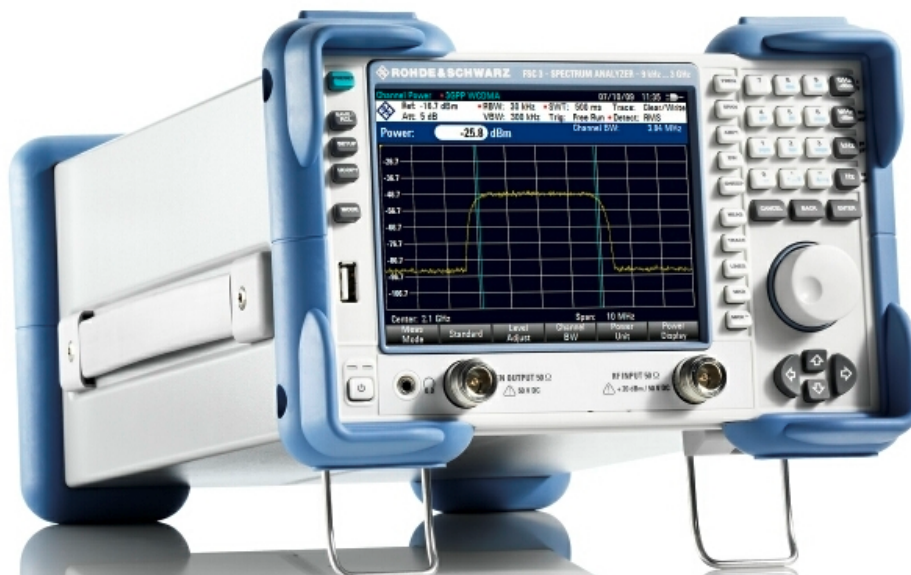


R&S®FSC

Spectrum Analyzer

Service Manual



1173.0966.82 – 01

The Service Manual describes the following models and options:

- R&S® FSC3 (1314.3006K03)
- R&S® FSC6 (1314.3006K06)
- R&S® FSC13 (1314.3006K13)
- R&S® FSC16 (1314.3006K16)

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81671 Munich, Germany

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R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.

Trade names are trademarks of the owners.

The following abbreviations are used throughout this manual:

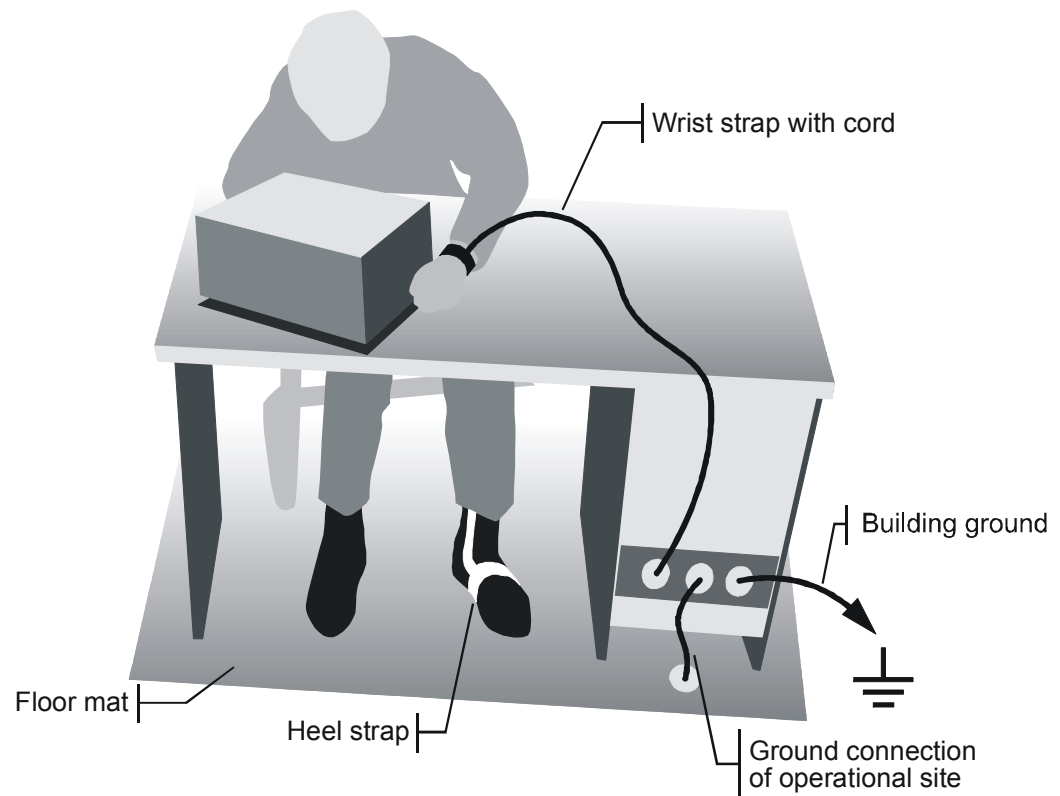
The signal analyzer R&S®FSC is abbreviated as R&S FSC.

Instructions for Electrostatic Discharge Protection

NOTICE

Risk of damaging electronic components

To avoid damage of electronic components, the operational site must be protected against electrostatic discharge (ESD).



The following two methods of ESD protection may be used together or separately:

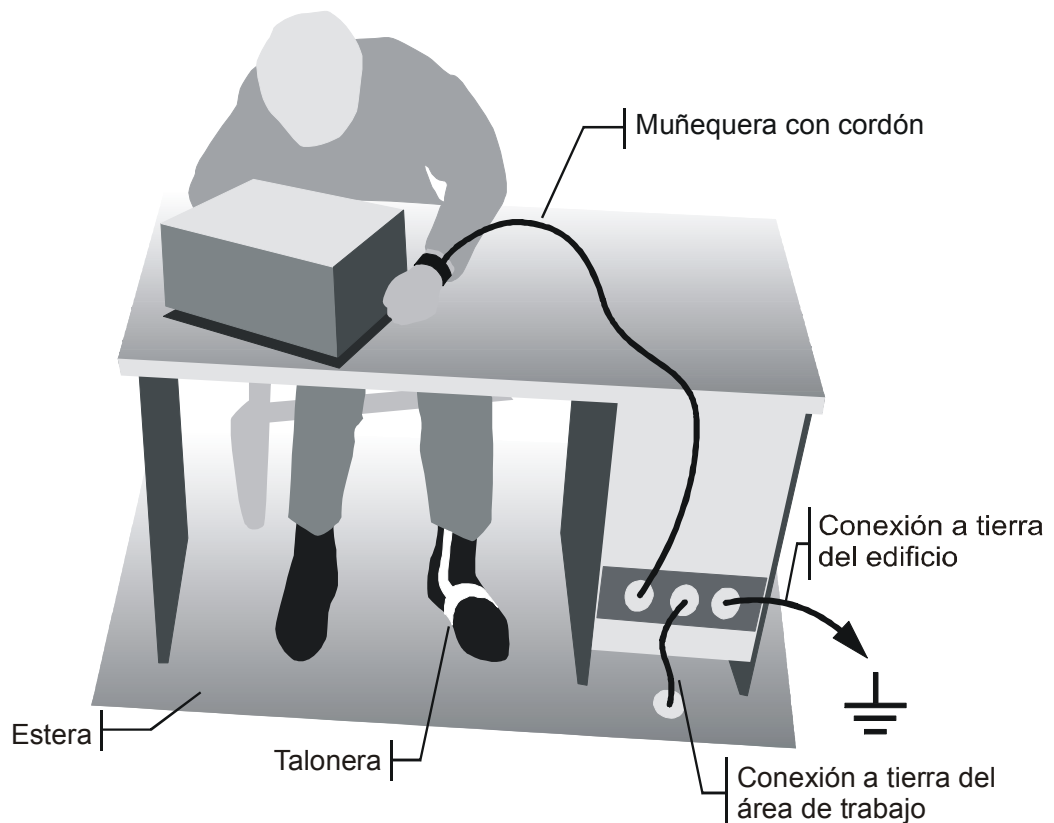
- Wrist strap with cord to ground connection
- Conductive floor mat and heel strap combination

Instrucciones para la protección contra descargas electroestáticas

AVISO

Riesgo de avería de los componentes electrónicos

Para evitar averías en los componentes electrónicos, el área de trabajo tiene que estar protegido contra descargas electroestáticas ESD (electrostatic discharge).



Los siguientes dos métodos de protección ESD pueden ser usados juntos o separados:

- Muñequera con cordón para conexión a tierra
- Combinación de estera antiestática y talonera

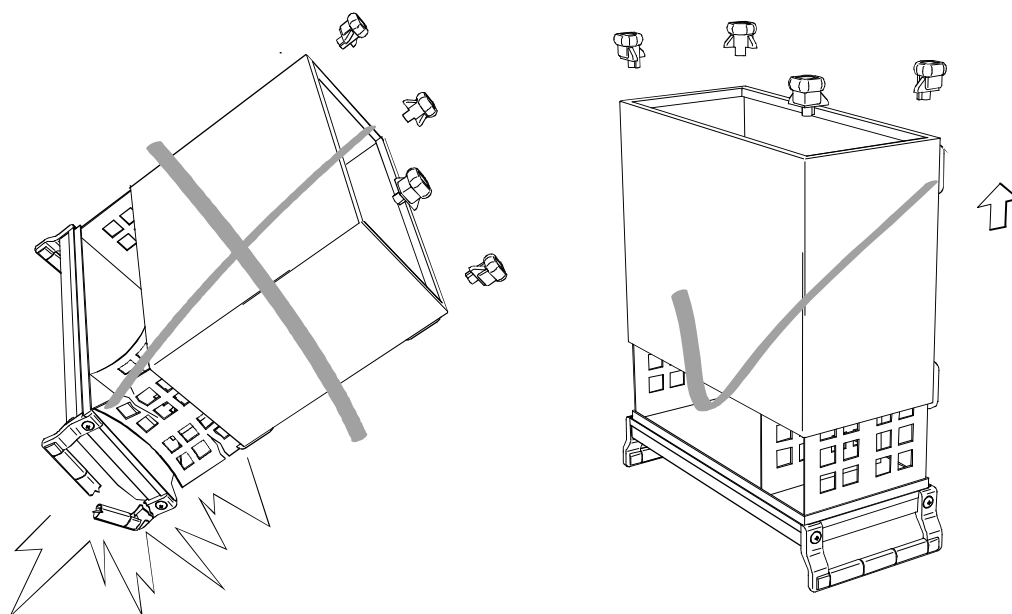
Safety Instructions for Units with Removable Cabinet

WARNING

Danger of injuries

When removing the rear feet, the unit can slip out of the cabinet.

Put the unit onto the front handles, before removing the rear feet and taking off the cabinet. Thus the risk of personal injuries and damages to the unit is avoided.



When mounting the cabinet take care not to pin the fingers. Also pay attention not to damage or pull off cables. Screw the rear feet back on immediately after mounting the cabinet. Do not move the unit with the rear feet missing.

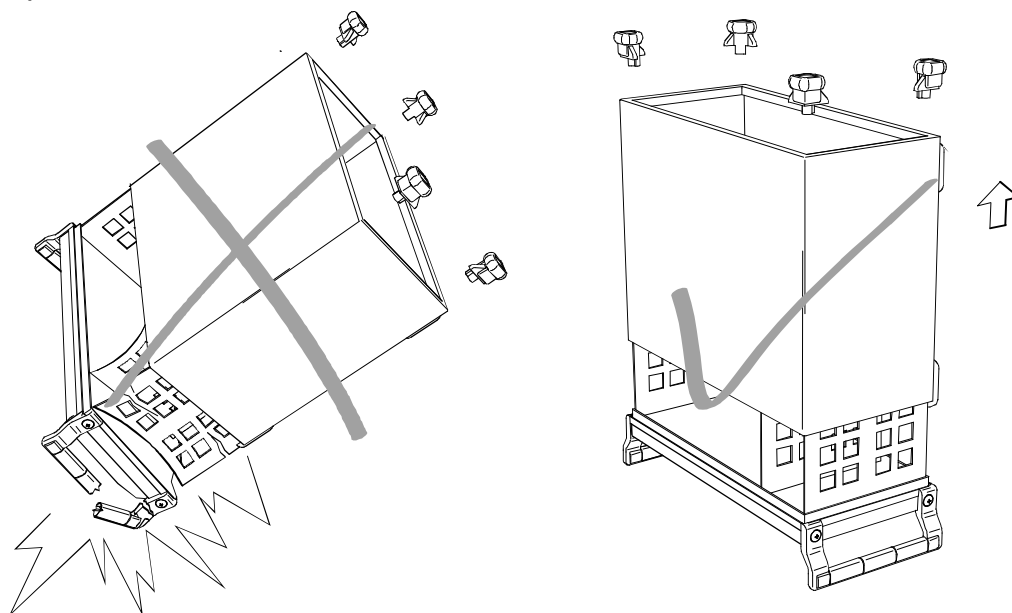
Informaciones de seguridad para aparatos con tubo de quita y pon

ADVERTENCIA

Peligro de heridas

Al sacar los piés de la pared posterior puede deslizarse el aparato fuera de la caja.

Posicionar el aparato de manera segura sobre las asas delanteras, antes de sacar los piés de la pared posterior y entonces sacar la caja. De esta manera evitarán el riesgo de daños en personas y daños en el aparato.



Existe el riesgo de heridas en el momento de poner otra vez la caja, como por ejemplo posiblemente engancharse los dedos. Por favor tengan además en cuenta de que no se enganchen o desconecten cables. Por favor atornillen los piés de la pared posterior directamente despues de poner la caja. No muevan el aparato nunca sin que los piés de la pared posterior estén atornillados.

Procedure in Case of Service and Ordering of Spare Parts

This section contains information on shipping an instrument to your service center and ordering spare parts.

Please contact your local Rohde & Schwarz service center if you need service or repair work of your equipment or to order spare parts. The list of the Rohde & Schwarz representatives is provided at the beginning of this service manual. You can find the current address of your representative on our homepage www.rohde-schwarz.com. Navigate to Service & Support / Service Locations.

Shipping the Instrument

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

- Instrument model
- Serial number
- Firmware version
- Must the instrument be returned with this firmware?
- Detailed error description in case of repair
- Indication of desired calibration
- Contact person for possible questions

In some countries, an RMA process is available for the return shipment of the instrument. For details, contact your local representative.

When shipping the instrument, be careful to provide for sufficient mechanical and antistatic protection.

- Use the original packaging for transporting or shipping the instrument. The protective caps for the front and rear prevent damage to the operating elements and the connectors.
- If you do not use the original packaging, provide for sufficient padding to prevent the instrument from slipping inside the box. Wrap antistatic packing foil around the instrument to protect it from electrostatic charging.

Rohde & Schwarz offers repair and calibrations of the test systems it produces. The calibration documentation fulfills ISO 17025 requirements.

Shipping Defective Modules

Also when shipping a module, be careful to provide for sufficient mechanical and antistatic protection.

- Ship the module in a sturdy, padded box.
- Wrap the module in antistatic foil.

If the packaging is only antistatic but not conductive, additional conductive packaging is required. The additional packaging is not required if the tightly fitting packaging is conductive.

Exception:

If the module contains a battery, the tightly fitting packaging must always consist of antistatic, non-chargeable material to protect the battery from being discharged.

Ordering Spare Parts

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

- Stock number (see list of spare parts in chapter "Documents")
- Designation
- Component number according to list of spare parts
- Number of pieces
- Instrument type for which the spare part is needed
- Instrument stock number
- Instrument serial number
- Contact person for possible questions

Refurbished Modules

Refurbished modules are an economical alternative to original modules. Bear in mind that refurbished modules are not new, but repaired and fully tested parts. They may have traces from use, but they are electrically and mechanically equivalent to new modules.

Your Rohde & Schwarz representative will be happy to inform you about which modules are available as refurbished modules.

Taking Back Defective Replaced Modules

Defective modules of the replacement program which cannot be repaired are taken back within three months following delivery. A repurchasing value is credited.

Excluded are parts which cannot be repaired, e.g. printed boards that are burnt, broken or damaged by attempts to repair them, incomplete modules, and parts with severe mechanical damage.

Please return the defective replacement modules, together with the accompanying document for returned merchandise, which you received with the spare module. We need the following information:

- Stock number, serial number and designation of the removed part
- Detailed error description
- Stock number, serial number and type of instrument from which the module was removed
- Date of removal
- Name of the engineer/technician who replaced the module
- R&S ordering number
- Service reference number (if available)

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Documentation Overview

The user documentation for the R&S FSC is divided as follows:

Quick Start Guide

The Quick Start Guide provides basic information on the instrument's functions.

It covers the following topics:

- overview of all elements of the front and rear panels
- basic information on how to set up the R&S FSC
- information on how to operate the R&S FSC in a network
- instructions on how to perform measurements

Operating Manual

The Operating Manual provides a detailed description on the instrument's functions

It covers the following topics:

- instructions on how to set up and operate the R&S FSC in its various operating modes
- instructions on how to perform measurements with the R&S FSC
- instructions on how to work with the available software options and applications
- instructions on how to remotel control the R&S FSC
- basic information on how a spectrum analyzer works

Service Manual

The Service Manual provides information on maintenance.

It covers the following topics:

- instructions on how to perform a performance test
- instructions on how to repair the R&S FSC including a spare parts list
- mechanical drawings

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided on the internet.

Internet Site

The internet site at: [R&S FSC Spectrum Analyzer](#) provides the most up to date information on the R&S FSC. The most recent manuals are available as printable PDF files in the download area.

Also provided for download are firmware updates including the associated release notes, instrument drivers, current data sheets, application notes and image versions.

Conventions Used in the Documentation

The following conventions are used throughout the R&S <Product type> <Manual type>:

Typographical conventions

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements both on the screen and on the front and rear panels, such as dialog boxes, softkeys, menus, options, buttons etc., are enclosed by quotation marks.
"KEYS"	Key names are written in capital letters and enclosed by quotation marks.
<i>Input</i>	Input to be entered by the user is displayed in italics.
File names, commands, program code	File names, commands, coding samples and screen output are distinguished by their font.
"Links"	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

Other conventions

- **Remote commands:** Remote commands may include abbreviations to simplify input. In the description of such commands, all parts that have to be entered are written in capital letters. Additional text in lower-case characters is for information only.
- **Procedure descriptions:** When describing how to operate the device, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described, where available. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the device or the on-screen keyboard is only described if it deviates from the standard operating procedures as described in the Quick Start Guide under "Basic Operations".

The terms "**select**" and "**press**" may refer to any of the described methods, i.e. using a finger on the touchscreen, a mouse pointer in the display, or a key on the device or on a keyboard.

1 Performance Test

1.1 Test Equipment

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S order no	Application
1	Signal generator	R&S FSC3/6: 10 MHz to 6 GHz Uncertainty of frequency: 0.1 ppm Phase noise at 500 MHz: < -100 dBc/Hz @ 10 kHz < -110 dBc/Hz @ 100 kHz < -130 dBc/Hz @ 1MHz	SMT06	1039.2000.06	Frequency response Frequency accuracy of reference oscillator
2	6-dB divider (power splitter)	R&S FSC3: 10 MHz to 3 GHz R&S FSC6: 10 MHz to 6 GHz	Weinschel 1870A Agilent 11667		Frequency response
3	Power meter		R&S NRP	1143.8500.02	Frequency response
4	Power sensor	Frequency: R&S FSC3: 10 MHz to 3 GHz R&S FSC6: 10 MHz to 6 GHz RSS ≤ 0.8% Meter Noise ≤ 20 pW	R&S NRP-Z21	1137.6000.02	Frequency response
5	N cable	Attenuation < 1 dB to 6 GHz			Tracking generator output level
6	50 Ohm termination	10 MHz to 6 GHz Return loss ≤ -10 dB			Noise display

1.2 Performance Test R&S FSC

1.2.1 Test Instructions

To ensure that rated specifications are maintained, the following preparations must be made prior to checking the rated characteristics:

- Allow for a minimum warm-up time of 30 minutes at ambient temperature.
- Carry out all internal adjustments.
- The values are specified in the data sheet. Additional uncertainties introduced by the measurement equipment must be taken into account when checking the rated values.
- Unless specified otherwise, all measurements will be performed with external reference frequency.

1.2.2 Checking the Reference Frequency Accuracy

Test equipment: Signal generator (see section "Measurement Equipment and Accessories", item 1)

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

Signal generator settings:
- Frequency 1 GHz
- Level -30 dBm

R&S FSC settings: - [**PRESET**]
- [**FREQ : 1 GHz**]
- [**SPAN : 100 kHz**]
- [**BW : MANUAL RBW : 10 kHz**]
- [**MARKER** : Marker Function: Frequency Count]

Measurement: ► Read out the frequency value (Count:) of the marker.
Nominal frequency: 1.0 GHz

1.2.3 Checking the Level Accuracy and the Frequency Response

- Test equipment:
- Signal generator (see section "Measurement Equipment and Accessories", item 1)
 - Power meter (see section "Measurement Equipment and Accessories", item 3)
 - Power sensor (see section "Measurement Equipment and Accessories", item 4)
 - 6-dB power splitter (see section "Measurement Equipment and Accessories", item 2)

1.2.3.1 Determining the Level Accuracy at 100 MHz

- Test setup:
- ▶ Connect the power sensor (item 4) to the power meter and execute function 'ZERO' when there is no signal applied to the power sensor.
 - ▶ Connect the RF output of the signal generator to the input of the divider.
 - ▶ Connect output 1 of the divider to the power sensor / power meter.
 - ▶ Connect output 2 of the divider to the RF input of the R&S FSC

- Signal generator settings:
- Frequency 100 MHz
 - Level 6 dBm
 - ▶ Determine the output power of the signal generator with the power meter. Adjust the output power of the generator until the power meter shows 0 dBm.

- R&S FSC settings:
- [**PRESET**]
 - [**FREQ : 100 MHz**]
 - [**AMPT: 0 dBm**]
 - [**SPAN : 100 kHz**]
 - [**BW : MANUAL RBW : 10 kHz**]
 - [**TRACE : DETECTOR : RMS**]
 - ▶ Set the marker to the peak of the signal.
 - [**MKR-> : Set to Peak**]

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

$$\text{Level error}_{100 \text{ MHz}} = L - L_{\text{powermeter}}$$

1.2.3.2 Checking the Frequency Response

For the measurement of the frequency response, the value at 100 MHz for each reference level setting is used as the reference. The reference level influences the RF attenuation (RF attenuation = +10 dBm + reference level).

- Test setup:
- ▶ Connect the RF output of the signal generator to the input of the divider.
 - ▶ Connect output 1 of the divider to the power sensor / power meter.
 - ▶ Connect output 2 of the divider to the RF input of the SA..

Signal generator settings:

- Frequency $\{f_{in}\}^*$
- Level -4 dBm

Determine the output power of the signal generator with the power meter. Adjust the output power of the generator until the power meter shows -10 dBm ± 0.2 dB.

R&S FSC settings:

- [**PRESET**]
- [**AMPT** : Ref_Lev*)]
- [**SPAN** : 100 kHz]
- [**BW** : MANUAL RBW : 10 kHz]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : $\{f_{in}\}^*$]

*) Refer to table under "Performance Test Report" for values of Ref_Lev and f_{in} .

The frequency response of the RF preamplifier has to be checked also. To switch it on please enter:

- [**SETUP** : RF Att / Amp / Imp: Preamp On]

To avoid oversteering of the preamplifier the output power of the signal generator shall be reduced to -30 dBm at the RF input of the R&S FSC during this measurement.

Reference measurement:

- ▶ Determine signal level $L_{\text{powermeter}}$.
- ▶ Set the marker to the peak of the signal.
- [**MKR->** : SET TO PEAK]
- ▶ The signal level L is displayed by the level reading of the marker.

$$\text{Ref}_{100\text{MHz}} = L - L_{\text{powermeter}}$$

Measurement

Signal generator settings:

- Frequency $\{f_{in}\}$

Refer to table under "Performance Test Report" for values of $\{f_{in}\}$.

Power meter settings:

Determine the signal level $L_{\text{powermeter}}$. To achieve higher accuracy, compensating the frequency response of the power sensor is recommended.

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

Refer to table under "Performance Test Report" for values of { f_{in} }.

► Set the marker to the peak of the signal.

- [**MKR->** : SET TO PEAK]

The signal level L is displayed by the level reading of the marker.

Evaluation: The frequency response can be calculated as:

► Frequency response = $L - L_{\text{powermeter}} - \text{Ref}_{100 \text{ MHz}}$

1.2.4 Checking the Accuracy of the RF Attenuator

Test principle: The RF attenuator of the R&S FSC can be switched from 0 to 40 dB in 5 dB increments.

Test equipment: Signal generator (refer to section "Measurement Equipment and Accessories", item 1)
Frequency 100 MHz

Maximum level $\geq 6 \text{ dBm}$

Test setup: ► Connect the RF output of the signal generator to the input of the divider.
► Connect output 1 of the divider to the power sensor / power meter.
► Connect output 2 of the divider to the RF input of the R&S FSC.

Signal generator settings: - Frequency 100 MHz
- Level -14 dBm

► Determine the output power of the signal generator with the power meter. Adjust the output power of the signal generator until the power meter shows $-20 \text{ dBm} \pm 0.2 \text{ dB}$.

R&S FSC settings: - [**PRESET**]
- [**FREQ** : 100 MHz]
- [**SPAN** : 10 kHz]
- [**BW** : MANUAL RBW : 1 kHz]
- [**BW** : MANUAL VIDEO BW : 100 Hz]
- [**TRACE** : DETECTOR : RMS]
- [**AMPT**: RF Att Amp / Imp: RF attenuation Man: 10dB]

Reference measurement: ► Set the marker to the peak of the signal.

[**MKR->** : SET TO PEAK]

The signal level L is displayed by the level reading of the marker.

$$\text{Ref}_{(0 \text{ dB})} = L - L_{\text{powermeter}}$$

- Measurement**
- Frequency 100 MHz
 - Level RF Att – 24 dB
- *) Refer to table under "Performance Test Report" for values of {RF Att}.
- Determine the output power of the signal generator with the power meter. Adjust the output power of the generator until the power meter shows the level: RF attenuation – 30 [dBm].

R&S FSC settings: - [**AMPT**: RF Att Amp / Imp: RF attenuation Man: **0dB**]
 - [**MKR->** : SET TO PEAK]

Evaluation: The signal level L is displayed by the level reading of the marker.

The difference between the level inaccuracy of the R&S FSC and Ref_{0dBm} (at 10 dB RF-Att) is the uncertainty of the RF attenuation:

$$RF\ Att_{accuracy} = (L - L_{powermeter}) - Ref_{(0\ dB)}$$

1.2.5 Checking the Displayed Average Noise Floor

Test equipment: 50-Ω termination (refer to section "Measurement Equipment and Accessories", item 6)

Test setup: ➤ Terminate the RF input of the R&S FSC with 50 Ω.

R&S FSC settings: - [**PRESET**]
 - [**SPAN** : Zero Span]
 - [**BW**: Manual RBW : **1 kHz**]
 - [**BW**: Manual VBW : **10 Hz**]
 - [**SWEEP** : Manual SWP Time : 1s]
 - [**TRACE** : Trace Mode: Average 10]
 - [**AMPT** : **-30 dBm**]
 - [**FREQ** : { f_n }]

Refer to table under "Performance Test Report" for values of f_n .

R&S FSC settings for the measurement of the displayed average noise floor with preamplifier = ON :- [**PRESET**]
 - [**SPAN** : Zero Span]
 - [**BW**: Manual RBW : **1 kHz**]
 - [**BW**: Manual VBW : **10 Hz**]
 - [**SWEEP** : Manual SWP Time : **1s**]
 - [**TRACE** : Trace Mode: Average **10**]
 - [**AMPT** : **-40 dBm**]
 - [**SETUP** : HARDWARE SETUP : PREAMP : ON]
 - [**FREQ** : { f_n }]

Refer to table under "Performance Test Report" for values of f_n .

Measurement: Read out the marker level.

Evaluation: The displayed average noise floor is displayed by the level reading of the marker.

1.2.6 Checking the Phase Noise

Test equipment: Signal generator (refer to section "Measurement Equipment and Accessories", item 1)

Frequency 500 MHz

Level ≥ 0 dBm

Phase noise at 500 MHz: < -105 dBc (1Hz) @ 10 kHz
 < -115 dBc (1Hz) @ 100 kHz
 < -130 dBc (1Hz) @ 1 MHz

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

R&S FSC settings: - Frequency 500 MHz

- Level 0 dBm

- [**PRESET**]

- [**FREQ : 500 MHz**]

- [**AMPT : 0 dBm**]

- [**AMPT:** RF Att Amp / Imp: RF attenuation Man: **10dB**]

- [**SPAN** : {span}]

Depending on the offset, refer to the table below for values of the span.

- [**TRACE** : Trace Mode: Average 10]

- Marker to peak

- [**MKR->** : SET TO PEAK]

- Delta marker to {offset}

- [**MARKER:** New Marker: {offset}: kHz]

Set marker mode to noise measurement

- [**MARKER:** Marker Function: Marker Mode Noise]

Evaluation: The phase noise is displayed in the marker field by the reading 'D2 {offset} {phasenoise}'

Phase noise measurement settings	
Offset	Span
30 kHz	100 kHz
100 kHz	300 kHz
1 MHz	3 MHz

1.2.7 Checking the Display Linearity

- Test equipment:
- Signal generator (see section "Measurement Equipment and Accessories", item 1)
 - Power meter (see section "Measurement Equipment and Accessories", item 3)
 - Power sensor (see section "Measurement Equipment and Accessories", item 4)
 - 6-dB power splitter (see section "Measurement Equipment and Accessories", item 2)

- Test setup:
- ▶ Connect the power sensor (item 4) to the power meter and execute function 'ZERO' when there is no signal applied to the power sensor.
 - ▶ Connect the RF output of the signal generator to the input of the divider.
 - ▶ Connect output 1 of the divider to the power sensor / power meter.
 - ▶ Connect output 2 of the divider to the RF input of the R&S FSC.

1st Measurement 0 to 30 dB below reference level

- Signal generator settings:
- Frequency 100 MHz
 - Level + 6 dBm

- ▶ Determine the output power of the signal generator with the power meter. Adjust the output power of the generator until the power meter shows 0 dBm.

- R&S FSC settings:
- [**PRESET**]
 - [**AMPT: 0 dBm**]
 - [**AMPT: RF Att Amp / Imp: RF attenuation Man: 10dB**]
 - [**FREQ: 100 MHz**]
 - [**SPAN : 10 kHz**]
 - [**Manual RBW : 1 kHz**]
 - [**SWEEP: Manual SWP Time : 1 s**]
 - [**TRACE : DETECTOR : RMS**]

- Reference measurement:
- ▶ Set the marker to the peak of the signal.
 - [**MKR-> : SET TO PEAK**]
 - ▶ The signal level L is displayed by the level reading of the marker.

$$\text{Ref}_{(\text{dB})} = L - L_{\text{powermeter}}$$

- Signal generator settings:
- Frequency 100 MHz
 - Level Sig_Lev + 6 dB

Refer to table under "Performance Test Report" for values of {Sig_Lev}.

- ▶ Determine the output power of the signal generator with the power meter. Adjust the output power of the generator until the power meter shows the value of {Sig_Lev}.

Evaluation: ► The signal level L is displayed by the level reading of the marker.

The difference between the level inaccuracy of the R&S FSC and $\text{Ref}_{0\text{dBm}}$ is the uncertainty of the display linearity:

$$\text{Linearity}_{\text{uncertainty}} = (L - L_{\text{powermeter}}) - \text{Ref}_{(0\text{dB})}$$

2nd Measurement 30 to 50 dB below reference level

Because the sensitivity of the power meter is limited, the internal RF attenuator of the R&S FSC is used to increase the dynamic range of the input signal.

R&S FSC settings: - [**AMPT**: RF Att Amp / Imp: RF attenuation Man: 30dB]

Signal generator settings: - Frequency 100 MHz
- Level - 4 dBm

► Determine the output power of the signal generator with the power meter. Adjust the output power of the generator until the power meter shows -10 dBm.

Reference measurement: ► Set the marker to the peak of the signal.

- [**MKR->** : SET TO PEAK]

The signal level L is displayed by the level reading of the marker.

With the result of the 1st linearity measurement, a new correction factor is to be calculated. "Linearity_{uncertainty} (-30dB)" is the measured uncertainty of the R&S FSC linearity at 30 dB below reference level.

$$\text{Ref}_{(20\text{dB})} = (L - L_{\text{powermeter}}) - \text{Linearity}_{\text{uncertainty}} (-30\text{dB})$$

Signal generator settings: - Frequency 100 MHz
- Level Sig_Lev + 6 dB

Refer to table under "Performance Test Report" for values of {Sig_Lev}.

► Determine the output power of the signal generator with the power meter. Adjust the output power of the generator until the power meter shows the value Sig_Lev ± 0.2 dB.

Evaluation: The signal level L is displayed by the level reading of the marker.

The difference between the level inaccuracy of the R&S FSC and $\text{Ref}_{20\text{dBm}}$ is the uncertainty of the display linearity:

$$\text{Linearity}_{\text{uncertainty}} = (L - L_{\text{powermeter}}) - \text{Ref}_{(20\text{dB})}$$

1.2.8 Checking the Tracking Generator

Test equipment: - N cable

Test setup: ► Connect both ports directly with the N cable.

R&S FSC settings: - [**PRESET**]

- [**MODE**: Network Analyzer]
- [**AMPT**: RF Att Amp / Imp: RF attenuation Man: 10dB]
- [**AMPT** : TG Output Attenuation: {TG_Att}]
- [**MEAS** : Result Display: {Transmission Rev / Transmission Fwd}]
- [**MKR->**: Set to Peak]
- [**MKR->** : Set to Minimum]

- Determine whether the maximum and the minimum value are within the upper and lower functional limit.

Lower functional limit:	-10dB
upper functional limit	+10dB

- Perform the test with the following values of TG_Att:
10 dB, 11 dB, 12 dB, 16 dB, 18 dB

Note:

This test is a functional test only, which makes sure that the tracking generator is working properly. The test result is therefore not included in the performance test report.

1.3 Performance Test Report

ROHDE&SCHWARZ	Spectrum Analyzer R&S FSC	1314.3006.03/06/13/16
Serial number:		
Date:		
Person responsible:		
Signature:		

For nominal data and limit values refer to the data sheet supplied with the instrument.

Identifier Limit	Ref.	Measurand	Specified min. value	Measured value	Specified max. value	Unit	MU
PT		Frequency accuracy Reference oscillator Basic unit	0.999998	_____	1.000002	GHz	
PT		Level accuracy at 100 MHz with Ref_Lev = 0 dBm	-0.3	_____	+0.3	dB	
PT		Frequency response (f_{resp}) with RF Att = 5 dB Ref_Lev = -10 dBm					
		10 MHz	-1	_____	+1	dB	
		100 MHz	-	Reference	-		
		500 MHz	-1	_____	+1	dB	
		1000 MHz	-1	_____	+1	dB	
		1500 MHz	-1	_____	+1	dB	
		2000 MHz	-1	_____	+1	dB	
		2500 MHz	-1	_____	+1	dB	
		2990 MHz	-1	_____	+1	dB	
		R&S FSC6:					
		3500 MHz	-1	_____	+1	dB	
		4000 MHz	-1	_____	+1	dB	
		4500 MHz	-1	_____	+1	dB	
		5000 MHz	-1	_____	+1	dB	
		5500 MHz	-1	_____	+1	dB	
		5990 MHz	-1	_____	+1	dB	

Identifier Limit	Ref.	Measurand	Specified min. value	Measured value	Specified max. value	Unit	MU
PT		Frequency response (f_{resp}) with RF Att = 10 dB Ref_Lev = -10 dBm					
		10 MHz	-1	_____	+1	dB	
		100 MHz	-	Reference	-		
		500 MHz	-1	_____	+1	dB	
		1000 MHz	-1	_____	+1	dB	
		1500 MHz	-1	_____	+1	dB	
		2000 MHz	-1	_____	+1	dB	
		2500 MHz	-1	_____	+1	dB	
		2990 MHz	-1	_____	+1	dB	
		R&S FSC6:					
		3500 MHz	-1	_____	+1	dB	
		4000 MHz	-1	_____	+1	dB	
		4500 MHz	-1	_____	+1	dB	
		5000 MHz	-1	_____	+1	dB	
		5500 MHz	-1	_____	+1	dB	
		5990 MHz	-1	_____	+1	dB	
PT		Frequency response (f_{resp}) with RF Att = 20 dB Ref_Lev = -10 dBm					
		10 MHz	-1	_____	+1	dB	
		100 MHz	-	Reference	-		
		500 MHz	-1	_____	+1	dB	
		1000 MHz	-1	_____	+1	dB	
		1500 MHz	-1	_____	+1	dB	
		2000 MHz	-1	_____	+1	dB	
		2500 MHz	-1	_____	+1	dB	
		2990 MHz	-1	_____	+1	dB	
		R&S FSC6:					
		3500 MHz	-1	_____	+1	dB	
		4000 MHz	-1	_____	+1	dB	
		4500 MHz	-1	_____	+1	dB	
		5000 MHz	-1	_____	+1	dB	
		5500 MHz	-1	_____	+1	dB	
		5990 MHz	-1	_____	+1	dB	
PT		Frequency response (f_{resp}) with RF Att = 30 dB Ref_Lev = -10 dBm					
		10 MHz	-1	_____	+1	dB	
		100 MHz	-	Reference	-		
		500 MHz	-1	_____	+1	dB	
		1000 MHz	-1	_____	+1	dB	
		1500 MHz	-1	_____	+1	dB	

Identifier Limit	Ref.	Measurand	Specified min. value	Measured value	Specified max. value	Unit	MU
PT		2000 MHz	-1	_____	+1	dB	
		2500 MHz	-1	_____	+1	dB	
		2990 MHz	-1	_____	+1	dB	
		R&S FSC6:					
		3500 MHz	-1	_____	+1	dB	
		4000 MHz	-1	_____	+1	dB	
		4500 MHz	-1	_____	+1	dB	
		5000 MHz	-1	_____	+1	dB	
		5500 MHz	-1	_____	+1	dB	
		5990 MHz	-1	_____	+1	dB	
		Frequency response (f_{resp}) with PreAmp = ON RF Att = 0 dB Ref_Lev = -25 dBm (only with option FSC- B22)					
		10 MHz	-1	_____	+1	dB	
		100 MHz	-	Reference	-		
		500 MHz	-1	_____	+1	dB	
		1000 MHz	-1	_____	+1	dB	
		1500 MHz	-1	_____	+1	dB	
		2000 MHz	-1	_____	+1	dB	
		2500 MHz	-1	_____	+1	dB	
		2990 MHz	-1	_____	+1	dB	
		R&S FSC6:					
		3500 MHz	-1	_____	+1	dB	
		4000 MHz	-1	_____	+1	dB	
		4500 MHz	-1	_____	+1	dB	
		5000 MHz	-1	_____	+1	dB	
		5500 MHz	-1	_____	+1	dB	
		5990 MHz	-1	_____	+1	dB	
PT		Attenuator accuracy					
		RF_Att / Ref_Lev :					
		0dB / -10dBm	-	Ref	-		
		5dB / -5dBm	-0.3	_____	+0.3	dB	
		10dB / 0dBm	-0.3	_____	+0.3	dB	
		20dB / 10dBm	-0.3	_____	+0.3	dB	
		30dB / 20dBm	-0.3	_____	+0.3	dB	
PT		Displayed average Noise floor (f_{noise}) in 1 Hz bandwidth					
		9kHz	-	_____	-108	dBm (1Hz)	
		100kHz	-	_____	-115	dBm (1Hz)	
		1 MHz	-	_____	-136	dBm (1Hz)	
		10.1 MHz	-	_____	-141	dBm (1Hz)	

Identifier Limit	Ref.	Measurand	Specified min. value	Measured value	Specified max. value	Unit	MU
		499 MHz	-	_____	-141	dBm (1Hz)	
		999 MHz	-	_____	-141	dBm (1Hz)	
		1499 MHz	-	_____	-141	dBm (1Hz)	
		1999 MHz	-	_____	-141	dBm (1Hz)	
		2499 MHz	-	_____	-138	dBm (1Hz)	
		2999 MHz	-	_____	-138	dBm (1Hz)	
		R&S FSC6:					
		3599 MHz	-	_____	-138	dBm (1Hz)	
		3601 MHz	-	_____	-142	dBm (1Hz)	
		3999 MHz	-	_____	-142	dBm (1Hz)	
		4499 MHz	-	_____	-142	dBm (1Hz)	
		4999 MHz	-	_____	-142	dBm (1Hz)	
		5499 MHz	-	_____	-140	dBm (1Hz)	
		5999 MHz	-	_____	-140	dBm (1Hz)	
PT		Displayed average Noise floor (f_{noise}) in 1 Hz bandwidth, PreAmp = ON (only with FSC-B22)					
		100kHz	-	_____	-133	dBm (1Hz)	
		1 MHz	-	_____	-157	dBm (1Hz)	
		10.1 MHz	-	_____	-161	dBm (1Hz)	
		499 MHz	-	_____	-161	dBm (1Hz)	
		999 MHz	-	_____	-161	dBm (1Hz)	
		1499 MHz	-	_____	-159	dBm (1Hz)	
		2499 MHz	-	_____	-155	dBm (1Hz)	
		2999 MHz	-	_____	-155	dBm (1Hz)	
		R&S FSC6:					
		3599 MHz	-	_____	-155	dBm (1Hz)	
		3601 MHz	-	_____	-155	dBm (1Hz)	
		3999 MHz	-	_____	-155	dBm (1Hz)	
		4499 MHz	-	_____	-155	dBm (1Hz)	
		4999 MHz	-	_____	-155	dBm (1Hz)	
		5499 MHz	-	_____	-151	dBm (1Hz)	
		5999 MHz	-	_____	-151	dBm (1Hz)	
PT		Phase noise at 500 MHz					
		Offset frequency:					
		30 kHz	-	_____	-95	dBc (1Hz)	
		100 kHz	-	_____	-100	dBc (1Hz)	
		1MHz	-	_____	-120	dBc (1Hz)	

Identifier Limit	Ref.	Measurand	Specified min. value	Measured value	Specified max. value	Unit	MU
PT		Display linearity 0 to -30 dB Reference level: 0 dBm					
		Sig_Lev:					
		0 dBm	-	Reference	-		
		-5 dBm	-0.2	_____	+0.2	dB	
		-10 dBm	-0.2	_____	+0.2	dB	
		-15 dBm	-0.2	_____	+0.2	dB	
		-20 dBm	-0.2	_____	+0.2	dB	
		-25 dBm	-0.2	_____	+0.2	dB	
		-30 dBm	-0.2	_____	+0.2	dB	
		Display linearity -30 to -50 dB Reference level: 20 dBm					
		Sig_Lev:					
		-10 dBm	-	Reference	-		
		-15 dBm	-0.2	_____	+0.2	dB	
		-20 dBm	-0.2	_____	+0.2	dB	
		-25 dBm	-0.2	_____	+0.2	dB	
		-30 dBm	-0.2	_____	+0.2	dB	

2 Adjustment

2.1 Quick Verification

This chapter describes a quick verification of the basic functions of the instrument hardware. Verifying the functionality of the R&S FSC as described in this section is recommended before adjustment or performance test. Testing of the following items is recommended:

- On/Off functionality
- Connections of the power adapter and the AF output
- Display
- Level and noise

2.1.1 Measurement Equipment

The quick verification procedure requires a very limited amount of equipment.

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S order no.	Use
1	Signal generator	Frequency: 10 MHz to 3 GHz	R&S SML		Level
2	N-cable	Attenuation: < 0.2 dB to 3 GHz			Tracking generator output level

2.1.2 Verifying on/off functionality

Test equipment	None
R&S FSC settings	Switch instrument ON.
Measurement	► Verify that the instrument switches ON.

2.1.3 Verifying Power and AF Connections

Test equipment	None
Accessories	Headphone
R&S FSC settings	Connect the AC supply. Switch instrument ON.
R&S FSC settings	Connect the headphone. - [Marker : MARKER DEMOD : AM]
Reference measurement	► Verify that a noise signal is heard on the headphone.

2.1.4 Verifying the Display

Test equipment	None
R&S FSC settings	Switch instrument ON.
Reference measurement	► Check the display for disturbance.

2.1.5 Verifying the Level and Noise

Test principle	The RF attenuator of the R&S FSC can be switched from 0 to 30 dB by changing the reference level in the instrument.
Test equipment	Signal generator (refer to section "Measurement Equipment and Accessories for Quick Verification", item 1). Frequency: 100 MHz Maximum level: ≥ 6 dBm
Test setup	Connect the RF output of the signal generator to the input of the R&S FSC.
Signal generator settings	- Frequency: 100 MHz - Level: -20 dBm
R&S FSC settings	- [PRESET] - [FREQ : 100 MHz] - [SPAN : 10 kHz] - [BW : RES BW MANUAL : 1 kHz] - [BW : VIDEO BW MANUAL : 100 Hz] - [TRACE : DETECTOR : RMS] - [AMPT: 0 dBm]
Verification	► Read the level and verify that it shows -20 dBm ± 2 dB. ► Verify that the noise level in the display is < -60 dBm.

Check 30 dB attenuation

Change signal generator setting	- Level: -30 dBm
Change R&S FSC setting	- [AMPT : -10 dBm]
Verification	► Read the level and verify that it shows -30 dBm ± 2 dB.

Check 10 dB attenuation

Change signal generator setting	- Level: -10 dBm
Change R&S FSC setting	- [AMPT : 10 dBm]
Verification	► Read the level and verify that it shows -10 dBm ± 2 dB.

Check 0 dB attenuation

Change signal generator setting	- Level: 0 dBm
Change R&S FSC setting	- [AMPT : 20 dBm]
Verification	► Read the level and verify that it shows 0 dBm +/-2 dB.

2.1.6 Verifying the Tracking Generator

Test principle	The generator output must be connected to the RF input and verified.
Test equipment	None
Test setup	Connect the generator output of the R&S FSC to the RF input.
R&S FSC settings	- [PRESET] - [MODE : Network Analyzer]
Verification	► Verify that the transmission shows 0 dB +/-5 dB. ► Following internal calibration, verify that the level shows 0 +/-1 dB.

2.2 Adjustment

NOTICE

Adjustment and re-alignment is only possible in R&S service centers

Adjustment and re-alignment of the R&S FSC is only possible in R&S service centers. For this reason this chapter only contains general preconditions and does not explicitly describe the adjustment procedures.

2.2.1 Adjustment Instructions

- Adjustment and re-alignment of the R&S FSC is only possible in R&S service centers.
- The adjustment of the analyzer must be performed after a warm-up time of at least 30 minutes. Only by adhering to this requirement can compliance with the guaranteed data be ensured.

2.2.2 Measurement Equipment and Accessories

The equipment necessary to perform adjustment and re-alignment is described in chapter 1, "Measuring Equipment and Accessories".

2.2.3 Frequency Response Correction

Measuring and programming frequency correction data is only possible in an R&S service center. If re-alignment of the frequency response is necessary, the instrument must be sent to R&S Service.

3 Repair

3.1 Instrument Design and Function Description

The following figure shows a block diagram of the R&S FSC.

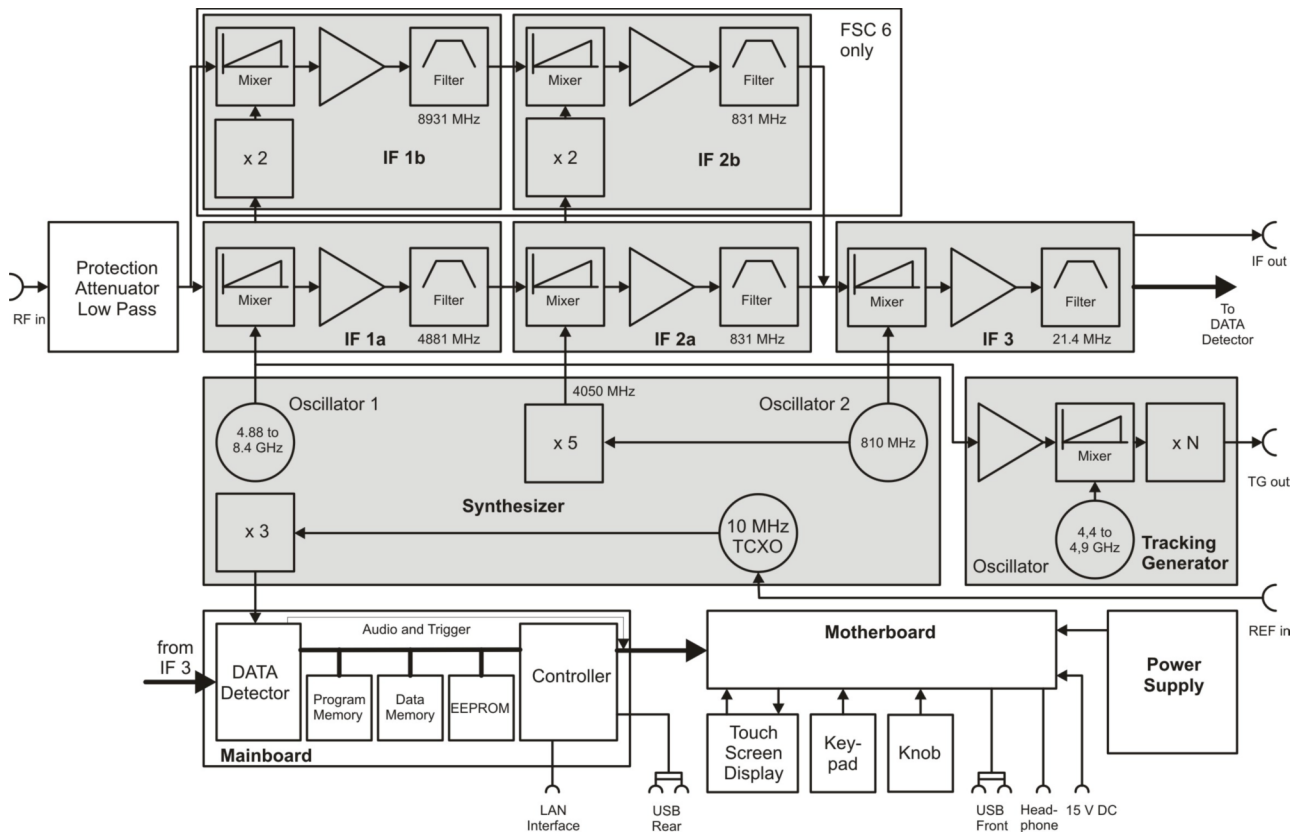


Figure 3-1: Block diagram of the R&S FSC

Description of the block diagram

The Spectrum Analyzers R&S FSC3 and R&S FSC6 are triple-conversion super-heterodyne receivers for the frequency range 9 kHz to 3 GHz and 6 GHz. After signals are received, they are processed by the RF/IF board and the mainboard. The RF/IF board contains the functions as described below.

3.1.1 R&S FSC HF-Module

3.1.1.1 RF/IF Board

Attenuator

The RF signal passes from the input connector RF INPUT to the programmable input attenuator, which can be switched from 0 dB to 40 dB in increments of 5 dB. The circuitry is protected from overvoltage.

RF to IF conversion

The RF/IF board converts the received frequencies to an IF of 21.4 MHz, which is digitized with a 14 bit ADC and a sample rate of 30 MHz on the mainboard. The RF/IF board also includes the required local oscillators and associated frequency processing circuits. The unit is housed in silver-plated aluminum packaging.

The input signal passes via the input attenuator and the lowpass filter to the first mixer. The lowpass filter provides suppression of the image frequency (image = LO + IF) to keep the conversion unambiguous. In the 1st mixer the input signal is up-converted to an IF of 4881.4 MHz (8931.4 GHz in the frequency band above 3.6 GHz) by means of the first LO (4.88 GHz to 8.4 GHz). The mixer is followed by a low noise IF amplifier, which compensates for the loss due to mixing. The signal then passes a filter with a 3 dB bandwidth of approximately 400 MHz for filtering the first IF. The local oscillator frequency required for this conversion is also generated on the board. This signal is generated by three VCOs which are synchronized to the third LO3 at 810 MHz, which in turn is synchronized to a Temperature Compensated 10-MHz Xtal Oscillator (TCXO). This TCXO is electrically adjustable to the predetermined frequency.

The signal from the 1st IF filter is converted to the 2nd IF of 831.4 MHz. The signal is routed to an 831.4 MHz filter with a 3-dB bandwidth of 20 MHz for further signal processing. The filter is followed by the 3rd mixer, which converts to 21.4 MHz and utilizes the 3rd IF filter that has a -3 dB bandwidth of approximately 2 MHz. For resolution bandwidths above 1 MHz this last IF filter is bypassed. The frequency range above 3.6 GHz in the R&S FSC6 is converted via two additional mixers to a first IF of 8931.4 MHz and to the same 2nd IF as in the R&S FSC3 of 831.4 MHz. As LO signals the oscillator signals of the R&S FSC3 are doubled.

Tracking Generator (Models .13 and .16 only)

The LO1 frequency of the 1st mixer is routed via isolation amplifiers to the Tracking Generator mixer. The other input of the mixer is a fixed frequency of 4881.4 MHz generated with a VCO locked to the TCXO frequency. The resulting IF signal is routed to the generator output connector. In the 6 GHz model in the frequency range above 3.6 GHz the VCO in the tracking generator is set to half the IF1b frequency to approx. 4.465 GHz. With the use of a frequency doubler the tracking signal is generated in between 3.6 GHz and 6 GHz. In this band a subharmonic about 10 dB below the wanted signal is visible on the tracking generator output. Due to the selectivity in the receiver part this subharmonic has no disadvantage for the user.

RF/IF control

The microcontroller available on the mainboard controls the RF/IF setting by programming registers via an internal serial bus.

For calibration purposes the level correction values are stored in an EEPROM. This EEPROM also contains module-specific information. The temperature of the module is continuously measured, and the measured levels will be compensated for drift if the temperature change is too great.

3.1.1.2 Mainboard

The mainboard functions are controlled by a dedicated processor. It also contains the analog to digital converter and the ASIC for the digital filtering of the IF signal.

Processing of measured data, detectors

The measured data is processed in a dedicated ASIC (UDC: universal down converter) to reduce the sample rate of the input signal to a value that can be handled by the processor.

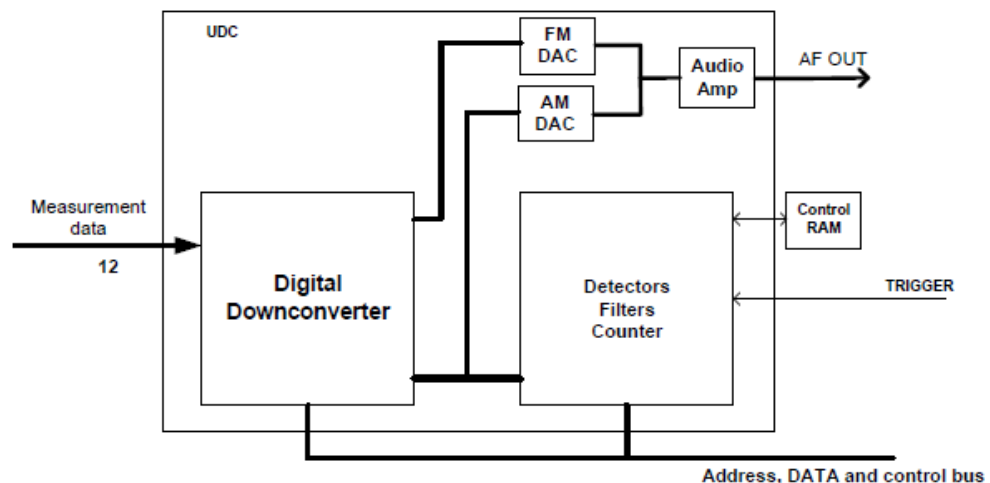


Figure 3-2: Measured data processing

The UDC converts the digital IF signal to I/Q base band and filters the base band signals using low pass filters with programmable bandwidth. In addition it delivers the AM or FM demodulated audio signal. The ASIC also detects the envelope of the filtered and combined base band signal and calculates its logarithm. It contains also the video filter and the different detectors. In addition it is responsible for the sweep control of the R&S FSC.

Resolution bandwidths (RBW)

The resolution bandwidths are implemented in the R&S FSC through digital processing in the UDC ASIC (Digital Down Converter). The RBW can be selected from within the range 100 Hz to 3 MHz in 1-3-10 unit increments. The UDC first mixes its input IF to the baseband using a NCO (Numeric Controlled Oscillator) and then filters the resulting IQ signals via a combination of HDF (High Decimation Filter) and a FIR filter (Finite Impulse Response) stages. At the end of the UDC processing chain, the IQ signal is split into magnitude and phase.

For AM demodulation the amplitude information is used. In the case of FM the phase information is used and fed to the headphone connector. In the analyzer mode the signal at the position of the marker can be demodulated. In this case the R&S FSC stops the sweep for a selectable period of time and demodulates the input signal. The volume can be adjusted.

Video bandwidths (VBW)

The video filters can be adjusted between 10 Hz and 3 MHz in increments of 1-3-10 units. They are designed as digital single pole lowpass filters for the video signals. Software can couple the VBW to the RBW, or the VBW can be set independently.

Detectors

The R&S FSC uses a detector for the positive peak and the negative peak value. In the "sample" mode the measured value is routed directly to the display. In the "RMS" mode the detector determines the RMS value of the input signal for one specific point in the display during the measured time.

Keypad control

Keypad control is a dedicated function of the controller. For the implementation of the rotary knob, an encoder is used that is detected with a dedicated CPLD (Complex Programmable Logic Device). This "One Time Programmable" CPLD is programmed during production.

3.1.2 Motherboard

The Motherboard is located on top of the R&S FSC HF-Module. It provides the interface circuits between the R&S FSC HF-Module and the peripherals: Keyboard, rotary knob encoder, display with touch screen, speaker and USB interface to the front panel.

In addition, the Motherboard connects the instrument to the power supply and to an external 15 V supply. Fuses for both supplies are located on the Motherboard.

3.1.3 Front Unit

The Front Unit consists of the front panel with keyboard, rotary knob encoder, touch sensitive color display and sockets for USB interface and headphone connector.

3.1.4 Power Supply

The power supply unit delivers a single +15V supply voltage to the instrument. A fuse for this supply voltage is located on the Motherboard. The switch on the mains socket disconnects the instrument completely from the mains. There are no replaceable fuses in the power supply.

3.2 Module Replacement

This chapter describes the replacement of modules. Chapter 5 provides information on how to order spare parts. It also contains the parts lists with material numbers of spare parts and additional illustrations.

The R&S FSC HF-Module (Pos. 30, 40, 50 or 60 depending on the model) can only be replaced by a Rohde & Schwarz Service representation. Special software is required to initialize the module.

The numbers in parenthesis in the text, i.e. (620) refer to the encircled numbers in drawings and photos as well as to the item numbers in the parts lists. Parts without a reference number are indicated with letters, i.e. (A) in the photos.

3.2.1 After replacing a module

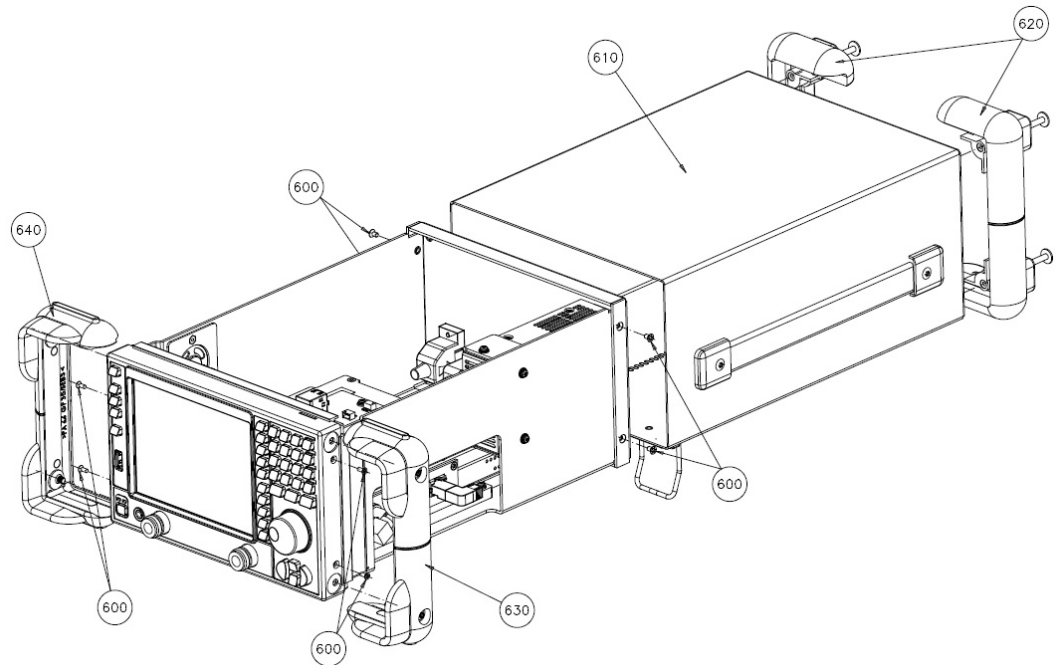
No additional adjustments are required after the replacement of any module. Spareparts of the R&S FSC HF-Module are completely adjusted and tested.

After replacing the R&S FSC HF-Module it is necessary

- to write the serial number back to the instrument. This is done with the Software "Performance Verification Suite" (PVS). The Software and additional information is available in GLORIS.
- to recover all software options installed in the instrument. The Software "R&S Option Key Tools" is used for this purpose. An additional Privilege Card for Service is needed to use the Software.
- to carry out the performance test according to chapter 1 or to calibrate the instrument with a calibration system to ensure proper function of the complete instrument.

After the replacement of other modules no adjustments are needed. However, the correct function should be checked.

3.2.2 Opening the Instrument

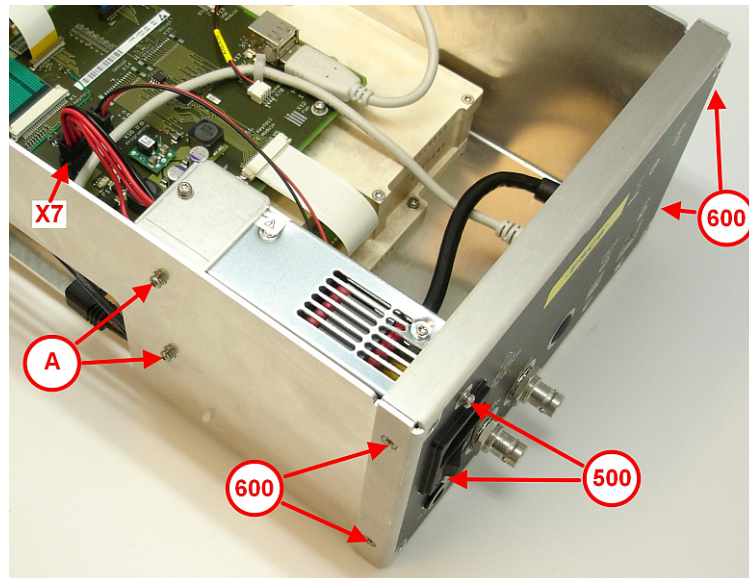


- Switch the instrument off and pull the mains plug.
- Put the instrument on the front shock mounts (630).
- Unscrew the four screws of the rear shock mounts (620) and remove the shock mounts.
- Pull off the case (610).

3.2.3 Reassembling the Instrument

- Put the instrument on the front shock mounts (630).
- Put the case (610) on the instrument. Take care that the case fits correctly in the groove of the front panel.
- Fix the rear shock mounts (620) with four screws

3.2.4 Power Supply



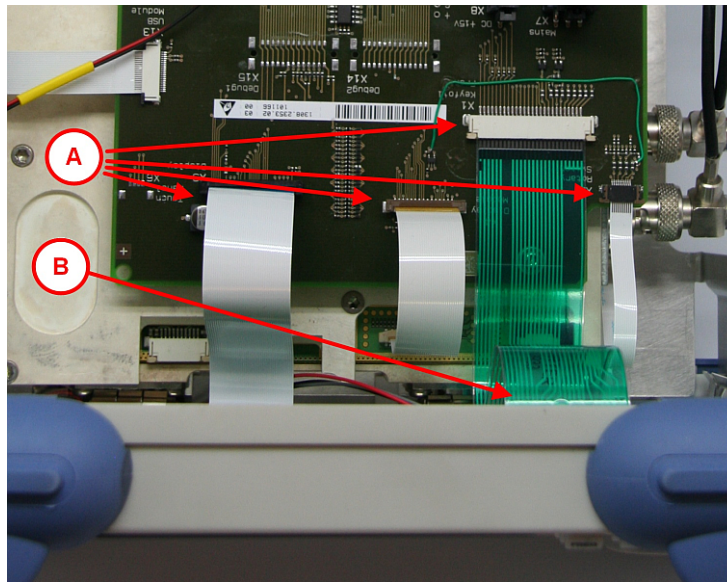
To remove the power supply,

- Open the instrument (see [Opening the Instrument](#))
- Disconnect the DC supply cable from the Motherboard connector X7.
- Remove two screws (A) on the side of the instrument fixing the holder of the power supply.
- Remove four countersunk screws (600) holding the rear panel on both sides. Pull the rear panel backward to increase the distance to the Motherboard.
- Remove two screws (500) on the rear panel holding the power supply.
- Carefully take the power supply unit out of the instrument.
- Remove two screws fixing the holder on the power supply.
- Remove the holder from the power supply. Keep the holder for the installation of the new power supply unit.

To install the power supply unit

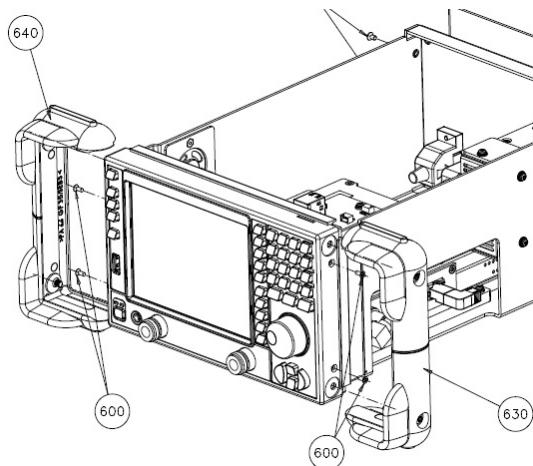
- Fix the holder with two screws on the power supply unit.
- Mount the power supply on the rear panel with two screws (500).
- Attach the rear panel on the instrument with four countersunk screws (600).
- Fix the power supply holder with two screws (A) on the side of the instrument.
- Connect the DC supply cable to socket X7 on the Motherboard. Take care that the clip on the connector is locked correctly.
- Reassemble the instrument (see [Reassembling the Instrument](#)).

3.2.5 Front Unit



To remove the Front Unit from the instrument,

- Open the instrument (see [Opening the Instrument](#))
- Disconnect all four (A) from the Motherboard to the Front Unit. Open the locks on the flex. cables before disconnecting them.
- Disconnect the cable (B) to the headphone socket on the R&S FSC HF-Module side.
- Remove four screws in the shock mounts. Remove the shock mounts (630 and 640) from the Front Unit.
- Remove four countersunk screws (600) on both sides of the Front Unit.
- Pull the Front Unit carefully forward to separate it from the instrument.

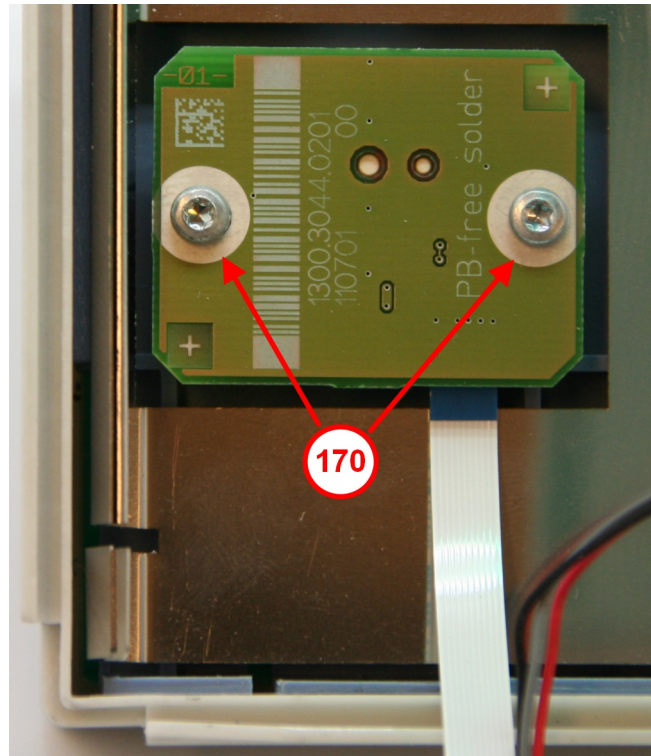


To reinstall the Front Unit on the instrument,

- Carefully mount the Front Unit on the instrument chassis. Take care that the shielding is not damaged and the unit is positioned correctly.
- Fix the Front Unit with four screws (600) on the sides of the instrument.

- Attach the shock mounts (620 and 630) on the sides of the instrument and fix them with four screws.
- Connect the headphone cable (B) to the R&S FSC HF-Module.
- Connect the cables (A) between Front Unit and Motherboard.
- Reassemble the instrument (see [Reassembling the Instrument](#)).

3.2.5.1 Rotary Knob



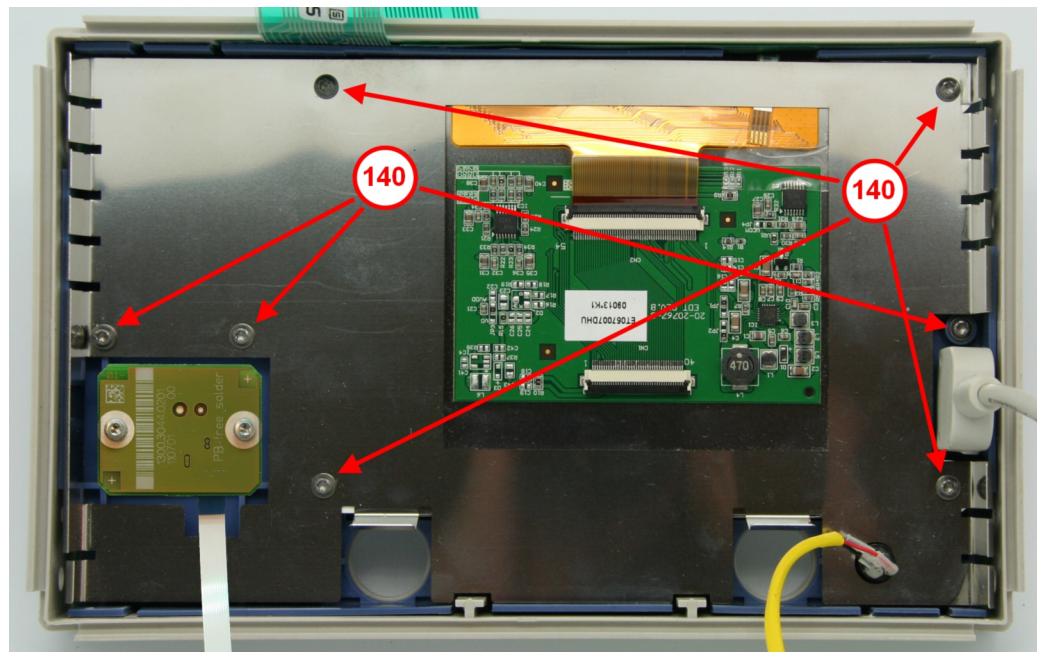
To remove the knob encoder from the Front Unit,

- Detach the Front Unit from the instrument (see [Front Unit](#)).
- Pull the knob on the front panel from the encoder shaft.
- Remove two screws (170) on the Encoder Board from the back side.
- Take the encoder out of the Front Unit

To install the encoder in the Front Unit,

- Put the encoder on its place in the Front Unit.
- Fix the encoder with two screws (170) in the Front Unit, observe the maximum torque of 40 Ncm.
- Attach the Front Unit to the instrument (see [Front Unit](#)).

3.2.5.2 Display



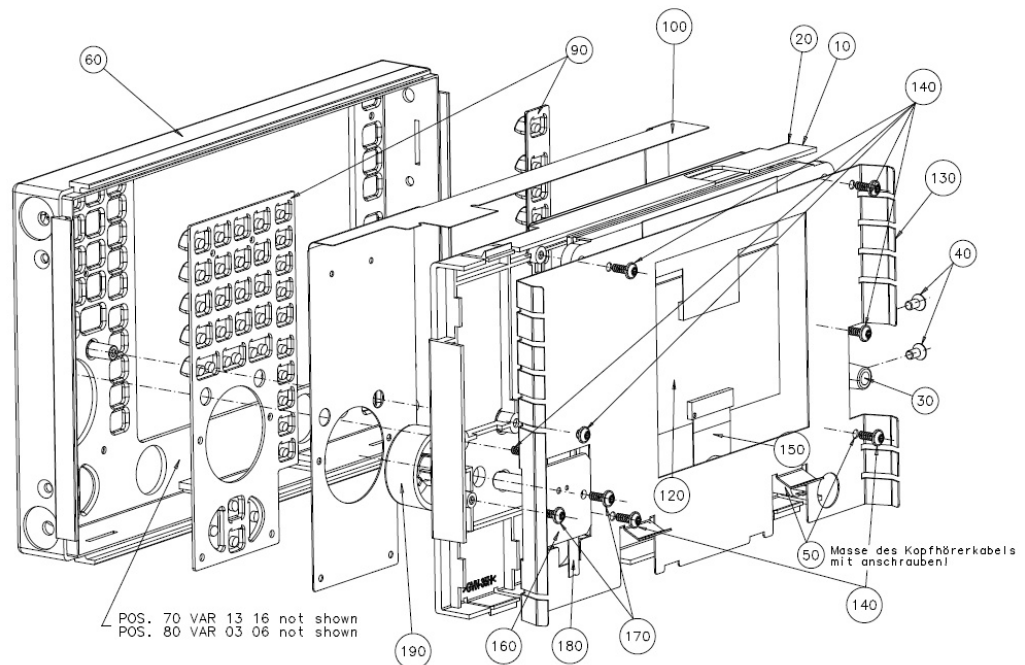
To remove the Display from the Front Unit,

- Detach the Front Unit from the instrument (see [Front Unit](#)).
- Remove the Knob Encoder (see [Rotary Knob](#)).
- Unscrew the seven screws (140) from the metal shielding on the rear side of the unit. Four screws are holding the display, three screws fix the front cover to the blue holding frame (10 or 20).
- Carefully remove the shielding (130).
- Take the display (120) out of the Front Unit.
- Keep the dust protection for the installation of the new display.

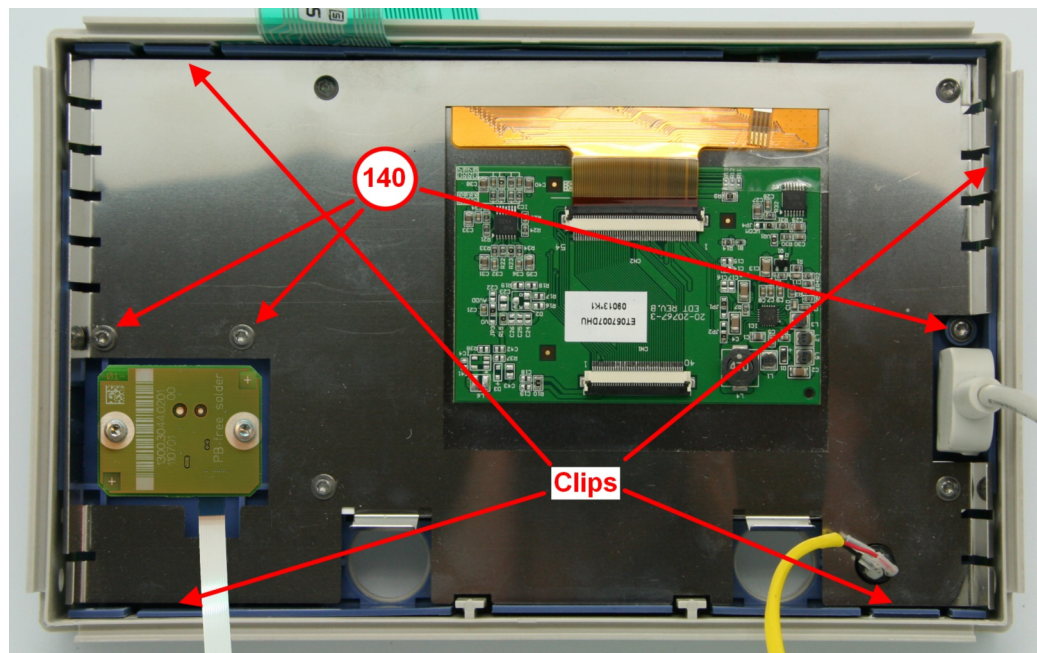
To install the display in the Front Unit,

- Lay the dust protection into the blue holding frame (10 or 20).
- Put the display (120) on its place in the holding frame.
- Put the shielding (130) on its place in the Front Unit.
- Fix the display with four screws (140). Observe the maximum torque (40 Ncm) for the screws. Check that the dust protection is correctly at its position and not covering part of the display.
- Secure the front cover with three screws. Observe the maximum torque (40 Ncm) for the screws.
- Install the knob encoder (see [Rotary Knob](#)).
- Attach the Front Unit to the instrument (see [Front Unit](#)).

3.2.5.3 Keyboard



To replace the Pushbutton Board Set and the Flex Switch Board, display and knob encoder can remain in the Front Unit. Only the front cover must be removed.



To dismantle the front cover,

- Detach the Front Unit from the instrument (see [Front Unit](#)).
- Pull the knob on the front panel from the encoder shaft.
- Remove three screws (140) that secure the front cover (60).

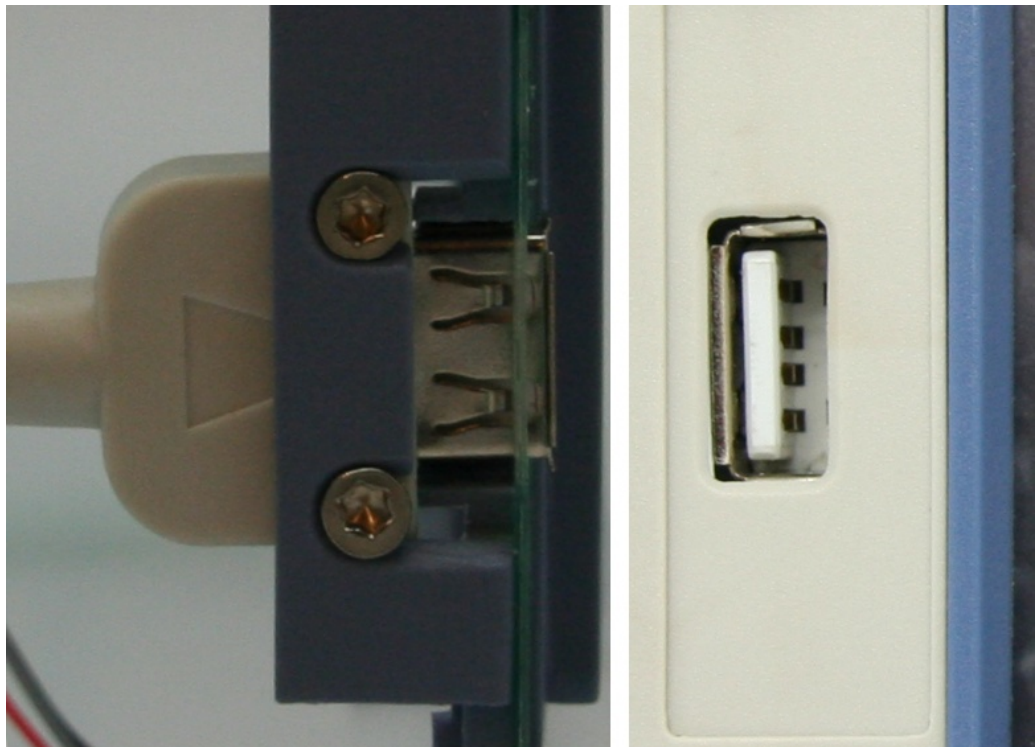
- Open four clips on the sides of the front cover with a small screwdriver. Push the clips through the slots of the cover until they unlock. When all four clips are opened, the holding frame (10 or 20) with display can be separated from the front cover.
- Remove the Push Button Board Set (90).
- Remove the adhesive Flex Switch Board (100) from the holding frame.



To install the new keyboard components,

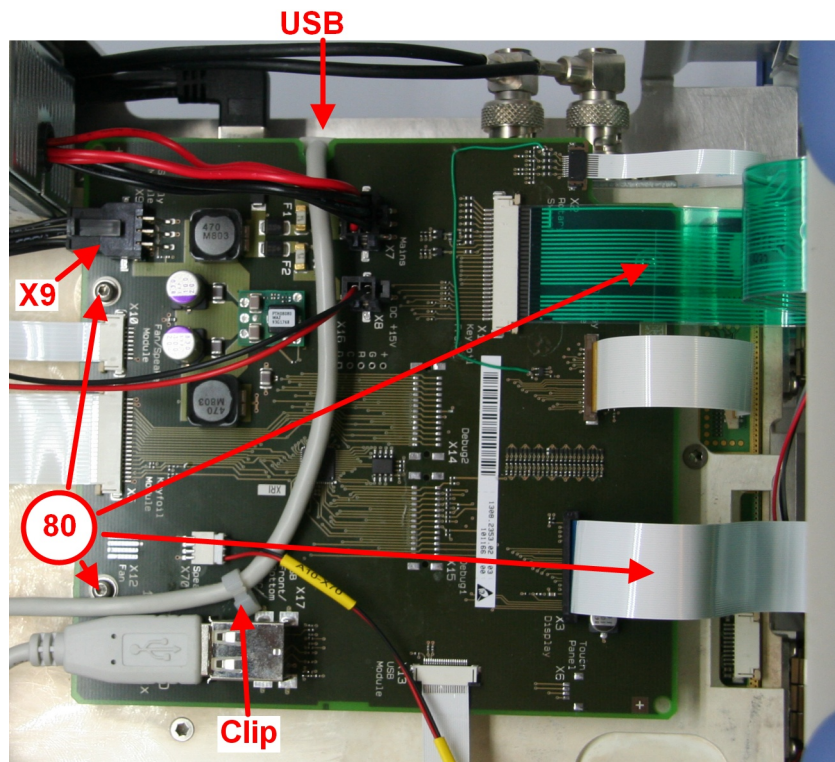
- Remove the protection from the self adhesive side of the Flex Switch Board (100) and fix the board on the holding frame.
- Insert the Pushbutton Board Set (90) in the front cover (60).
- Insert the holding frame into the front cover. Take care that the Flex Switch Board is not damaged on the top side of the holding frame. Check that the buttons are positioned correctly in the front cover.
- Press the holding frame into the front cover until all four clips are locked.
- Secure the front cover with three screws (140) from the rear side. Observe the maximum torque (40 Ncm) of the screws.
- Attach the Front Unit to the instrument (see [Front Unit](#)).

3.2.5.4 USB Connector on Front Panel



To replace the USB front panel connector, the front cover must be removed (see [Keyboard](#)). The socket is fixed with two countersunk screws on the side of the holding frame. Observe correct mounting direction of the USB socket and the maximum torque (50 Ncm) when tightening the screws again.

3.2.6 Motherboard



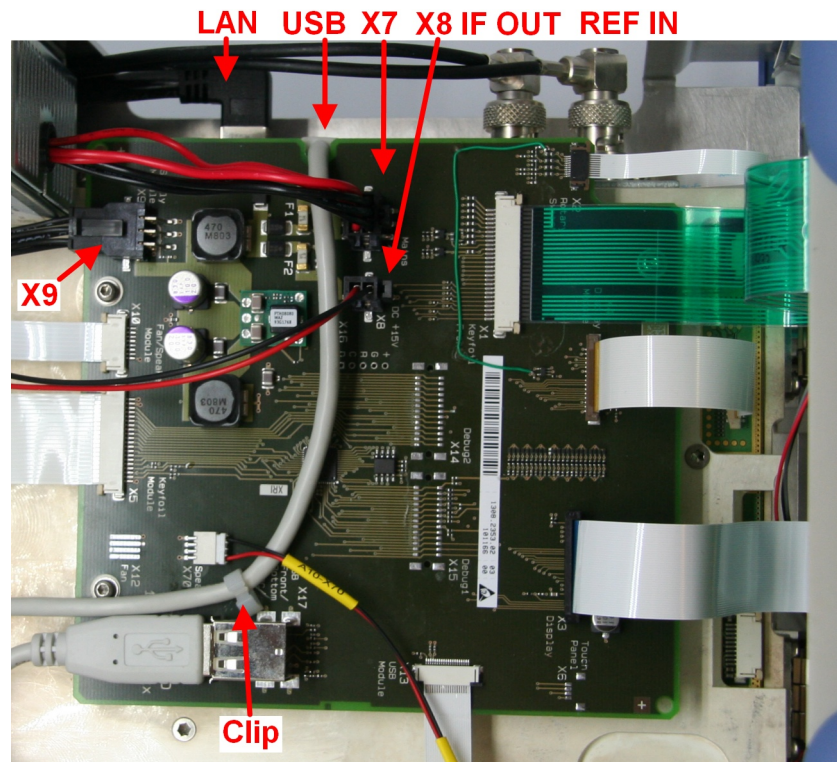
To remove the Motherboard from the instrument,

- Open the instrument (see [Opening the Instrument](#)).
- Disconnect all cables from the Motherboard, except to socket X9 (Supply Module). The connector is blocked by the power supply and can be disconnected after the removal of the Motherboard screws. Open the locks on the sockets for the flex. cables before removing the cables.
- Disconnect the USB cable to the rear panel from the R&S FSC HF-Module and remove the cable from the plastic clip on the Motherboard.
- Remove four screws (80) from the Motherboard, disconnect X9 and take the board carefully out of the instrument.

To install the new Motherboard,

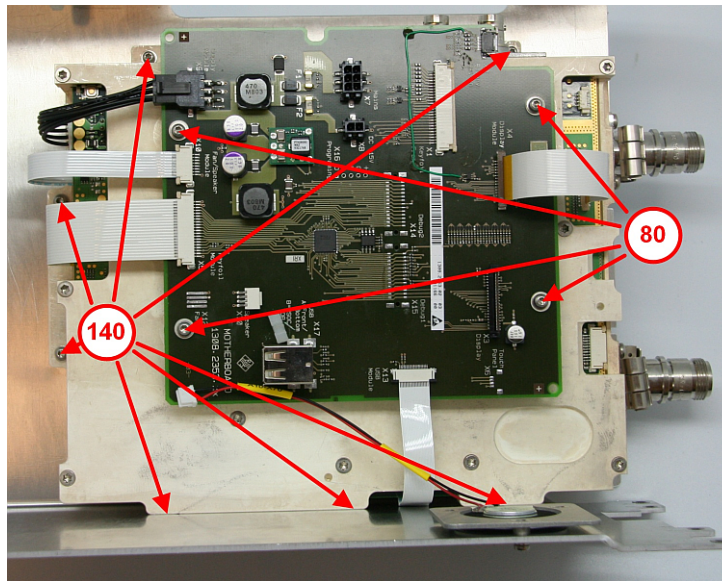
- Connect X9 (Supply Module) to the socket on the Motherboard before fixing the Motherboard.
- Fix the Motherboard with four screws (80) on the R&S FSC HF-Module.
- Connect the USB cable from the rear panel to the R&S FSC HF-Module and fix the cable in the plastic clip of the Motherboard.
- Connect all cables to their sockets on the Motherboard. Make sure the flex. cables are mounted correctly and the sockets are locked.
- Reassemble the instrument (see [Reassembling the Instrument](#)).

3.2.7 R&S FSC HF Module



The R&S FSC HF-Module is removed completely with the Motherboard. The Motherboard is separated from the module later. To remove the R&S FSC HF-Module, rear panel and Front Unit must be detached:

- Open the instrument (see [Opening the Instrument](#)).
- Disconnect the DC supply cable from the Motherboard connector X7.
- Unplug the external power supply cable from the Motherboard connector X8.
- Disconnect the cables from the side of the FSC HF-Module to the rear panel: Reference Input, IF Output, USB interface and LAN interface. Remove the USB cable from the plastic clip on the Motherboard.
- Remove two screws on the side of the instrument fixing the holder of the power supply.
- Remove four countersunk screws holding the rear panel on both sides.
- Detach the rear panel from the instrument tray.
- Dismount the Front Unit from the instrument (see [Front Unit](#)).



- Remove seven screws (140) that hold the R&S FSC HF-Module in the instrument.
- Take the R&S FSC HF-Module together with the Motherboard out of the instrument tray.
- Disconnect all cables between R&S FSC HF-Module and Motherboard on the R&S FSC HF-Module side. Unlock the sockets before disconnecting the flex. cables.
- Remove four screws (80) from the Motherboard and detach the Motherboard from the R&S FSC HF-Module.

To reinstall the R&S FSC HF-Module,

- Attach the Motherboard to the R&S FSC HF-Module and fix it with four screws (80).
- Connect all cables between Motherboard and R&S FSC HF-Module and lock the sockets of the flex. cables.
- Put the R&S FSC HF-Module and Motherboard into the instrument tray and fix it with seven screws (140).
- Mount the Front Unit to the instrument (see [Front Unit](#)).
- Attach the rear panel to the instrument tray.
- Fix the rear panel with four countersunk screws.
- Fix the power supply with two screws from the side of the instrument.
- Reconnect the cables from the rear panel to the side of the R&S FSC HF-Module: Reference Input, IF Output, USB Interface and LAN Interface. Secure the USB cable with the plastic clip on the Motherboard.
- Reconnect the external power supply cable to the Motherboard connector X8.
- Reconnect the DC supply cable to the Motherboard connector X7.
- Reassemble the instrument (see [Reassembling the Instrument](#)).

4 Firmware Updates / Installing Options

This chapter provides information on software updates and how to install options on the R&S FSC. Additional manuals supplied along with software/firmware updates or with options obtained later can be recorded here.

4.1 Installing New R&S FSC Firmware

A new firmware version can be installed via the R&S website. You can download the newest software version. In order to install the firmware, it must first be copied onto a USB Stick.

For preparation of the USB Stick the following steps must be processed:

1. Download the firmware update package from the R&S website into an empty folder on your PC.

The update package comes as a self-extracting .ZIP file, e.g. "FSCV1.00.EXE" for version 1.00.

2. Start the .EXE-file. The installer will allow you to select the folder for the extracted files. After you have entered the desired folder, press the START button.

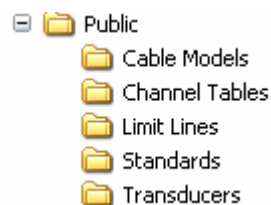


Overwriting files

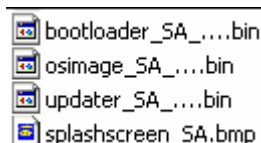
The installer will create a number of subdirectories for standards, limit lines, cable models etc and copy the predefined configuration files into them. In case that files already exist, it will prompt you for confirmation to overwrite the files.

3. Copy all the files and subfolders into the root directory of the USB stick.

In the sequence the folder structure should be as follows:



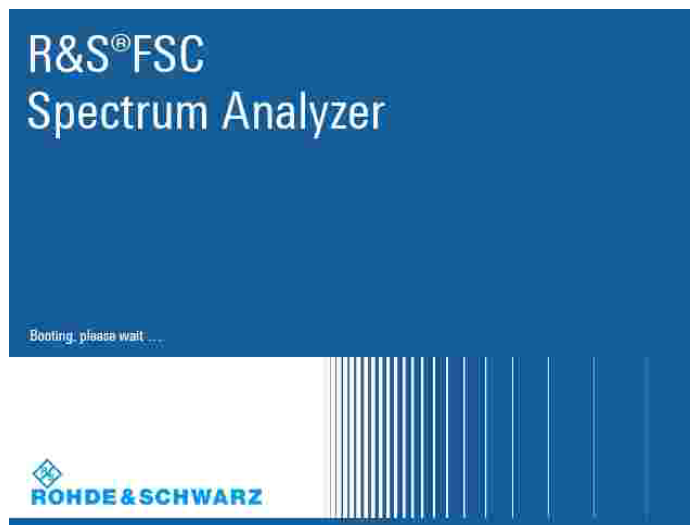
The root directory of the USB stick should now contain the following files:



The USB stick is now ready for use.

In order to perform the firmware update on the instrument itself the following steps must be processed:

1. Switch the instrument OFF.
2. Insert the USB stick into the USB connector on the front of the instrument.
3. Connect the instruments power supply.
4. Press the keys PRESET and 8 simultaneously and switch the instrument ON.
5. Keep PRESET and 8 pressed until the startup screen appears



6. Release the keys PRESET and 8.

The R&S FSC will continue its boot process and after a couple of seconds the following information will appear on the screen:

Instrument Firmware Update

Searching for Storage card ... OK

Searching for updater *.bin ... Found updater _SA_....bin

Checking updater _SA_....bin: ... OK

Update instrument to software version ...

Press [ENTER] to update the firmware.

Press [CANCEL] to abort firmware updating.

7. Press ENTER to start the firmware update process.

The instrument will perform the firmware update. This will take about 5 minutes.

The progress of the update will be displayed in a sequence of messages on the screen.

NOTICE**Risk of data corruption**

Do not switch the instrument off during the update process in order to avoid data corruption of the internal flash memory!

8. As soon as the firmware update is completed, the R&S FSC will display the following message at the bottom of the screen:

Firmware updating is successfully completed.

Please switch off the instrument.

Switch the instrument off and on again. The R&S FSC will boot with the new firmware version.

4.2 Installing Options

Installation of options is described in the Quick Start Guide, chapter "Enabling Options".

5 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 FSC unit.

5.1 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)

5.2 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 modules

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.

Pos.	Stock No	Designation	No	Electr. design.	Recommended spare parts
Drawing 1314.3006.01 D1					
0020	1314.3112.00	U-SHEET	1		X
0030	1314.3364.03	FSC HF-MODUL 3GHZ	1	A110	X
0040	1314.3364.13	FSC HF-MODUL 3GHZ+TG	1	A110	X
0050	1314.3364.06	FSC HF-MODUL 6GHZ	1	A110	X
0060	1314.3364.16	FSC HF-MODULE 6GHZ+TG	1	A110	X
0070	1308.2353.02	MOTHERBOARD FSC	1	A100	X
0080	0041.1653.00	VS 6900/ISR-M2.5X8-A2	4		
0090	5300.1976.00	FLEX-STRIP 30P. R=0.5	1	W4	X
0100	1314.3470.00	FLEX STRIP 8P R=1 L=78	1	W10	X
0110	1314.3412.00	FLEX. STRIP 20P. R=1 L=70	1	W5	X
0120	1314.3429.00	FLEX STRIP 20P R0.5 L70	1	W13	X
0130	1314.3306.00	6 POL SUPPLY CABLE	1	W9	X
0140	0041.1653.00	VS 6900/ISR-M2.5X8-A2	7		
0150	1314.3258.00	SPEAKER HOLDER	1		
0160	1308.0809.00	SPEAKER FSV	1	B1	X
0170	0041.1653.00	VS 6900/ISR-M2.5X8-A2	3		

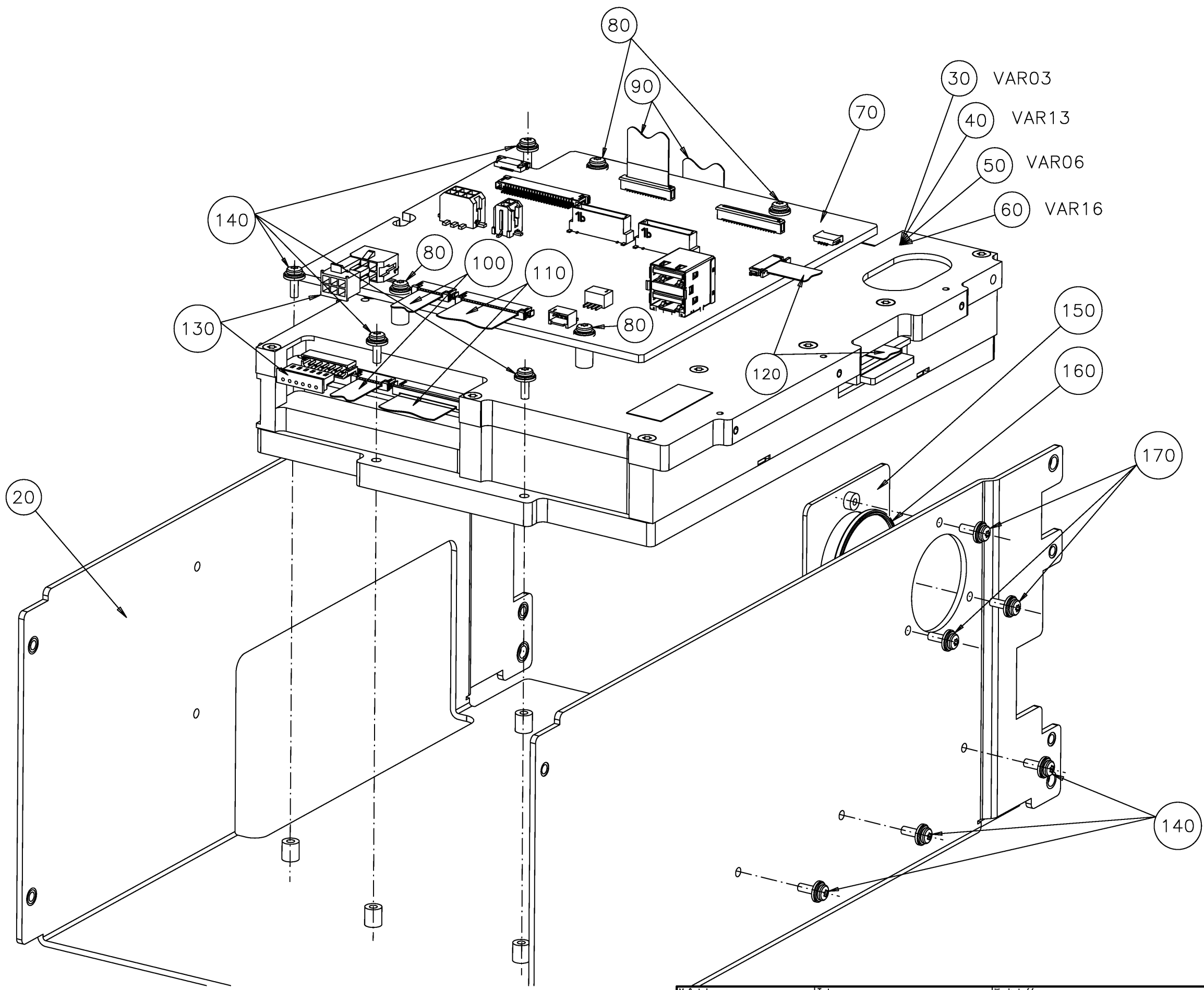
Drawing 1314.3006.01 D3					
0300	1314.3329.03	FRONT UNIT	1	A30	X
0310	1314.3329.13	FRONT UNIT	1	A30	X
0320	1314.3329.06	FRONT UNIT	1	A30	X
0330	1314.3329.16	FRONT UNIT	1	A30	X
Drawing 1314.3006.01 D2 + D3					
0400	1314.3312.00	REAR PANEL	1		X
0410	1314.3658.00	DC SUPPLY CABLE	1	W8	X
0420	1314.3064.00	BNC1 CABLE	2	W111/W112	X
0430	0344.4591.00	COVER RD12.7	1		X
0440	1314.3087.00	USB CABLE USB-MINI/USB-B	1	W113	X
0450	1148.2781.00	VS 965/ISR-M3X6-A4-PA	2		
0460	1314.3070.00	LAN CABLE 300 ST-W CAT5E	1	W114	X
0470	1148.2781.00	VS 965/ISR-M3X6-A4-PA	2		
0480	1416.0870.00	POWER SUPPLY UNIT PS75	1	A10	X
0490	1314.3270.00	POWER SUPPLY HOLDER	1		X
0500	0041.1653.00	VS 6900/ISR-M2.5X8-A2	4		
0600	1148.2781.00	VS 965/ISR-M3X6-A4-PA	8		
0610	1314.3129.00	BW2K TUBE 3E1/2T350	1		X
0620	1096.6460.00	SHOCK MOUNT REAR. 3E	2		X
0630	1096.7295.00	SHOCK MOUNT FRONT RI.	1		X
0640	1096.7289.00	SHOCK MOUNT FRONT LE.	1		X
0700	1314.3487.00	ACCESSORIES FSC	1		

Front Unit Drwaing 1314.3329.01 D1					
0010	1314.3393.00	HOLDING FRAME FSC3	1		X
0020	1314.3406.00	HOLDING FRAME FSC6	1		X
0030	1314.3241.00	CABLE USB-A BU./USB-A ST.	1	W35	X
0040	1148.3320.00	VS 965/ISR-M3X10-A4-PA	2		
0050	1314.3293.00	HEADPHONE CABLE	1	W36	X
0060	1314.3435.00	FRONT COVER	1		X
0070	1314.3341.00	FRONT FOIL WITH TG	1		X
0080	1314.3358.00	FRONT FOIL WITHOUT TG	1		X
0090	1314.3193.00	PUSH-BUTTON BOARD SET	1	A31	X
0100	1314.3206.00	FLEX. SWITCH BOARD	1	A32	X
0120	1314.3212.00	TFT 5.7 VGA DRGB LED TP	1	A33	X
0130	1314.3564.00	SHIELDING	1		X
0140	1148.3188.00	SCREW FOR PLASTIC 2.5X7	7		X
0150	3584.1942.00	FLEX-STRIP.40P R=0.5	1	W33	X
0160	1300.3044.02	ENCODER BOARD	1	A34	X
0170	1148.3188.00	SCREW FOR PLASTIC 2.5X7	2		X
0180	1314.3458.00	FLEX STRIP 10P R0.5 L90	1	W34	X
0190	0852.1086.00	KNOB	1		X
0200	1314.3387.00	DUST PROTECTIVE	1		X
Accessories R&S FSC 1314.3487.00					
0030	1314.3493.62	QUICK START GUIDE ENG.	1		
0040	1314.3506.08	FSC CD ROM MANUAL ENG.	1		
0050	1502.0567.00	CABLE USB/A-USB/B 2.0M	1		

5.3 Mechanical Drawings

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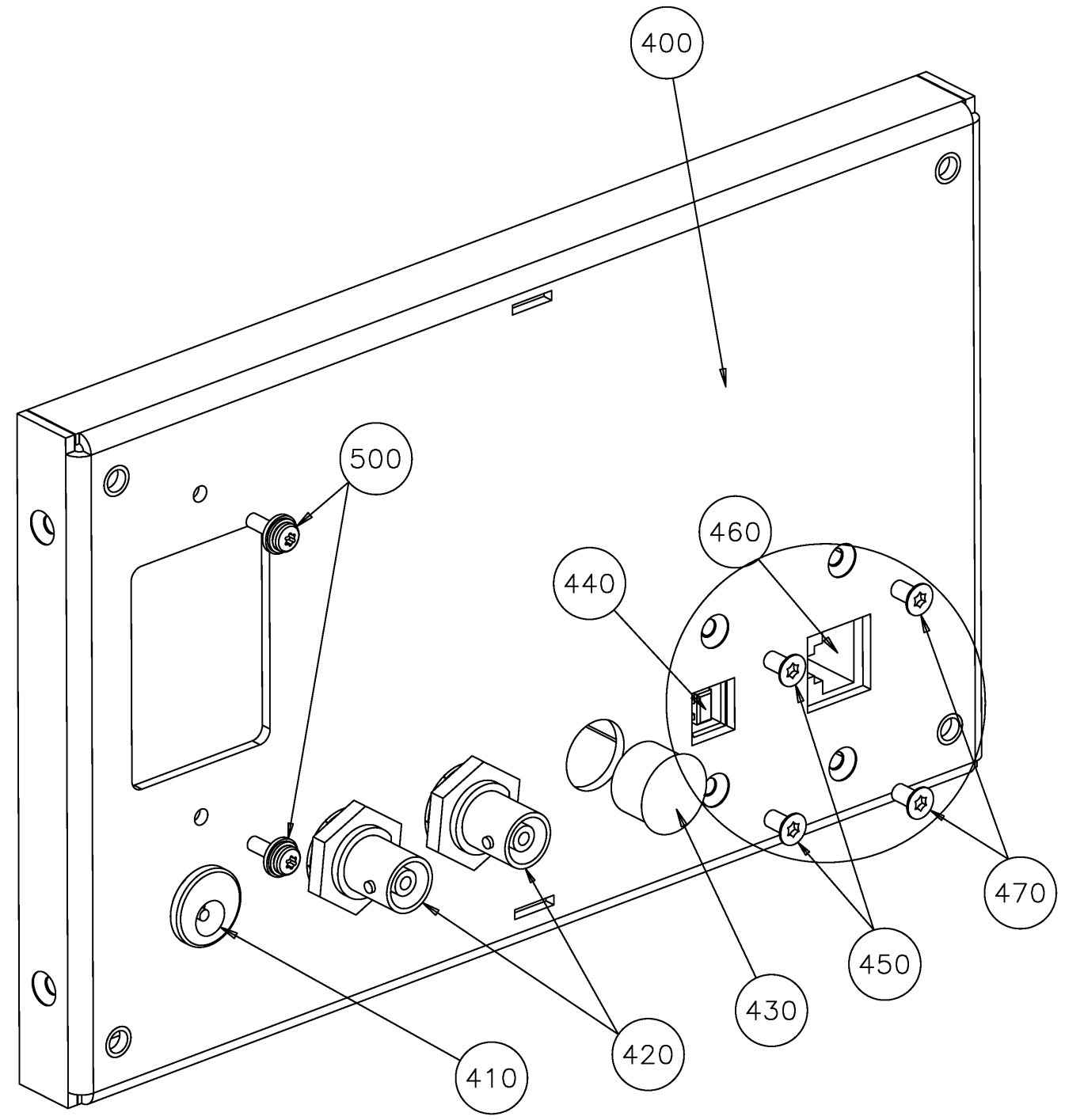
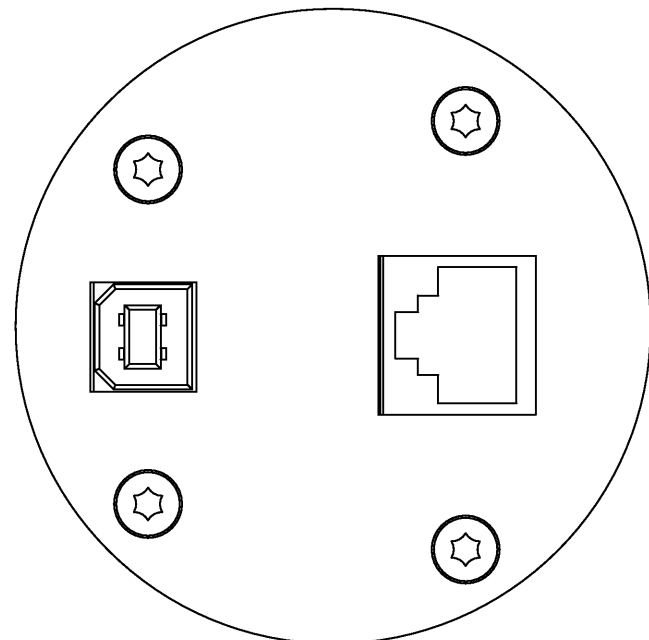
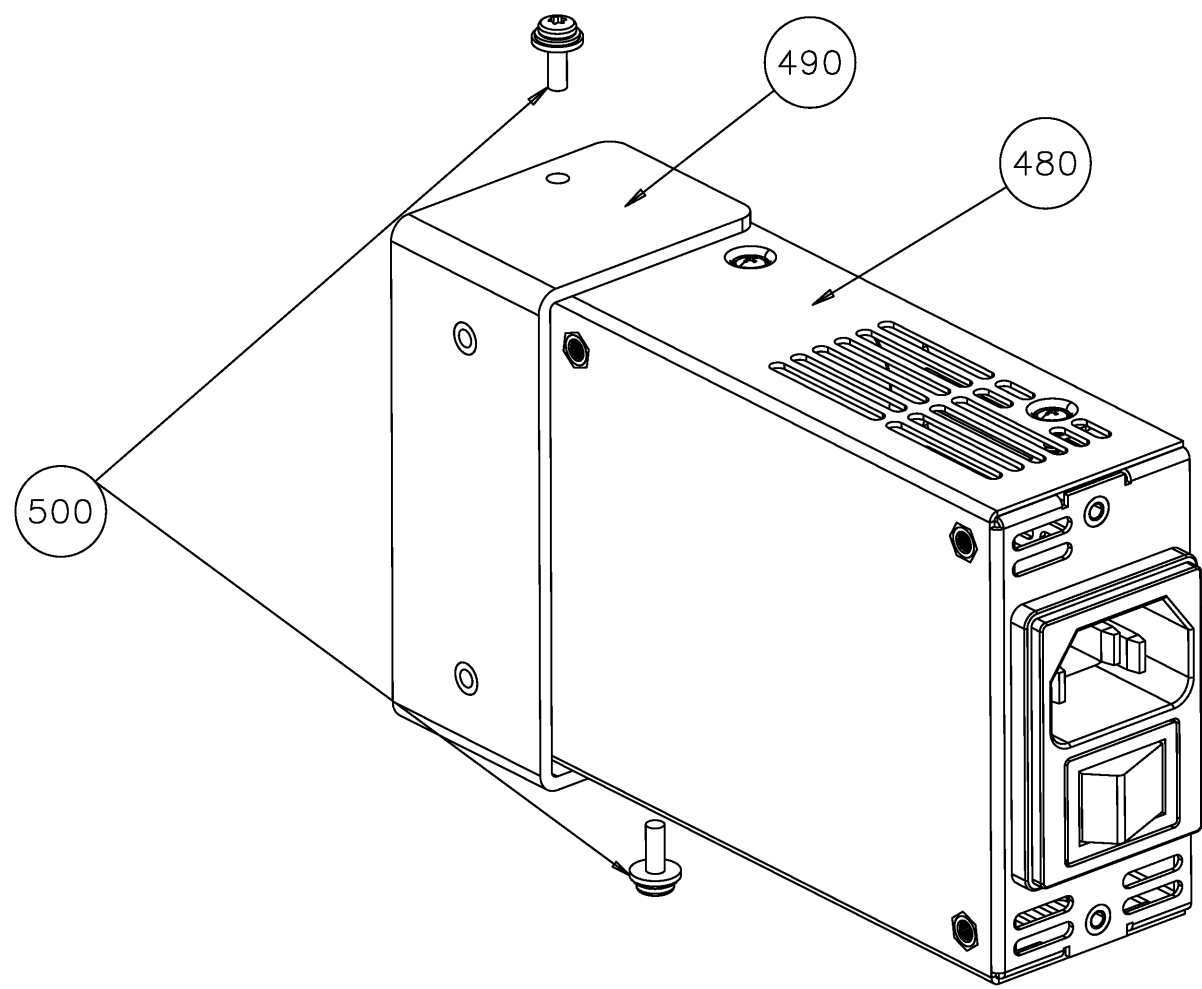
Projektions-
methode
Projection
Method



Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang. / Ael. / C.I.			Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	FSC SPECTRUM ANALYZER FSC SPECTRUM ANALYZER	de en	01.00	1	
PLUTO	Datum Date	2009-07-07	Abteilung Dept.	1ESK	Name Name	rn
						1314.3006.01 D

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Projektions-
methode
Projection
Method



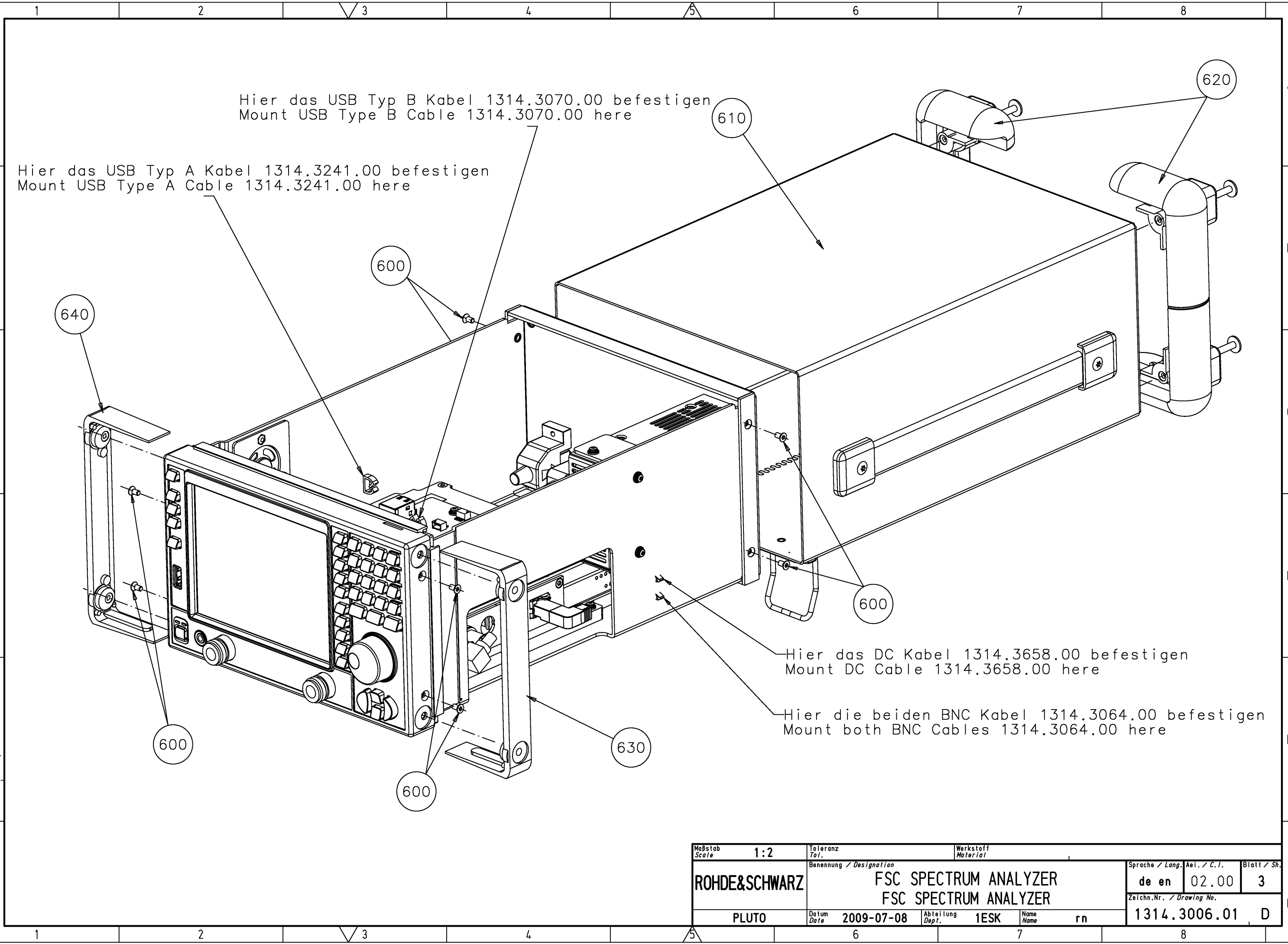
Anzugsmoment der M3 Senkschrauben (Position 450 und 470) auf 50Ncm begrenzen

Eibaurichtung des USB und LAN Kabels beachten !

Maßstab Scale	1:1	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Äsl. / C.I.	Blatt / Sh.
Benennung / Designation	ROHDE&SCHWARZ FSC SPECTRUM ANALYZER FSC SPECTRUM ANALYZER			de en	02.00	2
Datum Date	2009-10-16	Abteilung Dept.	1ESK	Name Name	rn	1314.3006.01 D
PLUTO						

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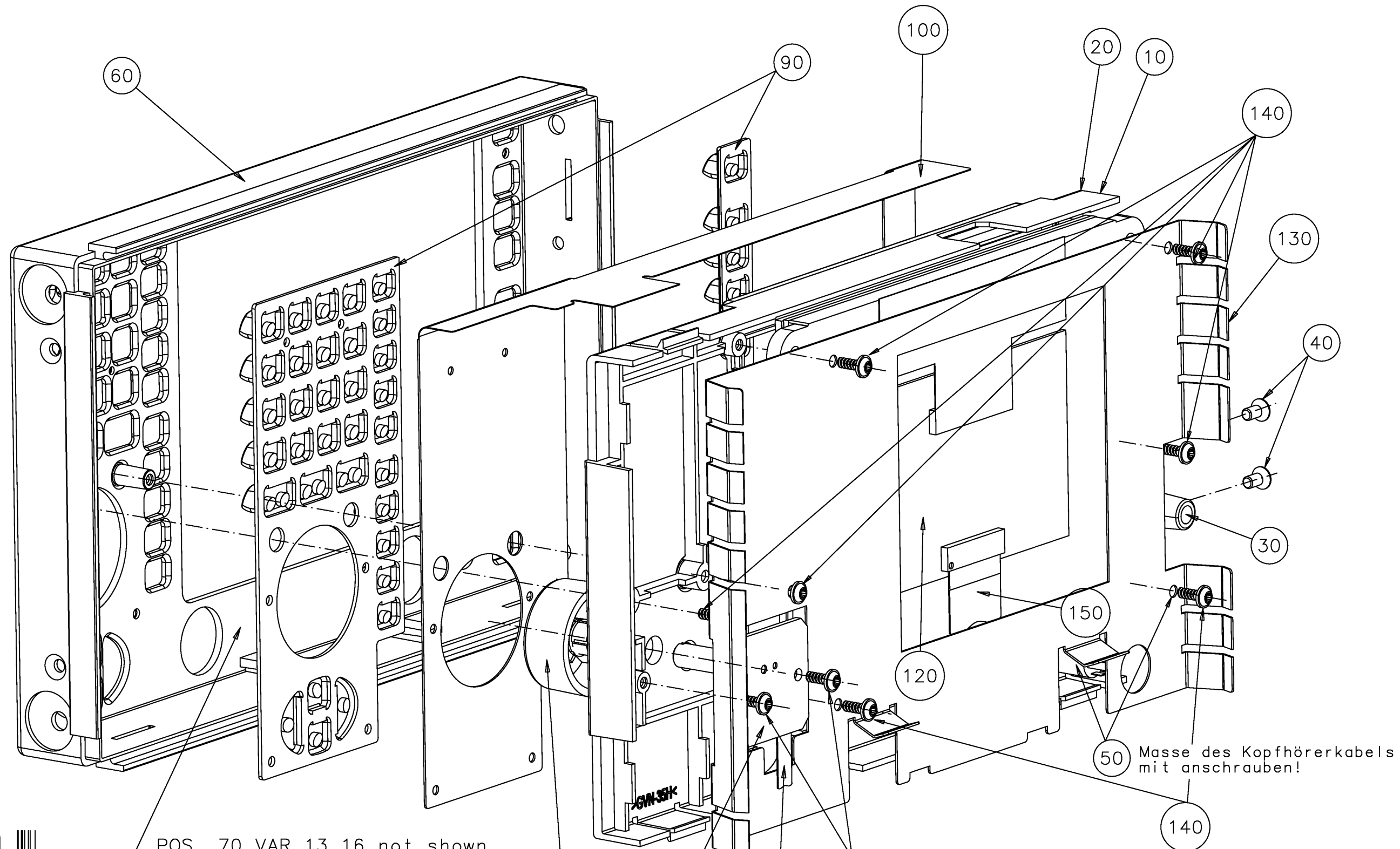
Projektions-
methode
Projection
Method



Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang. / Ael. / C.I.	Blatt / Sh.
Benennung / Designation	ROHDE&SCHWARZ FSC SPECTRUM ANALYZER FSC SPECTRUM ANALYZER			de en 02.00	3
Datum Date	2009-07-08	Abteilung Dept.	1ESK	Name Name	rn
PLUTO	1314.3006.01			D	

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Projektions-
methode
Projection
Method



POS. 70 VAR 13 16 not shown
POS. 80 VAR 03 06 not shown

Einbaurichtung des USB
Kabels beachten

Pos. 50 Sicherung der Mutter des Kopfhörerkabels
mit Loctide 243 blau 0088.3675.00
POS. 40 maximales Anzugsmoment 50Ncm
POS. 140 und Pos. 170 maximales Anzugsmoment 35Ncm
POS. 200 not shown, is affixed to POS. 120

Maßstab Scale	1:1	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	FRONTEINHEIT FRONT UNIT			de en	03.00	1
PLUTO	Datum Date	2009-11-06	Abteilung Dept.	1ESK	Name Name	rn
				Zeichn.Nr. / Drawing No.	1314.3329.01	D