EC4	Name / Name KK	Zeichn.Nr. / Drawing No. 1325.2112.00		D

Projektions-methode
Projection Method

A2

Umbau der Vorverstärkereinheit (Pos.2200 bzw. 2210)
conversion of Preamp Unit (pos.2200 bzw. 2210)



alter Haltewinkel 1313.0226.00
old holding plate 1313.0226.00

Schrauben entfernen
remove screws

neuer Haltewinkel 1325.5205.00
new holding plate 1325.5205.00

Maßeinheit
Measuring Unit
[mm]

Projektions-methode
Projection Method

Maßstab *Scale* 1:1	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung */ Designation* ZUSAMMENBAUANWEISUNG FSWP-B24 MOUNTING INSTRUCTION FSWP-B24			Sprache */ Lang.* de en	Aei. */ C.I.* 01.00	Blatt */ Sh.* 1
FSWP-B24	Datum *Date* 2015-03-31	Abteilung *Dept.* 1ESK	Name *Name* BUAN	Zeichn.Nr. */ Drawing No.* 1331.4288.00		D

A3

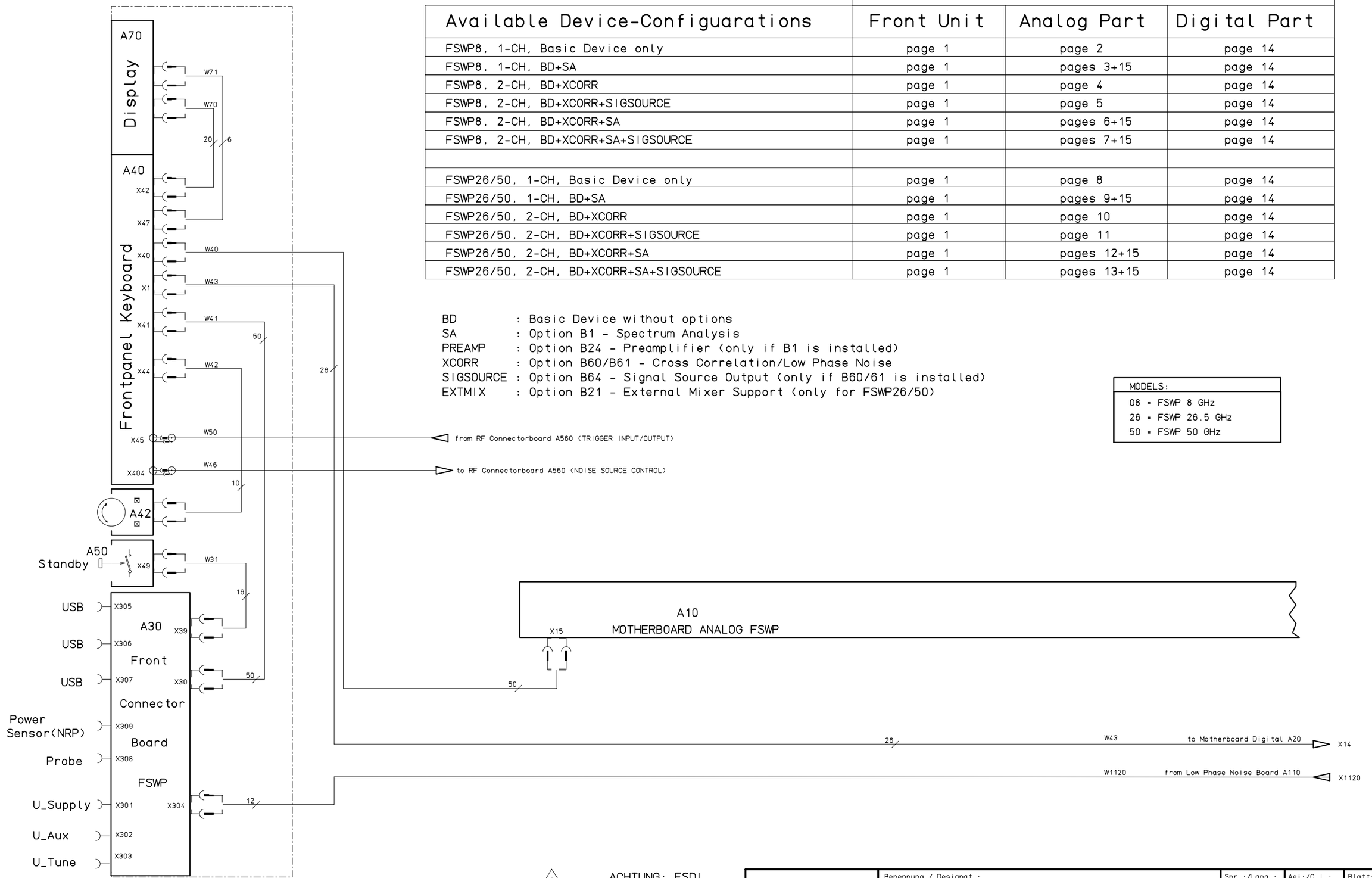
Overview

Available Device-Configuarations	Detailed Description of Front Unit	Analog Part	Digital Part
FSWP8, 1-CH, Basic Device only	page 1	page 2	page 14
FSWP8, 1-CH, BD+SA	page 1	pages 3+15	page 14
FSWP8, 2-CH, BD+XCORR	page 1	page 4	page 14
FSWP8, 2-CH, BD+XCORR+SIGSOURCE	page 1	page 5	page 14
FSWP8, 2-CH, BD+XCORR+SA	page 1	pages 6+15	page 14
FSWP8, 2-CH, BD+XCORR+SA+SIGSOURCE	page 1	pages 7+15	page 14
FSWP26/50, 1-CH, Basic Device only	page 1	page 8	page 14
FSWP26/50, 1-CH, BD+SA	page 1	pages 9+15	page 14
FSWP26/50, 2-CH, BD+XCORR	page 1	page 10	page 14
FSWP26/50, 2-CH, BD+XCORR+SIGSOURCE	page 1	page 11	page 14
FSWP26/50, 2-CH, BD+XCORR+SA	page 1	pages 12+15	page 14
FSWP26/50, 2-CH, BD+XCORR+SA+SIGSOURCE	page 1	pages 13+15	page 14

BD : Basic Device without options
SA : Option B1 - Spectrum Analysis
PREAMP : Option B24 - Preamplifier (only if B1 is installed)
XCORR : Option B60/B61 - Cross Correlation/Low Phase Noise
SIGSOURCE : Option B64 - Signal Source Output (only if B60/61 is installed)
EXTMIX : Option B21 - External Mixer Support (only for FSWP26/50)

MODELS:
08 = FSWP 8 GHz
26 = FSWP 26.5 GHz
50 = FSWP 50 GHz

FRONTPANEL FSWP



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 1 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

FSWP8 BASIC DEVICE (WITHOUT OPTIONS)

X561 RF Input
A560
not fitted
X560 Sig Out
RF CONNECTOR BOARD
not fitted
X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
W46 X404 from Frontpanel Keyboard A40
X565 Trigger In
W50 X45 to Frontpanel Keyboard A40

W1100
W1101
W1109
W1110
W1113
W1114
W1117
W1118
W1120

A110
LOW PHASE NOISE BOARD
X1109 BB_I input
X1110 BB_Q input
X1111 MWC_I1 input
X1112 MWC_Q1 input
X1113 ADC_I1 output
X1114 ADC_Q1 output
X1115 MWC_I2 input
X1116 MWC_Q2 input
X1117 ADC_I2 output
X1118 ADC_Q2 output
X1120 3xDC output
X1100 RF_AC input
X1101 RF_DC input
X1102 LO_MWC2 output
X1103 AUX_LO2 input
X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
X1107 LO_MWC1 output
X1108 SYNTH2 input

X110
12
A10
MOTHERBOARD ANALOG FSWP
X140

A140
SYNTH. 18G
1
X141 50R SMA
X142
X143
X144 50R SMP
X145

to FRONTCONNECTOR BOARD A30 X304
to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232
W7 from REFERENCE A120 X123
W1101 from REFERENCE A120 W1201

MODELS: 08 = FSWP 8 GHz
Configuration: BD only Single Channel Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 2 +
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev	Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		

FSWP8 (BD+SA)

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

X561 RF Input
(Option B1) W1
A560
X2
A60
RF Attenuator 1
(Option B1/B24)
X3
W2 (Option B1)
W23 (Option B24)
W60 (Option B1)
12
X300
from Motherboard Digital A20
Cal In
X4
W3 (Option B1)

not fitted
X560 Sig Out
not fitted
X566 Aux LO1
X567 Aux LO2
RF CONNECTOR BOARD

X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
W46
X404
from Frontpanel Keyboard A40
X565 Trigger In
W50
X45
to Frontpanel Keyboard A40

A270
RF-Preamp-Unit 8GHz
(only if Option B1 is installed)
(details described on page 15)
X1-C
X2-C
X273
W270 (Option B24)
12
X310
from Motherboard Digital A20
W27 (Option B24)

OPTION B24

A110
LOW PHASE NOISE BOARD

W1109	X1109 BB_I input	X1100 RF_AC input	
W1110	X1110 BB_Q input	X1101 RF_DC input	W1101 (Option B1)
	X1111 MMC_I1 input	X1102 LO_MMC2 output	
	X1112 MMC_Q1 input	X1103 AUX_LO2 input	
W1113	X1113 ADC_I1 output	X1104 SYNTH1 input	W1104
W1114	X1114 ADC_Q1 output	X1105 AUX_LO1 input	
	X1115 MMC_I2 input	X1106 SIG_OUT output	
	X1116 MMC_Q2 input	X1107 LO_MMC1 output	
W1117	X1117 ADC_I2 output	X1108 SYNTH2 input	
W1118	X1118 ADC_Q2 output		
W1120	X1120 3xDC output		

X110
12
A10
MOTHERBOARD ANALOG FSWP
to FRONTCONNECTOR BOARD A30
X304

to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232

OPTION B1

A100
FE 8G
X101 RF In
X111 Presel
X109 LO1
X107 IF2 MMC
50R
X110 IF1
X102 IF3 Out +
X103 IF3 Out -
X112 Presel In
X105 IF2
X104 IF3 Wide
X106 LO3In
X108 LO2

A140
SYNTH. 18G
1
X141
X142
X143
X144
X145
W4
50R SMP
X140
X100

W6 to Detector Board A200 X209
W5 to Detector Board A200 X208
W22 to Wide Band ADC A290 X292
W9 to REFERENCE A120 X126
W8 to REFERENCE A120 X124
W7 to REFERENCE A120 X123
W3 from REFERENCE A120
X121

MODELS: 08 = FSWP 8 GHz
Configuration:
BD+B1+(B24)
Single Channel Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ

FSWP

Benennung / Designat.:
FSWP PHASE NOISE ANALYZER
FSWP PHASE NOISE ANALYZER

Datum: Date: 2016-07-28
Abteilung: Dept.: 1ENK
Name: Name: iliev

Spr.:/Lang.: de en
Aei:/C.I.: 06.00
Blatt:/Sh.: 3 +

Zeichn.Nr.:/Drawing No.:
1322.8003.01 S

FSWP8 (BD+XCORRELATION)

Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)

additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

X561 RF Input
A560
not fitted
X560 Sig Out
RF CONNECTOR BOARD
not fitted
X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
X565 Trigger In
W46 X404 from Frontpanel Keyboard A40
W50 X45 to Frontpanel Keyboard A40
W588
W591
W1100
W590
A590 Relais
fixed attenuator 6dB
W1106
W1109 X1109 BB_I input
W1110 X1110 BB_Q input
A110
X1111 MMC_I1 input
X1112 MMC_Q1 input
X1113 ADC_I1 output
X1114 ADC_Q1 output
X1115 MMC_I2 input
X1116 MMC_Q2 input
X1117 ADC_I2 output
X1118 ADC_Q2 output
X1120 3xDC output
X1100 RF_AC input
X1101 RF_DC input
X1102 LO_MMC2 output
X1103 AUX_LO2 input
X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
X1107 LO_MMC1 output
X1108 SYNTH2 input
LOW PHASE NOISE BOARD
W1104
W1108 (Option B60/B61)
OPTION B60
OPTION B61
A180 SYNTH. 18G 2
A150 REFERENCE 2
A140 SYNTH. 18G 1
X141 50R SMA
X142
X143
X144 50R SMP
X145
X1503
X1506
X1507
X1508
X1501
X1502
X1504
X1509
X1505
(Option B60/B61) W159
X17
X110
X180
X150
X140
12
A10
MOTHERBOARD ANALOG FSWP
W155 (Option B60/B61)
W77 (Option B61)
to FRONTCONNECTOR BOARD A30 X304
to DIGITIZER A230 X236
to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232
W7 from REFERENCE A120 X123
W591 from REFERENCE A120 X121

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

MODELS: 08 = FSWP 8 GHz
Configuration: BD+B60/B61 2-Channel-Device

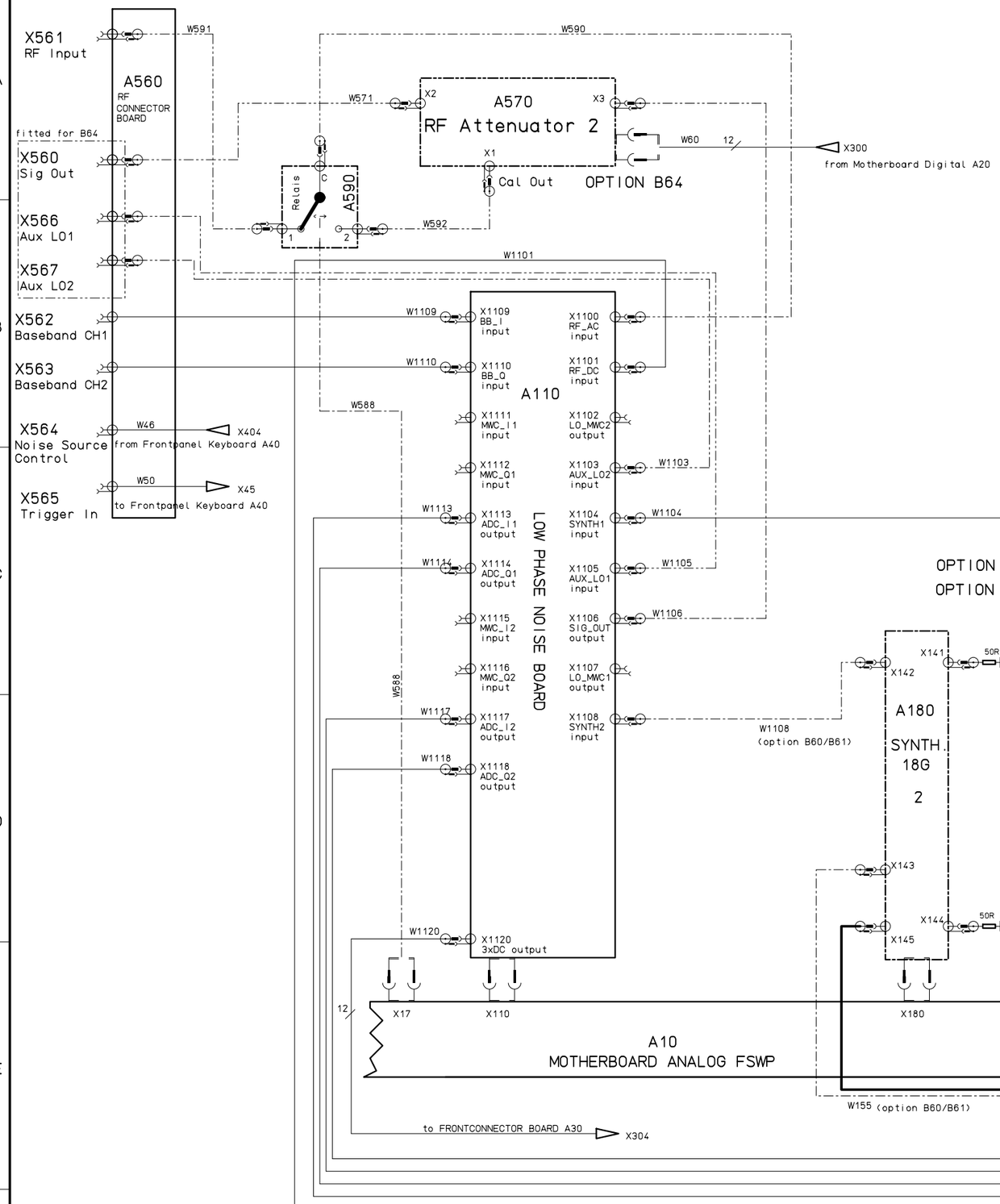
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 4 +
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev	Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		

FSWP8 (BD+XCORRELATION+SIGNALSOURCE)



Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)

additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

MODELS: 08 = FSWP 8 GHz
Configuration: BD+B60/B61+B64 2-Channel-Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER FSWP PHASE NOISE ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 5 +
FSWP	Datum: Date: 2016-07-28 / Abteilung: Dept.: 1ENK / Name: Name: iliev	Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		

FSWP8 (BD+XCORRELATION+SA)

Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)

additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

X561 RF Input
A560
W1
OPTION B1
A60
RF Attenuator 1
X2
X3
X1
Cal In
W590
Relais
A590
fixed attenuator
6dB
W1106
12
W60
X300
from Motherboard Digital A20
W2 (option B1)
W23 (option B24)
OPTION B24
A270
RF-Preamp-Unit 8GHz
(only if Option B1 is installed)
(details described on page 15)
X1-C
X2-C
X273
from Motherboard Digital A20
W270 (Option B24)
X310
W27 (option B24)
not fitted
X560 Sig Out
not fitted
X566 Aux LO1
X567 Aux LO2
RF CONNECTOR BOARD
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
W46
X404
from Frontpanel Keyboard A40
X565 Trigger In
W50
X45
to Frontpanel Keyboard A40
W588
W591
W1109
W1110
W1101
A110
LOW PHASE NOISE BOARD
X1109 BB_I input
X1110 BB_Q input
X1111 MMC_I1 input
X1112 MMC_Q1 input
X1113 ADC_I1 output
X1114 ADC_Q1 output
X1115 MMC_I2 input
X1116 MMC_Q2 input
X1117 ADC_I2 output
X1118 ADC_Q2 output
X1120 3xDC output
X1100 RF_AC input
X1101 RF_DC input
X1102 LO_MMC2 output
X1103 AUX_LO2 input
X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
X1107 LO_MMC1 output
X1108 SYNTH2 input
W1104
W1108 (option B60/61)
OPTION B60
OPTION B61
A180
SYNTH. 18G 2
X141
X142
X143
X144
X145
50R SMA
50R SMP
A150
REFERENCE 2
X1505
X1503
X1506
X1507
X1508
X1501
X1502
X1504
X1509
(Option B60/B61) W159
A140
SYNTH. 18G 1
SMP 50R
OPTION B1
A100 FE 8G
X101 RF In
X111 Presel
X109 LO1
X107 IF2 MWC
X110 IF1
X102 IF3 Out +
X103 IF3 Out -
X112 Presel In
X105 IF2
X104 IF3 Wide
X106 LO3In
X108 LO2
W4
W7
12
X17
X110
X180
X150
X140
X100
A10
MOTHERBOARD ANALOG FSWP
W155 (option B60/61)
W77 (option B61)
to FRONTCONNECTOR BOARD A30
X304
to DIGITIZER A230
X236
X235
X234
X233
X232
W6 to Detector Board A200
X209
W5 to Detector Board A200
X208
W22 to Wide Band ADC A290
X292
W9 to REFERENCE A120
X126
W8 to REFERENCE A120
X124
from REFERENCE A120
X123
W591 from REFERENCE A120
X121

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

MODELS: 08 = FSWP 8 GHz
Configuration:
BD+B60/B61+B1+(B24)
2-Channel-Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 6 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

FSWP8 (BD+XCORRELATION+SA+SIGSOURCE)

Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)

additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

OPTION B1
X561 RF Input
A560 RF CONNECTOR BOARD
fitted for B64
X560 Sig Out
X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
X565 Trigger In
W1 W46 W50 W571 W591 W588
X404 from Frontpanel Keyboard A40
X45 to Frontpanel Keyboard A40
A60 RF Attenuator 1
X1 Cal In
W590
W60 12 from Motherboard Digital A20 X300
A570 RF Attenuator 2
X1 Cal Out
OPTION B64
A590 Relais
W592
W2(option B1)
OPTION B24
A270 RF-Preamp-Unit 8GHz
(only if Option B1 is installed)
(details described on page 15)
X1-C X2-C
W23 (option B24)
from Motherboard Digital A20
X273 W270 12 X310
W27 (option B24)
A110 LOW PHASE NOISE BOARD
X1109 BB_I input
X1110 BB_Q input
X1111 MMC_I1 input
X1112 MMC_Q1 input
X1113 ADC_I1 output
X1114 ADC_Q1 output
X1115 MMC_I2 input
X1116 MMC_Q2 input
X1117 ADC_I2 output
X1118 ADC_Q2 output
X1120 3xDC output
X1100 RF_AC input
X1101 RF_DC input
X1102 LO_MMC2 output
X1103 AUX_LO2 input
X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
X1107 LO_MMC1 output
X1108 SYNTH2 input
W1109 W1110 W1103 W1104 W1105 W1106 W1108 (option B60/B61) W1117 W1118 W1120
OPTION B60
OPTION B61
A180 SYNTH. 18G 2
X141 X142 X143 X144 X145 50R SMA 50R SMP
A150 REFERENCE 2
X1503 X1506 X1507 X1508 X1505 X1501 X1502 X1504 X1509
(Option B60/B61) W155g
W155 (option B60/B61)
W77 (option B61)
A140 SYNTH. 18G 1
W4
OPTION B1
A100 FE 8G
X101 RF In
X111 Presel
X109 LO1
X107 IF2 MWC
X110 IF1
X102 IF3 Out +
X103 IF3 Out -
X112 Presel In
X105 IF2
X104 IF3 Wide
X106 LO3In
X108 LO2
50R SMP
A10 MOTHERBOARD ANALOG FSWP
X17 X110 X180 X150 X140 X100
12
W1101
W7
to FRONTCONNECTOR BOARD A30 X304
to DIGITIZER A230 X236
to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232
W6 to Detector Board A200 X209
W5 to Detector Board A200 X208
W22 to Wide Band ADC A290 X292
W9 to REFERENCE A120 X126
W8 to REFERENCE A120 X124
from REFERENCE A120 X123
W591 from REFERENCE A120 X121

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

MODELS: 08 = FSWP 8 GHz
Configuration:
BD+B60/B61+B64+B1+(B24)
2-Channel-Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.
For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 7 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

FSWP26/50 BASIC DEVICE (WITHOUT OPTIONS)

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

not fitted
X568
X569
X561 RF Input
A560
RF CONNECTOR BOARD
not fitted
X560 Sig Out
not fitted
X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
X565 Trigger In

W1 X2 A60 RF Attenuator 1 X3
Cal In X1
W580
12 W60 X300 from Motherboard Digital A20

= K-Connector for VAR26 / 2,4mm-Connector for VAR50

A580
Relais bistable, 26/50GHz
W581
always 2,4mm-Connector

W46 X404 from Frontpanel Keyboard A40
W50 X45 to Frontpanel Keyboard A40

A110 LOW PHASE NOISE BOARD

W1109	X1109 BB_I input	X1100 RF_AC input	
W1110	X1110 BB_Q input	X1101 RF_DC input	always K-Connector, W582
X1610 from MWC50X A161, W1111	X1111 MWC_I1 input	X1102 LO_MWC2 output	W1102
X1611 from MWC50X A161, W1112	X1112 MWC_Q1 input	X1103 AUX_LO2 input	
W1113	X1113 ADC_I1 output	X1104 SYNTH1 input	W1104
W1114	X1114 ADC_Q1 output	X1105 AUX_LO1 input	
X1608 from MWC50X A161, W1115	X1115 MWC_I2 input	X1106 SIG_OUT output	
X1609 from MWC50X A161, W1116	X1116 MWC_Q2 input	X1107 LO_MWC1 output	W1107
W1117	X1117 ADC_I2 output	X1108 SYNTH2 input	
W1118	X1118 ADC_Q2 output		
W1120	X1120 3xDC output		

X110

A161
MW CONVERTER FRONTEND 50X
VAR26 for FSWP26
VAR50 for FSWP50

X1601 X4 X1602 X1605 LO X1603 IF
Ext-Mix

X1606 LO1_IN (W1107, W1102)
X1607 LO2_IN (W1102)
X1604 IF Out 1GHz - 2GHz

X1608 I_CH2 W1115 X1115
X1609 Q_CH2 W1116 X1116
X1610 I_CH1 W1111 X1111
X1611 Q_CH1 W1112 X1112
to LPNB (A110)

X16 X179
W14 50 W34 12

A140 SYNTH. 18G 1
X141 50R SMA
X142
X143
X144 50R SMP
X145
X140

A170 MWC BASE BOARD 50
X361 X369
X367 IF_IN
X363 PREAMP
X362 CAL_OUT
X365 1.3 GHz_OUT
X366 1.3 GHz_OUT
X368 LO2 In
X160

W589

12
A10 MOTHERBOARD ANALOG FSWP
X16

to FRONTCONNECTOR BOARD A30 X304

to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232

W7 from REFERENCE 1 A120 X123
W3 from REFERENCE 1 A120 X121

MODELS: 26 = FSWP 26 GHz
50 = FSWP 50 GHz

Configuration:
BD only
Single Channel Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER				Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 8 +
	FSWP PHASE NOISE ANALYZER				Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev				

FSWP26/50 (BD+SA)

= K-connector for VAR26 / 2,4mm-connector for VAR50

not fitted.
X568
X569
X561 RF Input
A560 RF CONNECTOR BOARD
not fitted
X560 Sig Out
not fitted
X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
X565 Trigger In
W46 X404 from Frontpanel Keyboard A40
W50 X45 to Frontpanel Keyboard A40

A60 RF Attenuator 1
X1 Cal In
X2 X3 W1 W580 W60 12 X300 from Motherboard Digital A20

A580 Relais bistable, 26/50GHz
W581 (Option B1)
W582
W589
W23 (Option B24)

A270 RF-Preamp-Unit 26/50GHz
(only if Option B1 is installed)
(details described on page 15)
X1-C X2-C
(only for 26 GHz) X276 X275
OPTION B24
(only for 26GHz) from Motherboard Digital A20 X310
12 X363 from MMC BB 50 A170 (only for 50GHz)
W27 (Option B24)
W276 (only for 26 GHz + B24)
W275 (only for 26 GHz + B24)
W10
W11

always K-Connector

always 2.4mm-Connector

YIG-FILTER 26 / 50 GHz
A162
X1 X2 W30 W31 W1 W17

A340 TRIPLEXER
X168 RF In
X7 8-50G
X9 8-50G
X169 30M-8G Out
X6 Cal Inp.
X501 X502 X503 X504 X505
TRIPLEXER BOARD X340
X169 RF Direct DC ... 80M

A161 MW CONVERTER FRONTEND 50X
VAR26 for FSWP26
VAR50 for FSWP50
X1601 X4 X1602 X1605 LO X1603 IF
Ext-Mix
X1608 I_CH2 W1115 X1115
X1609 Q_CH2 W1116 X1116
X1610 I_CH1 W1111 X1111
X1611 Q_CH1 W1112 X1112
to LPNB (A110)

A110 LOW PHASE NOISE BOARD
from MMC50X A161
X1610 W1111 X1111 MMC_I1 input
X1611 W1112 X1112 MMC_Q1 input
W1113 X1113 ADC_I1 output
W1114 X1114 ADC_Q1 output
X1608 W1115 X1115 MMC_I2 input
X1609 W1116 X1116 MMC_Q2 input
W1117 X1117 ADC_I2 output
W1118 X1118 ADC_Q2 output
W1120 X1120 3xDC output
X1109 BB_I input
X1110 BB_Q input
X1111 MMC_I1 input
X1112 MMC_Q1 input
X1113 ADC_I1 output
X1114 ADC_Q1 output
X1115 MMC_I2 input
X1116 MMC_Q2 input
X1117 ADC_I2 output
X1118 ADC_Q2 output
X1100 RF_AC input
X1101 RF_DC input
W1102 X1102 LO_MMC2 output
X1103 AUX_LO2 input
W1104 X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
W1107 X1107 LO_MMC1 output
X1108 SYNTH2 input
W1109 W1110 W1100

A140 SYNTH. 18G 1
X141 X142 X143 X144 X145 50R SMP

A100 FE 8G
X101 RF In
50R X110 IF1
X112 Presel In
X111 Presel
X107 IF2 MMC
X102 IF3 Out +
X103 IF3 Out -
X105 IF2
X104 IF3 Wide
X109 LO1
X106 LO3In
X108 LO2
W4 W134
W18 (only for 50 GHz + B24)
W29 (only for 26 GHz + B24)

OPTION B1

A170 MMC BASE BOARD 50
X1607 X1606 X1604 IF Out 10Hz - 2GHz
X16 X179
W14 50 W34 12
X361 X369
X367 IF_IN
X363 PREAMP
X362 CAL_OUT
X365 1.3 GHz_OUT
X366 1.3 GHz_OUT
X368 LO2 In
W270
to preamp unit A270 only for FSWP50

X110 X16 X140 X100 X160

12
A10 MOTHERBOARD ANALOG FSWP

to FRONTCONNECTOR BOARD A30 X304
to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232
W6 to Detector Board A200 X209
W5 to Detector Board A200 X208
W22 to Wide Band ADC A290 X292
W9 to REFERENCE 1 A120 X126
W8 to REFERENCE 1 A120 X124
W7 from REFERENCE 1 A120 X123
W3 from REFERENCE 1 A120 X121

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

MODELS: 26 = FSWP 26 GHz
50 = FSWP 50 GHz
Configuration:
BD+B1+(B24)
Single Channel Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.
For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 9 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

FSWP26/50 (BD+XCORR)

OPTION B21

fitted for B21
X568 IF_in
X569 LO_out

X561 RF Input
A560 RF CONNECTOR BOARD
not fitted X560 Sig Out
not fitted X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
X565 Trigger In
W46 from Frontpanel Keyboard A40 X404
W50 to Frontpanel Keyboard A40 X45

A60 RF Attenuator 1
W1 X2 X3 W580
X1 Cal In
12 W60 X300 from Motherboard Digital A20
W590

A590 Relais
fixed attenuator 6dB
W1106

A580 Relais bistable, 26/50GHz
W581
always K-Connector
W582 W589

always 2,4mm-Connector
W20 W21

NOTE:
= K-connector for VAR26 / 2,4mm-connector for VAR50

Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)

additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

A110 LOW PHASE NOISE BOARD
W588 W591
W1109 X1109 BB_I input
W1110 X1110 BB_Q input
W1111 X1111 MMC_I1 input
W1112 X1112 MMC_Q1 input
W1113 X1113 ADC_I1 output
W1114 X1114 ADC_Q1 output
W1115 X1115 MMC_I2 input
W1116 X1116 MMC_Q2 input
W1117 X1117 ADC_I2 output
W1118 X1118 ADC_Q2 output
W1120 X1120 3xDC output
X1100 RF_AC input
X1101 RF_DC input
X1102 LO_MMC2 output
X1103 AUX_LO2 input
X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
X1107 LO_MMC1 output
X1108 SYNTH2 input
from MMC50X A161: X1610 X1611 X1608 X1609

OPTION B60
OPTION B61

A180 SYNTH. 18G 2
X141 50R SMA
X142 X143 X144 X145
W1107
W1108 (Option B60/B61)
50R SMP

A150 REF. 2
X1503 X1506 X1507 X1505 X1508 X1501 X1502 X1504 X1509
(Option B60/B61) W159

A140 SYNTH. 18G 1
X141 50R SMA
X142 X143 X144 X145
50R SMP

A161 MW CONVERTER FRONTEND 50X
VAR26 for FSWP26
VAR50 for FSWP50
X1601 X4 X1602 X1605 LO X1603 IF
Ext-Mix
W1107 W1102
X1606 X1607 X1604 IF Out 1GHz - 2GHz
X1608 I_CH2 W1115 X1115
X1609 Q_CH2 W1116 X1116
X1610 I_CH1 W1111 X1111
X1611 Q_CH1 W1112 X1112
to LPNB (A110)
X16 X179
W14 50 W34 12

A170 MWC BASE BOARD 50
X361 X369
X367 IF_IN
X363 PREAMP
X362 CAL_OUT
X365 1.3 GHz_OUT
X366 1.3 GHz_OUT
X368 LO2 In

A10 MOTHERBOARD ANALOG FSWP
X17 X110 X16 X180 X150 X140 X160
12
W1120
W155 (Option B60/B61)
W77 (Option B61)
to FRONTCONNECTOR BOARD A30 X304
to DIGITIZER A230 X236
to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232
W7 from REFERENCE 1 A120 X123
W591 from REFERENCE 1 A120 X121

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

MODELS: 26 = FSWP 26 GHz
50 = FSWP 50 GHz
Configuration:
BD+B60/B61+(B21)
2-Channel-Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.
For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 10 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.:		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev	1322.8003.01 S		

FSWP26/50 (BD+XCORR+SIGSOURCE)

OPTION B21

fitted for B21
X568 IF_in
X569 LO_out
X561 RF Input
A560 RF CONNECTOR BOARD
fitted for B64
X560 Sig Out
X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
X565 Trigger In
W46 from Frontpanel Keyboard A40 X404
W50 to Frontpanel Keyboard A40 X45

A60 RF Attenuator 1
Cal In
from Motherboard Digital A20 W60 X300
A580 Relais bistable, 26/50GHz
W580
W581
A570 RF Attenuator 2
OPTION B64
Cal Out
A590 Relais
W571 W590 W592 W582 W589 W588

always K-Connector
always 2,4mm-Connector
W20 W21

NOTE:
= K-connector for VAR26 / 2,4mm-connector for VAR50

Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)

additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

A110 LOW PHASE NOISE BOARD
X1109 BB_I input
X1110 BB_Q input
X1111 MWC_I1 input
X1112 MWC_Q1 input
X1113 ADC_I1 output
X1114 ADC_Q1 output
X1115 MWC_I2 input
X1116 MWC_Q2 input
X1117 ADC_I2 output
X1118 ADC_Q2 output
X1120 3xDC output
X1100 RF_AC input
X1101 RF_DC input
X1102 LO_MWC2 output
X1103 AUX_LO2 input
X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
X1107 LO_MWC1 output
X1108 SYNTH2 input
from MWC50X A161 X1610 W1111 X1611 W1112 X1608 W1115 X1609 W1116
W1109 W1110 W591 W1113 W1114 W1117 W1118 W1120 W1103 W1104 W1105 W1106 W1107 W1108 (Option B60/B61)

OPTION B60
OPTION B61

A180 SYNTH. 18G 2
X141 50R SMA
X142 X143 X144 X145 50R SMP
A150 REF.2
X1503 X1506 X1507 X1508 X1505 X1501 X1502 X1504 X1509
(Option B60/B61) W159
A140 SYNTH. 18G 1
X141 50R SMA X142 X143 X144 50R SMP X145

A161 MW CONVERTER FRONTEND 50X
VAR26 for FSWP26
VAR50 for FSWP50
X1601 X4 X1602 X1605 LO X1603 IF Ext-Mix
X1606 X1607 X1604 IF Out 1GHz - 2GHz
X1608 I_CH2 W1115 X1115
X1609 Q_CH2 W1116 X1116
X1610 I_CH1 W1111 X1111
X1611 Q_CH1 W1112 X1112
W1107 W1102
to LPNB (A110)
X16 X179
W14 50 W34 12

A170 MWC BASE BOARD 50
X361 X369
X367 IF_IN
X363 PREAMP
X362 CAL_OUT
X365 1.3 GHz_OUT
X366 1.3 GHz_OUT
X368 LO2 In

A10 MOTHERBOARD ANALOG FSWP
X17 X110 X16 X180 X150 X140 X160
12
W155 (Option B60/B61)
W77 (Option B61)
to FRONTCONNECTOR BOARD A30 X304
to DIGITIZER A230 X236
to DIGITIZER A230 X235
to DIGITIZER A230 X234
to DIGITIZER A230 X233
to DIGITIZER A230 X232
W7 from REFERENCE 1 A120 X123
W591 from REFERENCE 1 A120 X121

MODELS: 26 = FSWP 26 GHz
50 = FSWP 50 GHz
Configuration:
BD+B60/B61+B64+(B21)
2-Channel-Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.
For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 11 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

FSWP26/50 (BD+XCORR+SA)

NOTE: ▭ = K-connector for VAR26 / 2,4mm-connector for VAR50

OPTION B21

fitted for B21
X568 IF_in
X569 LO_out

X561 RF Input
A560 RF CONNECTOR BOARD
not fitted X560 Sig Out
not fitted X566 Aux LO1
X567 Aux LO2
X562 Baseband CH1
X563 Baseband CH2
X564 Noise Source Control
X565 Trigger In

A60 RF Attenuator 1
Cal In
from Motherboard Digital A20
A580 Relais bistable, 26/50GHz
A590 Relais fixed attenuator 6dB

always K-Connector
always 2,4mm-Connector

OPTION B24
A270 RF-Preamp-Unit 26/50GHz
(only if Option B1 is installed)
(details described on page 15)
(only for 26GHz) from Motherboard Digital A20
from MMC BB 50 A170 (only for 50GHz)
(only for 26 GHz) X276 X275

YIG-FILTER 26 / 50 GHz
A162

A340 TRIPLEXER
TRIPLEXER BOARD
X168 RF In
X169 30M-8G Out
X6 Cal Inp.
X169 RF Direct DC ... 80M

A161 MW CONVERTER FRONTEND 50X
VAR26 for FSWP26
VAR50 for FSWP50
X1601 X4 X1602 X1605 LO X1603 IF Ext-Mix

Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)
additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

A110 LOW PHASE NOISE BOARD
X1109 BB_I input
X1110 BB_Q input
X1111 MMC_I1 input
X1112 MMC_Q1 input
X1113 ADC_I1 output
X1114 ADC_Q1 output
X1115 MMC_I2 input
X1116 MMC_Q2 input
X1117 ADC_I2 output
X1118 ADC_Q2 output
X1120 3xDC output
X1100 RF_AC input
X1101 RF_DC input
X1102 LO_MMC2 output
X1103 AUX_LO2 input
X1104 SYNTH1 input
X1105 AUX_LO1 input
X1106 SIG_OUT output
X1107 LO_MMC1 output
X1108 SYNTH2 input
from MMC50X A161 X1608 X1609 X1610 X1611

OPTION B60
OPTION B61

A180 SYNTH. 18G 2
A150 REF. 2
A140 SYNTH. 18G 1
50R SMA 50R SMP

OPTION B1
A100 FE 8G
X101 RF In
X110 IF1
X112 Presel In
X111 Presel
X107 IF2 MMC
X102 IF3 Out +
X103 IF3 Out -
X105 IF2
X104 IF3 Wide
X109 LO1
X106 LO3In
X108 LO2

A170 MMC BASE BOARD 50
X361 X369
X367 IF_IN
X363 PREAMP
X362 CAL_OUT
X365 1.3 GHz_OUT
X366 1.3 GHz_OUT
X368 LO2 In
to preamp unit A270 only for FSWP50

A10 MOTHERBOARD ANALOG FSWP
X17 X110 X16 X180 X150 X140 X100 X160

to LPNB (A110)
X1608 I_CH2 X1609 Q_CH2 X1610 I_CH1 X1611 Q_CH1
X1606 X1607 X1604 IF Out 1GHz - 2GHz
X16 X179

to FRONTCONNECTOR BOARD A30 X304
to DIGITIZER A230 X236 X235 X234 X233 X232
from Frontpanel Keyboard A40 X404
to Frontpanel Keyboard A40 X45
from REFERENCE 1 A120 X123
W591 from REFERENCE 1 A120 X121
W6 to Detector Board A200 X209
W5 to Detector Board A200 X208
W22 to Wide Band ADC A290 X292
W9 to REFERENCE 1 A120 X126
W8 to REFERENCE 1 A120 X124

MODELS:	26 = FSWP 26 GHz 50 = FSWP 50 GHz
Configuration:	BD+B60/B61+B1+(B24) 2-Channel-Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 12 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

FSWP26/50 (BD+XCORR+SA+SIGSOURCE)

NOTE: ▭ = K-connector for VAR26 / 2,4mm-connector for VAR50

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

OPTION B21

fitted for B21
- X568 IF_in
- X569 LO_out

X561 RF Input

A560 RF CONNECTOR BOARD

fitted for B64
- X560 Sig Out
- X566 Aux LO1
- X567 Aux LO2

X562 Baseband CH1

X563 Baseband CH2

X564 Noise Source Control

X565 Trigger In

W46 from Frontpanel Keyboard A40 X404

W50 to Frontpanel Keyboard A40 X45

A60 RF Attenuator 1 (X1 Cal In, X2, X3)

W580

A580 Relais bistable, 26/50GHz

from Motherboard Digital A20 W60 X300

W581 (Option B1)

OPTION B24

A270 RF-Preamp-Unit 26/50GHz
(only if Option B1 is installed)
(details described on page 15)

(only for 26GHz) from Motherboard Digital A20 X310

from MMC BB 50 A170 (only for 50GHz) X363

X273, X1-C, X2-C

(only for 26 GHz) X276 X275

W23 (Option B24)

W27 (Option B24)

W275 (only for 26 GHz + B24)

W276 (only for 26 GHz + B24)

A570 RF Attenuator 2 (X1 Cal Out, X2, X3)

A590 Relais (C, 1, 2)

W571, W590, W592

W582, W589

OPTION B64

always K-Connector

always 2.4 mm connector

Option B60 (Standard XCORRELATION)
-> Cabling according to dash-dot-lines

Option B61 (Low Phase Noise XCORRELATION)
-> Cabling according to dash-dot-lines
-> Install FSWP-B4-Option (place at REFERENCE 1 A260/X139)

additionally the following modification:
(see bold line + comment):
- Cable W77 between A140/X144 and A180/X145

W588, W591

A110 LOW PHASE NOISE BOARD

- X1109 BB_I input
- X1110 BB_Q input
- X1111 MMC_I1 input
- X1112 MMC_Q1 input
- X1113 ADC_I1 output
- X1114 ADC_Q1 output
- X1115 MMC_I2 input
- X1116 MMC_Q2 input
- X1117 ADC_I2 output
- X1118 ADC_Q2 output
- X1120 3xDC output
- X1100 RF_AC input
- X1101 RF_DC input
- X1102 LO_MMC2 output
- X1103 AUX_LO2 input
- X1104 SYNTH1 input
- X1105 AUX_LO1 input
- X1106 SIG_OUT output
- X1107 LO_MMC1 output
- X1108 SYNTH2 input

from MMC50X A161: X1610 W1111, X1611 W1112, X1608 W1115, X1609 W1116

W1109, W1110, W1100, W1102, W1103, W1104, W1105, W1106, W1107, W1108 (Option B60/B61)

OPTION B60 OPTION B61

A180 SYNTH. 18G 2 (X141, X142, X143, X144, X145)

50R SMA, 50R SMP

W155 (Option B60/B61)

A150 REF. 2 (X1501, X1502, X1503, X1504, X1505, X1506, X1507, X1508, X1509)

(Option B60/B61) W159

A140 SYNTH. 18G 1 (X141, X142, X143, X144, X145)

W4

OPTION B1

A100 FE 8G

- X101 RF In
- X110 IF1
- X112 Presel In
- X111 Presel
- X107 IF2 MMC
- X102 IF3 Out +
- X103 IF3 Out -
- X105 IF2
- X104 IF3 Wide
- X109 LO1
- X106 LO3In
- X108 LO2

W276 (only for 26 GHz + B24), W18 (NOT for 26 GHz + B24)

OPTION B21

YIG-FILTER 26 / 50 GHz A162 (X1, X2)

W20, W21, W30, W31, W1, W17

A340 TRIPLEXER
- X168 RF In
- X169 30M-8G Out
- X6 Cal Inp.

TRIPLEXER BOARD X340
- X501, X502, X503, X504, X505
- X169 RF Direct DC...80M

W10, W11

A161 MW CONVERTER FRONTEND 50X

VAR26 for FSWP26
VAR50 for FSWP50

- X7 8-50G
- X9 8-50G
- X1601
- X4
- X1602
- X1605 LO
- X1603 IF
- Ext-Mix
- X1606 IF Out 1GHz - 2GHz
- X1607
- X1604

W1107, W1102, W134

X16, X179

W14 50, W34 12

X1608 I_CH2 W1115 X1115
X1609 Q_CH2 W1116 X1116
X1610 I_CH1 W1111 X1111
X1611 Q_CH1 W1112 X1112

to LPNB (A110)

A170 MWC BASE BOARD 50
- X361, X369
- X367 IF_IN
- X363 PREAMP
- X362 CAL_OUT
- X365 1.3 GHz_OUT
- X366 1.3 GHz_OUT
- X368 LO2 In

to preamp unit A270 only for FSWP50

W270

X17, X110, X16, X180, X150, X140, X100, X160

A10 MOTHERBOARD ANALOG FSWP

W77 (Option B61)

to FRONTCONNECTOR BOARD A30 X304

to DIGITIZER A230: X236, X235, X234, X233, X232

W6 to Detector Board A200 X209
W5 to Detector Board A200 X208
W22 to Wide Band ADC A290 X292
W9 to REFERENCE 1 A120 X126
W8 to REFERENCE 1 A120 X124

W7 from REFERENCE 1 A120 X123

W591 from REFERENCE 1 A120 X121

MODELS: 26 = FSWP 26 GHz
50 = FSWP 50 GHz

Configuration:
BD+B60/B61+B64+B1+(B24+B21)
2-Channel-Device

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 13 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

A300
OPTION
X251

A20
MOTHERBOARD DIGITAL FSWP

X91
X92
X93
X94
A90
IPC11
W91_DATA
15
W92_POWER
A92
SATA
ADAPTOR
A91
SYSTEM
DRIVE

X81
X82
A80
POWER SUPPLY
Power
Line

from LPNB
(A110)
X1113 I_CH1 W1113
X1114 Q_CH1 W1114
X1117 I_CH2 W1117
X1118 Q_CH2 W1118
6x
X231-236
X230
A230
DIGITIZER
X230

from Reference 2
(A150)
X1504 100MHz W154 (Option B61)
X1509 100MHz W159 (Option B60/B61)

OPTION FSW-B10
X240
A210 Backplane Option (middle) EXT. GEN. CTRL
X241
X242

X250
A250 Backplane Option (right)

OPTION FSW-B160/B320
X221-X224
A220 DETECTOR EXTENSION
X220 MARK1
X229 MARK2
X227 DIGIQ0
X228 DIGIQ1
X225 X226
X290 X291
X294
A290 Wide Band ADC
X296
X292
IF WIDE
rear panel

E2
M
4
X322
FANS
E1
M
4
X321

X70

X10 to Attenuator (A60/A570) 12 W60
X300

X201-X207
A200
DETECTOR BOARD
IEC X217
AUX X216
Sync Trigger IN X215
Sync Trigger OUT X214
TRIGGER 3 X213
Digital Baseband OUT X212
Digital Baseband IN X211
IF/VIDEO X218
X210
X209
X208
rear panel

OPTION B24 X273 to Preamp Unit (A270) 12 W270
(only for all FSWP8- and FSWP26-variants)
X310

W19

X120
A120 REFERENCE 1
X122
RT CLK
LO2 (reserved) X125
LO2 (FE) X126
LO3 (FE) X124
LO3 (SYNTH) X123
CAL Out X121
640 MHz Out X127
100 MHz Out X130
Ext. 100 MHz In X131
10 MHz Out X132
REF Out X133
REF In X134
X139
A260
OCXO
(assembled
in Option B61)
OPTION FSWP-B4
Abschluss-kappe
Abschluss-kappe
50R SMP
rear panel

X11 X12 X13 X14
X16
X11 X12 X13
A10
MOTHERBOARD ANALOG FSWP

X1 to Frontpanel Keyboard A70 26 W43

OPTION B1
X108 from Frontend A100 W9
X106 from Frontend A100 W8
X143 to Synth 1 A140 W7 (obsolete for Option B61)
X1 to Attenuator 1 A60 W3 (only if B64 is not assembled)
OPTION B64 1 to Relais Unit A590 W591
OPTION B1
X102 from Frontend A100 W6
X103 from Frontend A100 W5
X104 from Frontend A100 W22
W22
OPTION B60 B61 X1502 to Reference 2 A150 W152

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

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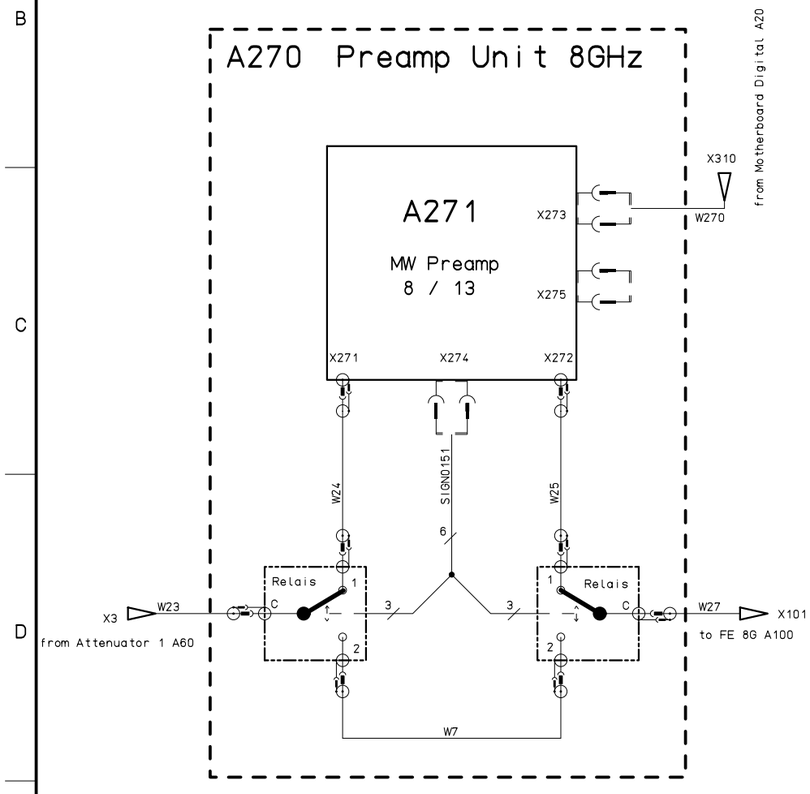
ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 14 +
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			

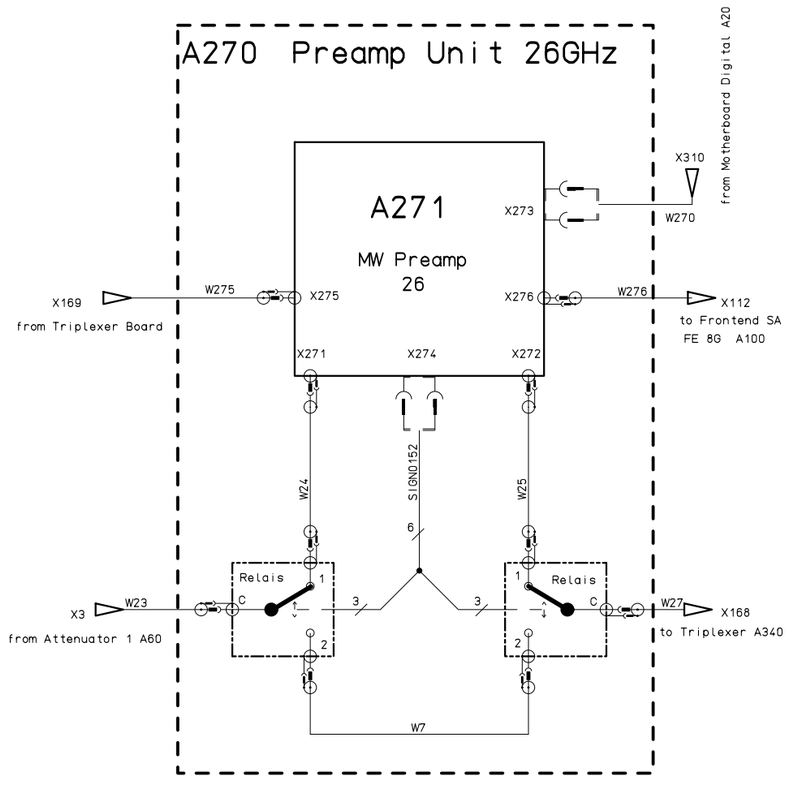
Preamp Unit FSWP-B24

(only if Option FSWP-B1 "Spectrum Analysis" is installed)

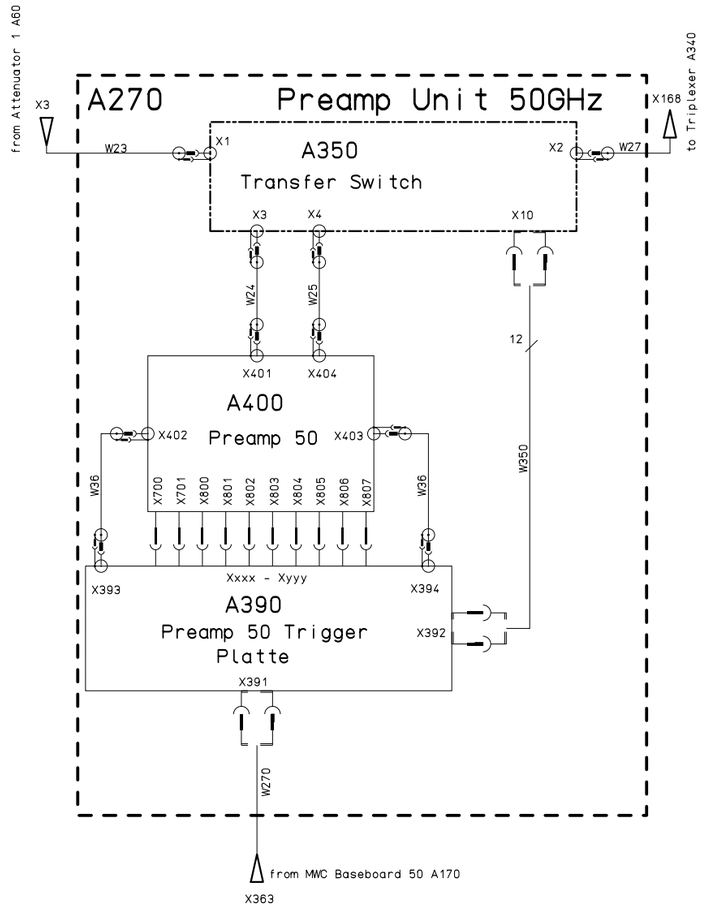
8GHz



26GHz



50GHz



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
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ROHDE&SCHWARZ	Benennung / Designat.: FSWP PHASE NOISE ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 06.00	Blatt:/Sh.: 15 -
	FSWP PHASE NOISE ANALYZER			Zeichn.Nr.:/Drawing No.: 1322.8003.01 S		
FSWP	Datum: Date: 2016-07-28	Abteilung: Dept.: 1ENK	Name: Name: iliev			