R&S®FSMR
Measuring Receiver
Getting Started

1313.9698.02 – 03

Test & Measurement

Getting Started

ROHDE&SCHWARZ

The Getting Started describes the following R&S®FSMR models and options:

- R&S FSMR3 1313.9200.03
- R&S FSMR26 1313.9200.26
- R&S FSMR431313.9200.43
- R&S FSMR50 1313.9200.50

The software contained in this product makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgment" on the user documentation CD-ROM (included in delivery).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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Trade names are trademarks of the owners.

The following abbreviations are used throughout this manual:
R&S®FSMR is abbreviated as R&S FSMR.

Safety Instructions
Instrucciones de seguridad
Sicherheitshinweise
Consignes de sécurité

⚠ WARNING

Risk of injury and instrument damage

The instrument must be used in an appropriate manner to prevent personal injury or instrument damage.

- Do not open the instrument casing.
- Read and observe the "Basic Safety Instructions" delivered as printed brochure with the instrument.
- Read and observe the safety instructions in the following sections. Note that the data sheet may specify additional operating conditions.
- Keep the "Basic Safety Instructions" and the product documentation in a safe place and pass them on to the subsequent users.

⚠ ADVERTENCIA

Riesgo de lesiones y daños en el instrumento

El instrumento se debe usar de manera adecuada para prevenir descargas eléctricas, incendios, lesiones o daños materiales.

- No abrir la carcasa del instrumento.
- Lea y cumpla las "Instrucciones de seguridad elementales" suministradas con el instrumento como folleto impreso.
- Lea y cumpla las instrucciones de seguridad incluidas en las siguientes secciones. Se debe tener en cuenta que las especificaciones técnicas pueden contener condiciones adicionales para su uso.
- Guarde bien las instrucciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

⚠ WARNUNG

Gefahr von Verletzungen und Schäden am Gerät

Betreiben Sie das Gerät immer ordnungsgemäß, um elektrischen Schlag, Brand, Verletzungen von Personen oder Geräteschäden zu verhindern.

- Öffnen Sie das Gerätegehäuse nicht.
- Lesen und beachten Sie die "Grundlegenden Sicherheitshinweise", die als gedruckte Broschüre dem Gerät beiliegen.
- Lesen und beachten Sie die Sicherheitshinweise in den folgenden Abschnitten; möglicherweise enthält das Datenblatt weitere Hinweise zu speziellen Betriebsbedingungen.
- Bewahren Sie die "Grundlegenden Sicherheitshinweise" und die Produktdokumentation gut auf und geben Sie diese an weitere Benutzer des Produkts weiter.

⚠ AVERTISSEMENT

Risque de blessures et d'endommagement de l'appareil

L'appareil doit être utilisé conformément aux prescriptions afin d'éviter les électrocutions, incendies, dommages corporels et matériels.

- N'ouvrez pas le boîtier de l'appareil.
- Lisez et respectez les "consignes de sécurité fondamentales" fournies avec l’appareil sous forme de brochure imprimée.
- Lisez et respectez les instructions de sécurité dans les sections suivantes. Il ne faut pas oublier que la fiche technique peut indiquer des conditions d’exploitation supplémentaires.
- Gardez les consignes de sécurité fondamentales et la documentation produit dans un lieu sûr et transmettez ces documents aux autres utilisateurs.

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

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ROHDE&SCHWARZ

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Tabbed Divider Overview

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Certificate of Quality
EU Certificate of Conformity
List of R&S Representatives

Manuals for Measuring Receiver R&S FSMR

Tabbed Divider

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Chapter 2: Getting Started

Chapter 3: Menu Overview

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Documentation Overview

The documentation of the R&S FSMR consists of base unit manuals and option manuals. All manuals are provided in PDF format on the CD-ROM delivered with the instrument. Each software option available for the instrument is described in a separate software manual.

The base unit documentation comprises the following manuals and documents:

- Quick Start Guide
- Operating Manual
- Service Manual
- Release Notes

Apart from the base unit, these manuals describe the models and options of the R&S FSMR Measuring Receiver that are listed in the documentation overview of the Operating Manual. All other options are described in separate manuals. These manuals are provided on the CD-ROM. For an overview of all options available for the R&S FSMR visit the R&S FSMR Measuring Receiver Internet site.
This manual is delivered with the instrument in printed form. It provides the information needed to set up and start working with the instrument. Basic operations and basic measurements are described. The function descriptions are provided in the Operating Manual. The Quick Start Guide includes general information (e.g. Safety Instructions) and the following chapters:

Quick Start Guide

Chapter 1 describes the control elements and connectors on the front and rear panel as well as all procedures required for putting the R&S FSMR into operation and integration into a test system.

Chapter 2 gives an introduction to typical measurement tasks of the R&S FSMR which are explained step by step.

Chapter 3 describes the operating principles, the structure of the graphical interface and offers a menu overview.

Chapter 10 contains an index for the quick start guide.

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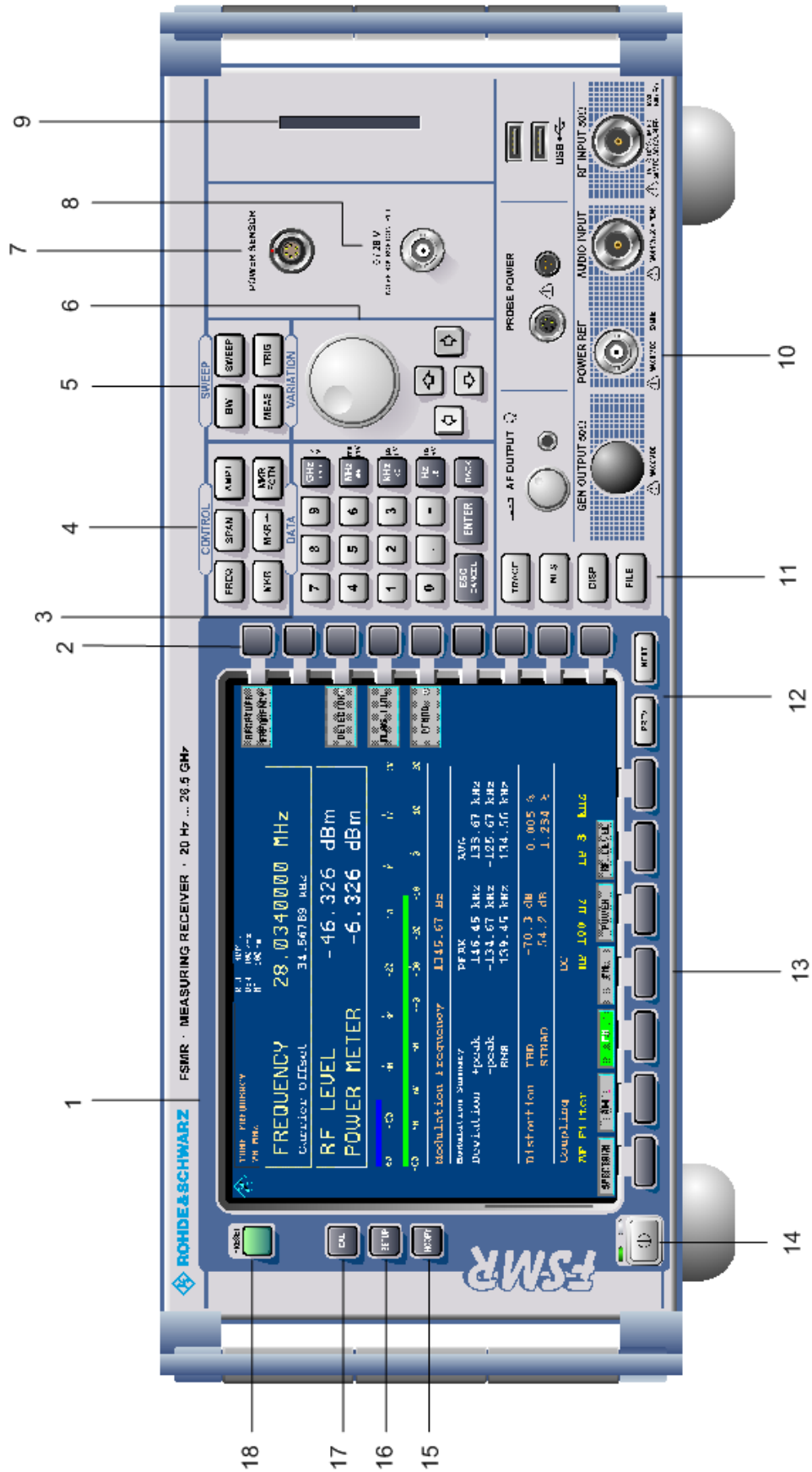


Fig. 1-1 Front View

1 Preparing for Operation

Chapter 1 describes the controls and connectors of the Spectrum Analyzer R&S FSMR by means of the front and rear view. Then follows all the information that is necessary to put the instrument into operation and connect it to the AC supply and to external devices.

A more detailed description of the hardware connectors and interfaces can be found in chapter 8. Chapter 2 provides an introduction into the operation of the R&S FSMR by means of typical examples of configuration and measurement; for the description of the concept for manual operation and an overview of menus refer to chapter 3.

For a systematic explanation of all menus, functions and parameters and background information refer to the reference part in chapter 4.

For remote control of the R&S FSMR refer to the general description of the SCPI commands, the instrument model, the status reporting system, and command description in chapter 5 and 6.

Description of Front and Rear Panel Views

Front View

1		
	Display Screen	see Chapter 3
2		
	Softkeys	see Chapter 3
3		
	Keypad for data input 0...9 input numbers . input decimal point – change sign ESC CANCEL – close input field (for uncompleted or already closed inputs, the original entry is kept) – erase the current entry in input field (beginning of an input) – close message window (status, error and warning messages) ENTER close the data input. BACK – erase last character input for uncompleted input – restore previous input (undo)	see Chapter 3

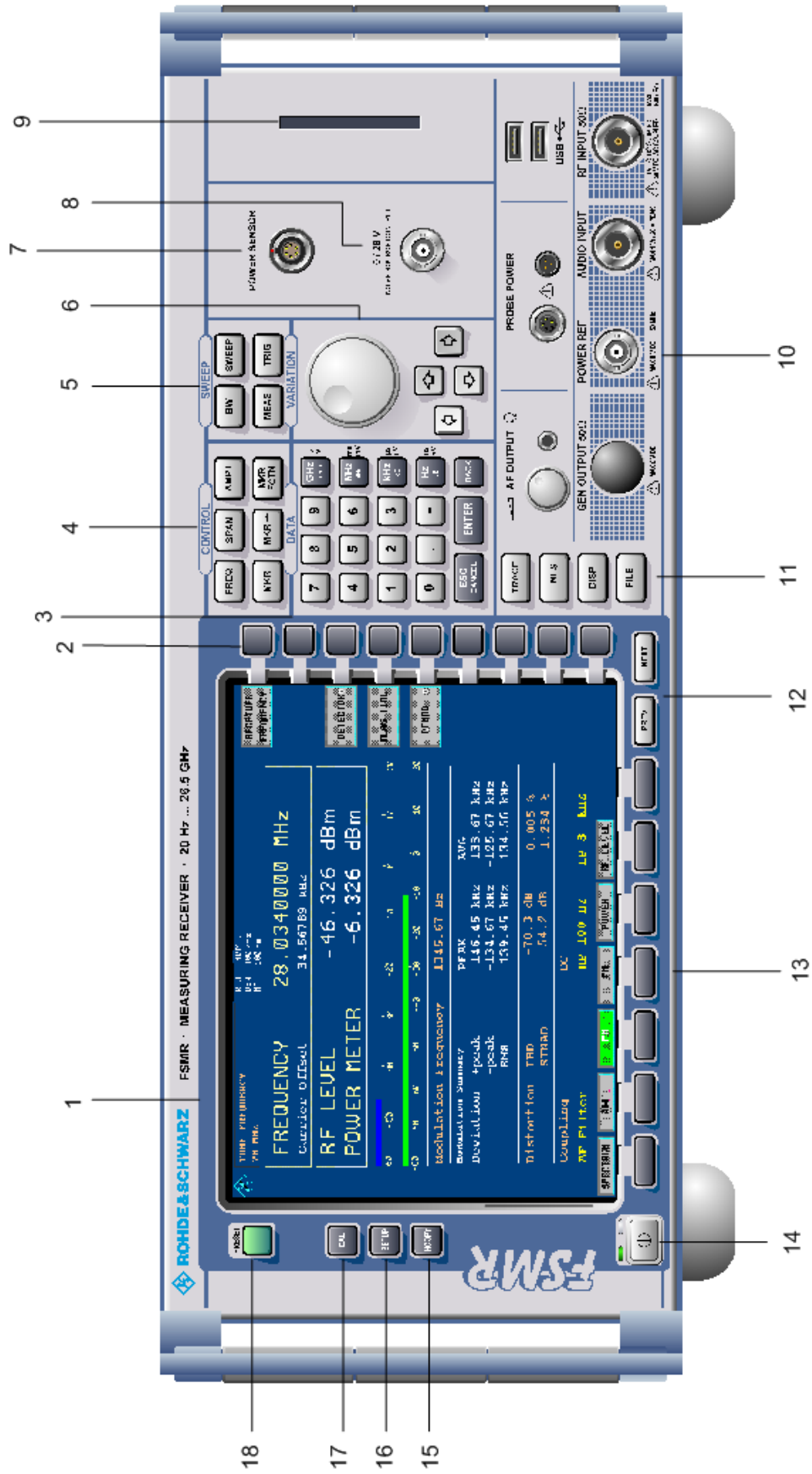


Fig. 1-1 Front View

Keypad for data input

GHz s
-dBm V
MHz ms
dBm mV
kHz µs
dB µV
Hz ns
dB.. nV

The units keys close the data input and define the multiplication factor for each basic unit. For dimension-less or alphanumeric inputs, the units keys have weight 1. They behave, in this case, like the ENTER key.

see Chapter 3

4

FREQ	Set frequency axis
SPAN	Set span
AMPT	Set level indication and configure RF input.
MKR	Select and set standard marker and delta marker functions.
MKR->	Change instrument settings via markers
MKR FCTN	Select further marker and delta marker functions

see Chapter 4

5

BW	– Set resolution bandwidth, video bandwidth and sweep time, – Set coupling of these parameters
SWEEP	Select sweep
MEAS	Select and set power measurements
TRIG	Set trigger sources

see Chapter 4

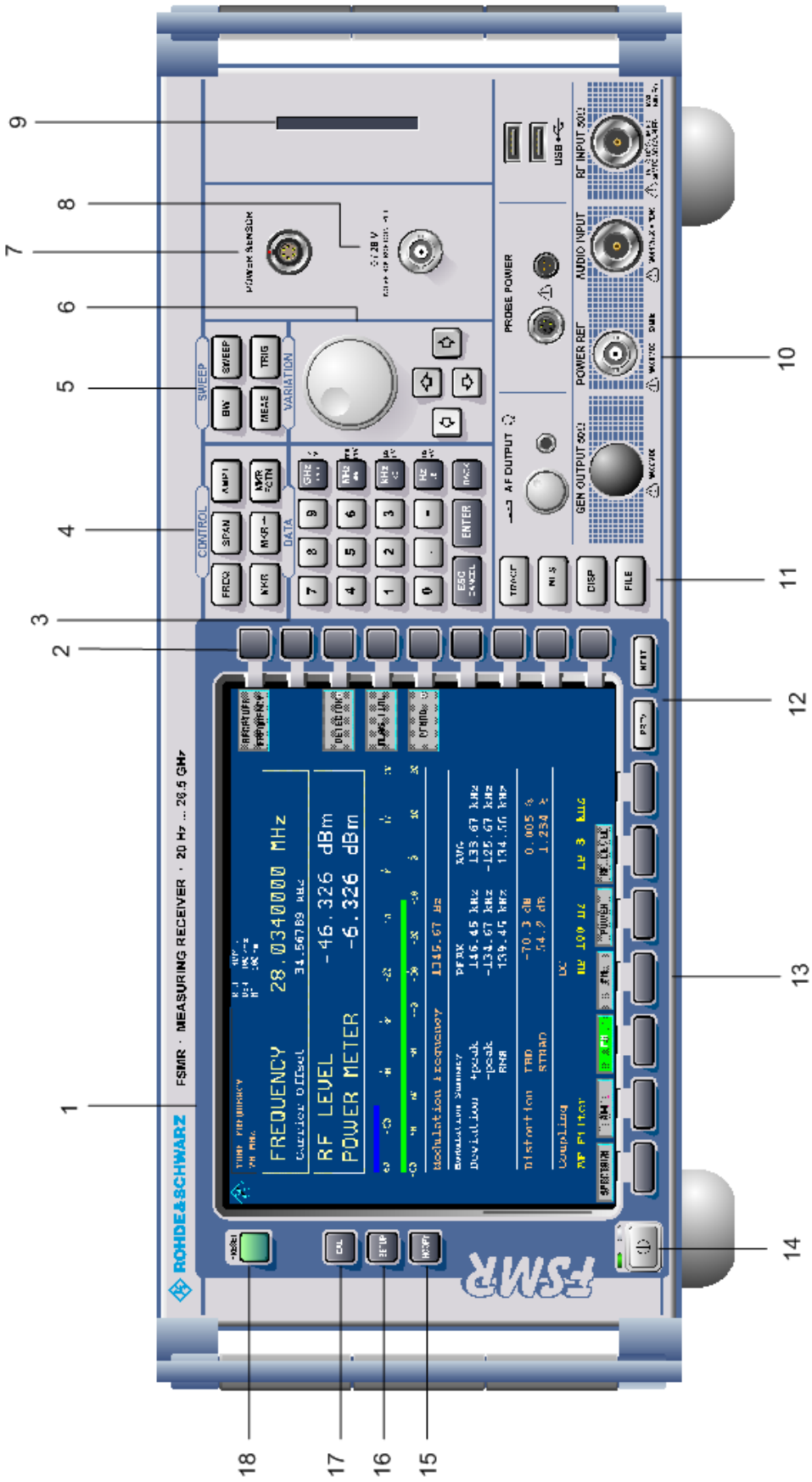
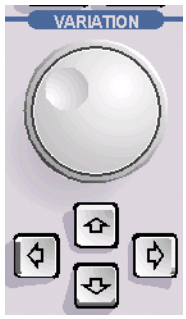


Fig. 1-1 Front View

6



Key group for entering data and for cursor movement

Cursor keys
- Move the cursor within the input fields and tables.
- Vary the input value.
- Define the direction of movement for the roll-key.

Roll-key
- Vary input values.
- Move markers and limits.
- Select letters in the help line editor.
- Move cursor in the tables
- Close data input (ENTER)

see Chapter 3

7

Connector for the power sensors NRP-Zx

8

Output connector for an external noise source

s. Chapter 3

9

CF Card option R&S FSU-B18

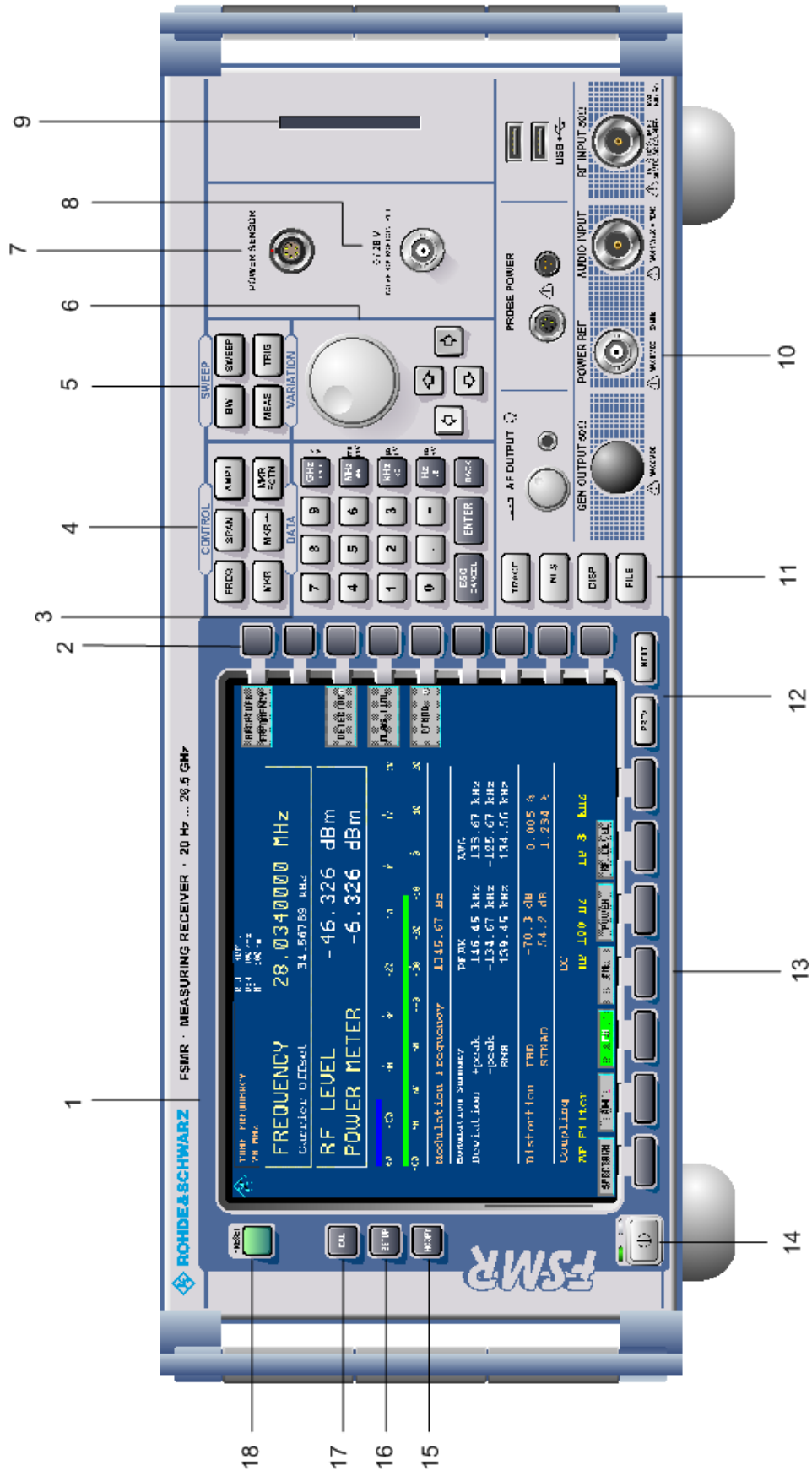


Fig. 1-1 Front View

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AF OUTPUT
- Volume control
- Head phone connector

PROBE POWER — Power supply and coded socket (+15 V/ -12 V) for accessories

USB — USB interfaces

RF INPUT — RF input

NOTICE!

The maximum DC voltage is 50 V, the maximum power is 1 W (≙ 30 dBm) at ≥ 10 dB attenuation.

AUDIO INPUT — Audio input with 50 Ω or 1 MΩ input impedance

NOTICE!

The input can handle a maximum power of 1 W or a peak voltage of 20 V.

POWER REF — Reference source 50 MHz, 1mW

NOTICE!

The maximum DC voltage is 0.

s. Chapter 8

see Chapter 8

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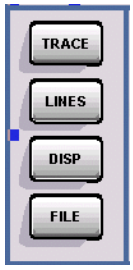

TRACE — Select and activate traces and detectors

LINES — Set limit lines

DISP — Configure display

FILE
- Save and recall instrument data
- Configuration of memory media and data

see Chapter 4

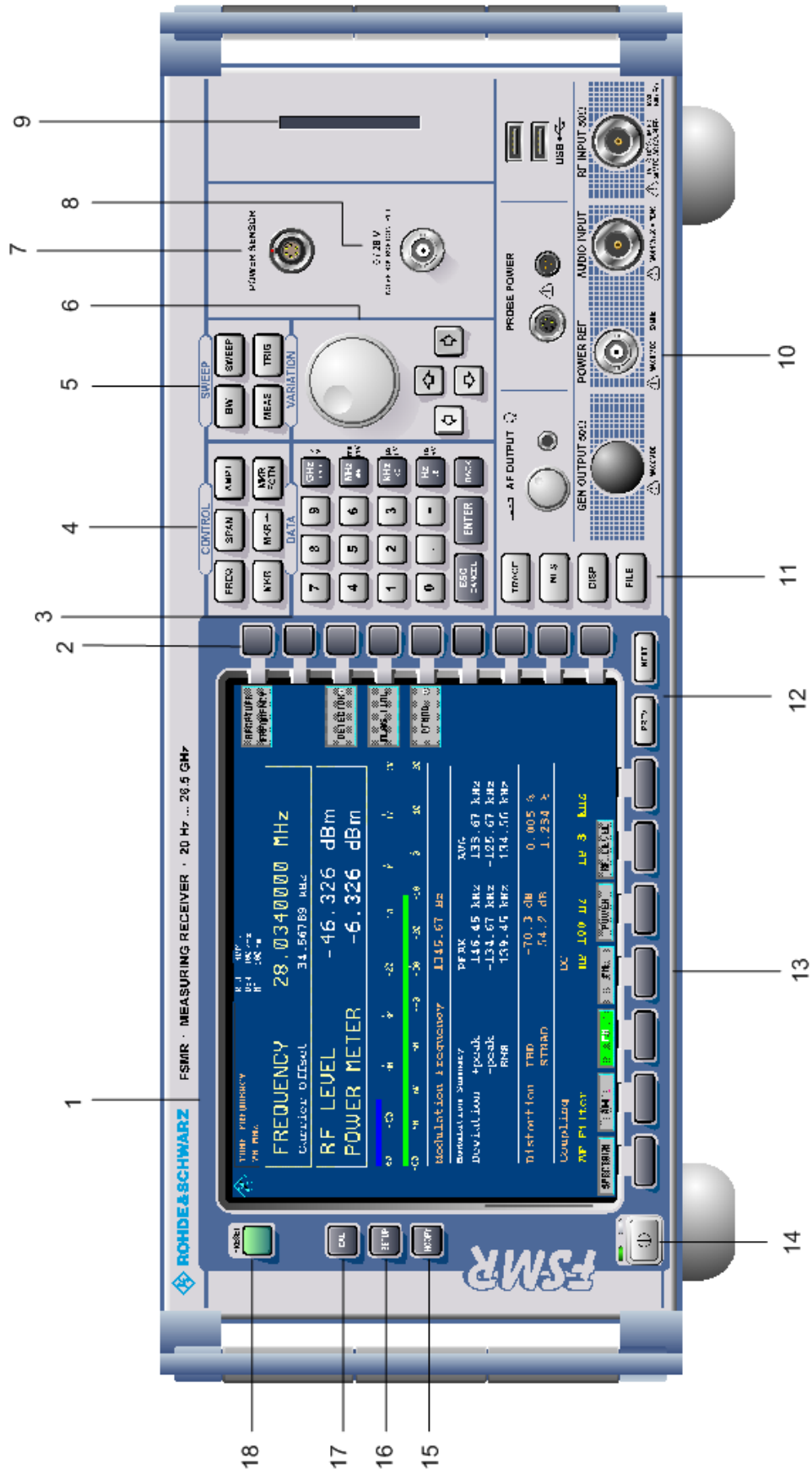

Fig. 1-1 Front View

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Menu-change keys

NEXT Change to side menu

PREV Call main menu

see Chapter 3

13

Hotkeys

see Chapter 3

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ON/STANDBY switch

see Chapter 1

15

Configure and start a print job

see Chapters 1 and 4

16

Define general configuration

see Chapter 4

17

Record correction data

see Chapter 4

18

Call default settings

see Chapter 4

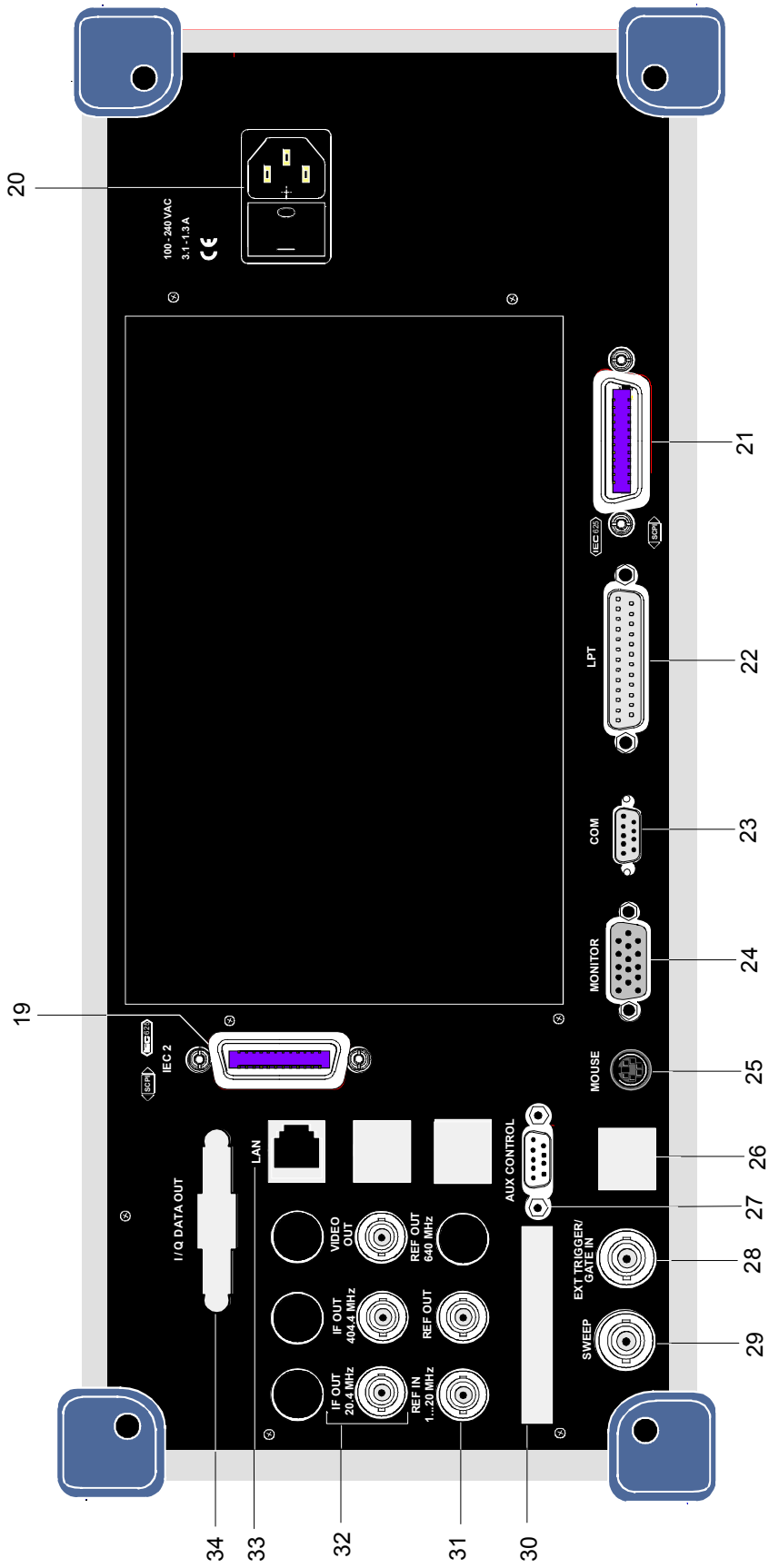

Fig. 1-2 Rear View

Rear View

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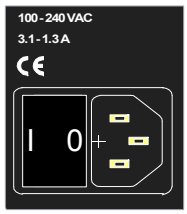
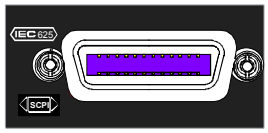
	2nd IEC/IEEE bus-connector	see Chapter 8

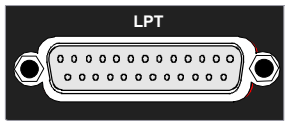
20

	Power switch and AC power connector	see Chapter 1

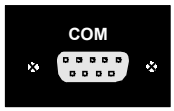
21

	IEC/IEEE bus-connector	see Chapter 8

22

	Parallel interface connector (printer connector)	see Chapter 8

23

	Connector for a serial interface (9-pin socket; COM)	see Chapter 8

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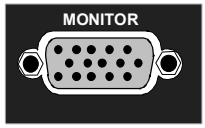	Connector for an external monitor	see Chapter 8

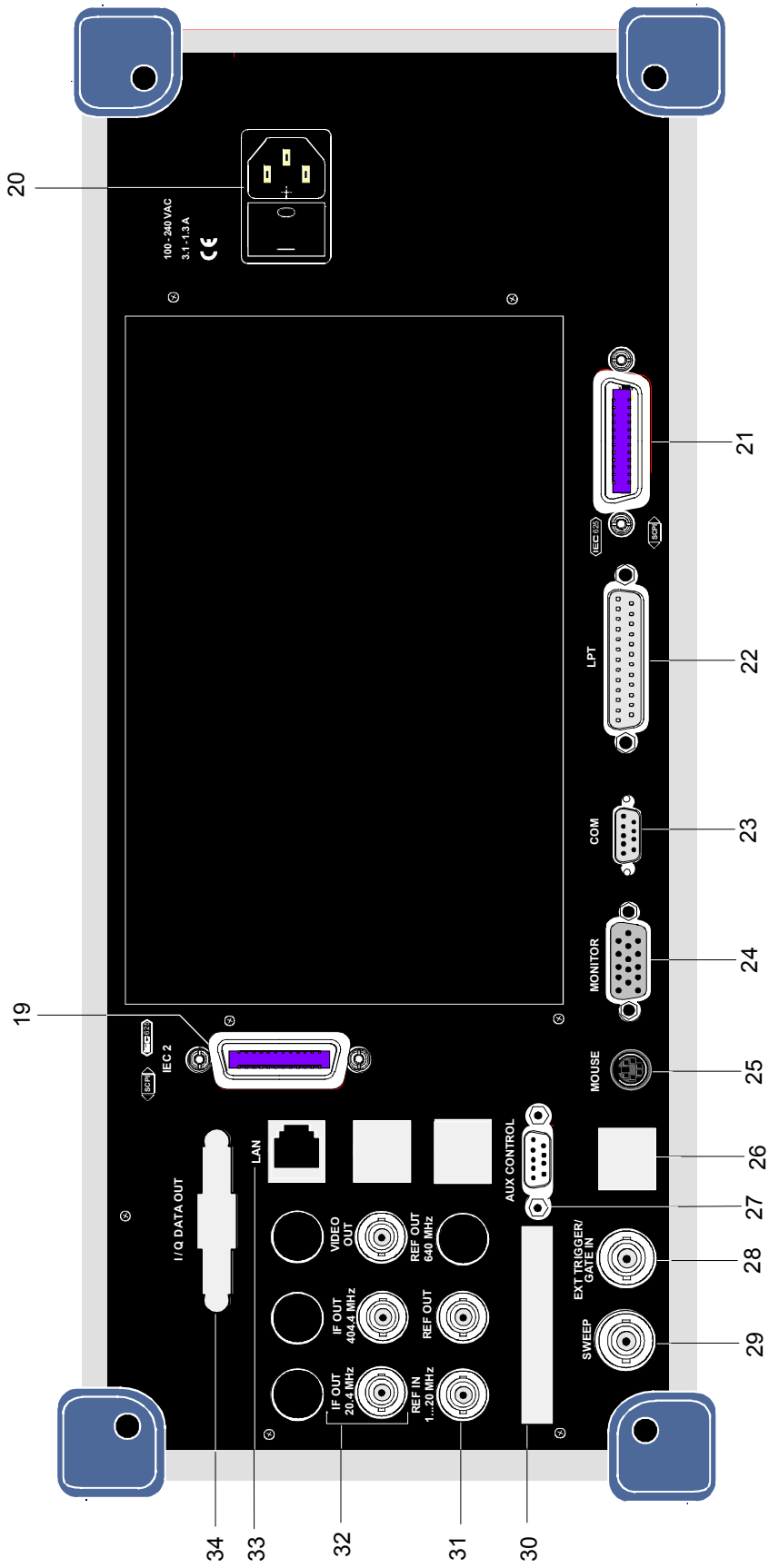

Fig. 1-2 Rear View

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Connector for a PS/2 mouse

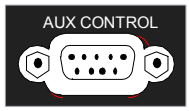
see Chapter 8

26

Connector for USB

see Chapter 8

27



Connector to control an external generator ((only with option FSP-B10)

28

Input connector for an external trigger or an external gate signal

see Chapter 8

29

Output connector

During a sweep saw toth voltage is output which is proportional to frequency

see Chapter 8

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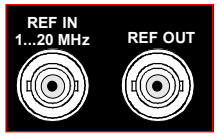
Reserved for options

31



REF IN Input connector for an external reference (1 to 20 MHz)

REF OUT Output connector for an internal reference (10 MHz)

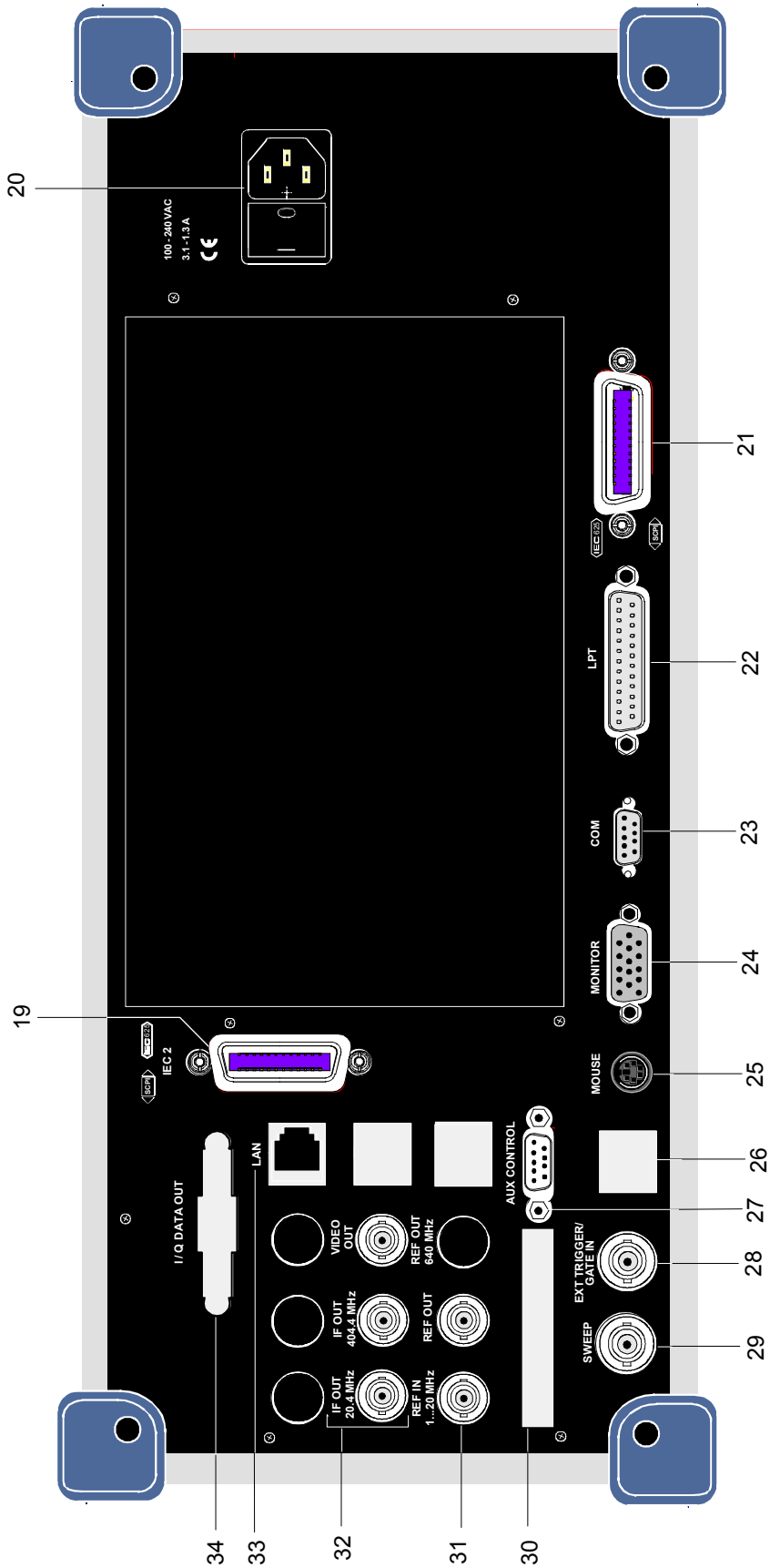
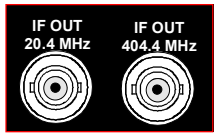


Fig. 1-2 Rear View

32



IF 20.4 MHz OUT	Output connector for 20.4 MHz IF	see Chapter 8
IF 404.4 MHz OUT	Output connector for 404.4 MHz IF	

33

LAN-Interface

34

Reserved for options

Getting Started with the Instrument

The following section describes how to activate the instrument and how to connect external devices such as printer and monitor.

Chapter 2 explains the operation of the instrument using simple measurement examples.

NOTICE

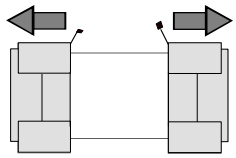
Optional notice heading

Prior to switching on the instrument, make sure that the following conditions are fulfilled:

- The instrument cover is in place and tightly screwed on
- Fan openings are not obstructed
- Signal levels at the inputs are within specified limits
- Signal outputs are connected correctly and not overloaded.

Any non-compliance may cause damage to the instrument

Preparing the Instrument for Operation



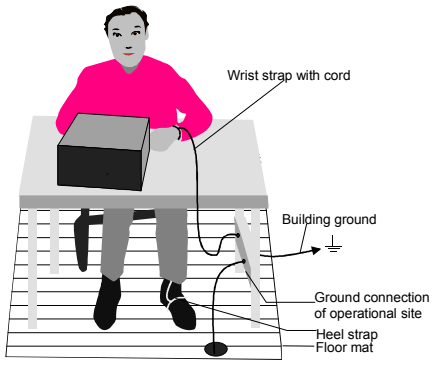
remove protective caps

- ➢ Take the instrument out of the packaging and check whether the items listed in the packing list and in the lists of accessories are all included.
- ➢ Remove the two protective covers from the front and rear of the R&S FSMR and carefully check the instrument for damage.
- ➢ Should the instrument be damaged, immediately notify the carrier and keep the box and packing material.
- ➢ For further transport or shipment of the R&S FSMR, the original packing should be used. It is recommended to keep at least the two protective covers of the front and rear panels in order to prevent damage to the controls and connectors.

Setting Up the Instrument

Standalone Operation

The instrument is designed for use under general laboratory conditions. The ambient conditions required at the site of operation are as follows:

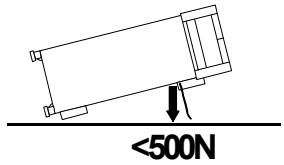


- The ambient temperature must be in the range specified in the data sheet.
- All fan openings must be unobstructed and the air flow at the rear panel and at the side-panel perforations must be unimpeded. The distance to the wall should be at least 10 cm.
- The mounting surface should be flat.
- To avoid damage of electronic components of the DUT due to electrostatic discharge on manual touch, protective measures against electrostatic discharge are recommended.

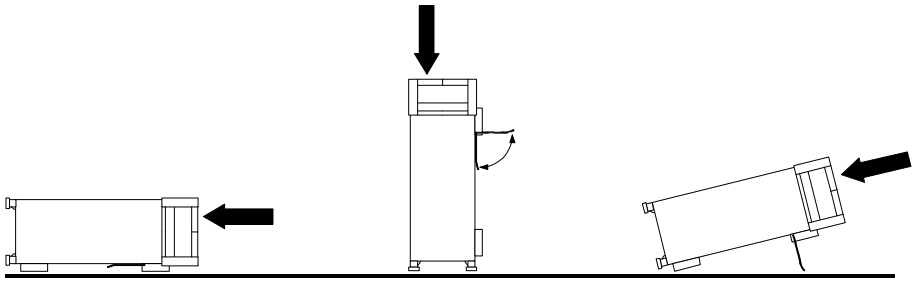
Safety Instruction for Instruments with Tiltable Feet

CAUTION

The feet must be fully folded in or out. Only in this way can the stability of the instrument be guaranteed and reliable operation be ensured. With the feet out, the total load for the feet must not exceed 500 N (own weight and additional units put onto the instrument). These units must be secured against slipping (e.g. by locking the feet of the unit at the top side of the enclosure).



When shifting the instrument with the feet out, the feet might collapse and fold in. To avoid injuries, the instrument must therefore not be shifted with the feet out.



The instrument can be operated in any position.

Rackmounting

NOTICE

For rack installation, ensure that the air flow at the side-panel perforations and the air exhaust at the rear panel are not obstructed.

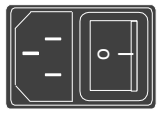
The instrument may be installed in a 19" rack by using a rack adapter kit (Order No. see data sheet). The installation instructions are part of the adapter kit.

EMC Safety Precautions

In order to avoid electromagnetic interference (EMI), the instrument may be operated only with all covers closed. Only adequately shielded signal and control cables may be used (see recommended accessories).

Connecting the Instrument to the AC Supply

The R&S FSMR is equipped with an AC voltage selection feature and will automatically adapt itself to the applied AC voltage (range: 100 to 240 V AC, 40 to 400 Hz). External voltage selection or adaptation of the fuses are not necessary. The AC power connector is located on the rear panel (see below).



Power connector

➢ Connect the instrument to the AC power source using the AC power cable delivered with the instrument.

As the instrument is designed according to the regulations for safety class EN61010, it must be connected to a power outlet with earthing contact.

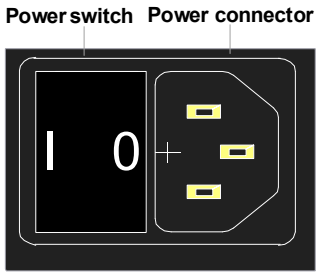
Switching the Instrument On/Off

NOTICE

Do not power down during booting.

Such a switch-off may lead to corruption of the hard disk files

AC power switch on the rear panel



Power switch

Position I = ON

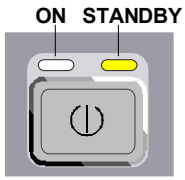
In the I position, the instrument is in standby mode or in operation, depending on the position of the ON/STANDBY key at the front of the instrument.

Note: *The AC power switch may remain ON continuously. Switching to OFF is only required when the instrument must be completely removed from the AC power source.*

Position O = OFF

The 0 position implies an all-pole disconnection of the instrument from the AC power source.

ON/STANDBY switch on the front panel



Standby switch

The ON/STANDBY switch activates two different operating modes indicated by coloured LEDs:

Operation ON - ON/STANDBY is depressed

The green LED (ON) is illuminated. The instrument is ready for operation. All modules within the instrument are supplied with power.

WARNING

Shock hazard

In standby mode, the AC power voltage is present within the instrument

STANDBY - ON/STANDBY switch is not pressed.

The yellow LED (STANDBY) is illuminated. Only the power supply is supplied with power and the quartz oven is maintained at normal operating temperature.

Switching On the Instrument

- In order to switch on the R&S FSMR, set the power switch on the rear panel to position I.
- Set the R&S FSMR to operating mode by pressing the *ON/STANDBY* key on the front panel. The green LED must be illuminated.

Startup Menu and Booting

After switching on the instrument, a message indicating the installed BIOS version (e.g. Analyzer BIOS Rev. 1.2) appears on the screen for a few seconds.

Subsequently Windows XP is booted first and after that the instrument firmware will boot. As soon as the boot process is finished the instrument will start measuring. The settings used will be the one that was active when the instrument was previously switched off, provided no other device configuration than *FACTORY* had been selected with *STARTUP RECALL* in the *FILE* menu.

Switching Off the R&S FSMR

- Switch the ON/STANDBY key on the front panel to standby mode by pressing it once.

  The R&S FSMR will write the current instrument settings to disk before performing a Windows XP shutdown. At the end of the shutdown procedure the power supply will be switched to STANDBY mode.

  The yellow LED must be illuminated.

Only when removing the R&S FSMR completely from the AC power source:

- Set the power switch at the rear panel to position 0.

Operating the R&S FSMR with the Removable Hard Disk Option R&S FSMR-B18

The R&S FSMR-B18 option allows the instrument to be operated with differently configured hard disks. Additional hard disks are therefore available as option FSU-B19.

CAUTION

Type and source of hazardous situation

Switch off the instrument before you remove and exchange the hard disk. Exchanging the hard disk during operation can produce severe data errors.

Power-Save Mode

Display:

The R&S FSMR offers the possibility of switching on a power-save mode for the screen display. The backlighting will be switched off if no entry is made on the front panel (key, softkey or hotkey as well as spinwheel) during the selected response time.

In order to switch on the power-save mode:

1. Call the *DISPLAY - CONFIG DISPLAY* submenu to configure the screen display:
   - Press *DISP* key
   - Press *CONFIG DISPLAY* softkey

2. Activate the save mode
   - Press *DISPLAY PWR SAVE* softkey.
     The softkey is highlighted in colour, thus indicating that the power-save mode is on. At the same time the data entry for the delay time is opened.

3. Define the delay time
   - Enter the required response time in minutes and confirm the entry using the *ENTER* key.
     The screen will be blanked out after the selected time period has elapsed.

Hard disk:

A power-save mode is preset for the built-in hard disk which is automatically closed down 15 minutes after the last access.

Recalling the Most Recent Instrument Settings

The R&S FSMR stores its current instrument settings onto the hard disk every time it is switched off via the ON/STANDBY key. After each power-on, the R&S FSMR is reloaded with the operational parameters which were active just prior to the last power-off (STANDBY or AC power OFF) or were set with STARTUP RECALL (see Chapter 4 "Saving and Recalling Data Sets").

Storing the current instrument settings is not possible if the instrument is switched off using the POWER ON switch at the rear panel or when unplugging the mains cord. After power-on the instrument settings stored previously on the hard disk will be loaded in this case.

Function Test

After turning on the AC power, the R&S FSMR will display the following message on the display screen:

Rohde & Schwarz GmbH & Co. KG
Analyzer BIOS Vx.y

After appearance of the above message, a selftest of the controller hardware is performed. Subsequently, the Windows XP controller boots and the measurement screen will appear.

The system self-alignment is activated via *CAL* key, *CAL TOTAL* softkey. The individual results of the self-alignment (PASSED / FAILED) can be displayed in the *CAL* menu (*CAL RESULTS)*.
With the aid of the built-in selftest functions (*SETUP* key, *SERVICE, SELFTEST* soft keys), the functional integrity of the instrument can be verified and/or defective modules can be localized.

Properties Specific to Windows XP

The instrument contains the Windows XP operating system. To ensure that the instrument software functions properly, certain rules must be adhered to when using the operating system..

NOTICE

Possible impairment of the instrument function

The instrument is equipped with the Windows XP operating system. It is thus possible to install commercial off-the-shelf software on the instrument. The use and installation of commercial software may impair the instrument functions. We recommend that you only execute programs tested by Rohde & Schwarz with regard to their compatibility to the instrument software. The program packages that have been tested are listed in section Windows XP Software Tested for the Instrument.

Install only service packs approved by Rohde & Schwarz to avoid impairment of instrument functions that could lead to the necessity to repair the instrument.

The user is especially warned against using Service Packs of Windows XP Home or of the Professional Edition, since these Service Packs are not compatible with Windows XP Embedded.

The drivers and programs used on the instrument under Windows XP have been adapted to the instrument. Existing instrument software must only be modified with update software released by Rohde & Schwarz.

Login

Windows XP requires that users identify themselves by entering a user name and password in a login window. The instrument provides a factory-installed auto login function, i.e. login is carried out automatically in the background. The ID used for auto login has administrator rights. As user name and password *instrument* (lowercase) are set.

Administrator ID

The ID used by the instrument to perform auto login has administrator rights.

Windows XP Service Packs

The Windows XP operating system on the instrument is supplied with pre-installed XP service packs (SP1 and additional updates/fixes) that are necessary and suitable for operating the instrument.

Opening the Windows XP Start Menu

You can open the Windows XP Start menu by pressing the Windows key ( ) or the key combination *CTRL+ESC*. From the start menu, you can navigate to the submenus by using the mouse or the arrow keys. To return to the measurement screen, activate the *R&S Analyzer Interface* button in the task bar.

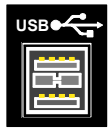
You can also open the Windows Start menu with the *OPEN START MENU* softkey in the SETUP menu.

Connecting an External Keyboard

NOTICE

Connect the keyboard only when the instrument is switched off (STANDBY). Otherwise, proper functioning cannot be ensured due to interactions with the firmware.

The R&S FSMR allows an external PC keyboard to be connected to one of the USB interfaces on the front panel or on the rear panel.



Keyboards and mouse devices conform to USB Standards 1.1 or 2.0 are suitable for connection to the USB interface.

Connecting a Mouse

To make Windows XP operation easier, the R&S FSMR allows a mouse to be connected to one of the USB interfaces interface on te front panel or on the rear panel.

Microsoft and Logitech mouse types are supported.

The recommended keyboard PSP-Z2 is equipped with a trackball for mouse control. Connecting an additional mouse will cause interface conflicts and lead to malfunctions of the instrument.

After connection the mouse is automatically recognized. Special settings such as mouse cursor speed etc, can be performed in the Windows XP menu START - SETTINGS - CONTROL PANEL - MOUSE. Chapter 8 contains the interface description for the connectors.

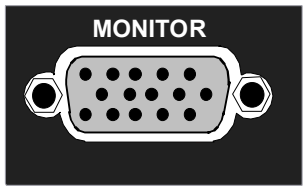
Connecting an External Monitor

NOTICE

The monitor may only be connected when the instrument is switched off (STANDBY). Otherwise, the monitor may be damaged.

Do not modify the screen driver (display type) and display configuration since this will severely affect instrument operation.

The instrument is equipped with a rear-panel MONITOR connector for the connection of an external monitor.

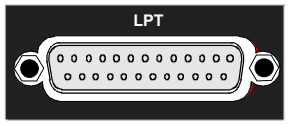


After connecting the external monitor the instrument needs to be rebooted in order to recognize the monitor. After that the measurement screen is displayed on both the external monitor and the instrument. Further settings are not necessary.

Connecting a Printer

A printer can be connected while the instrument is running.
The R&S FSMR allows two different printer configurations for printing a hardcopy to be created plus switchover between these two configurations. The *DEVICES* table in the *HCOPY* menu shows the available selection of installed printers (see section 4.4 "Documentation of Measurement Results").

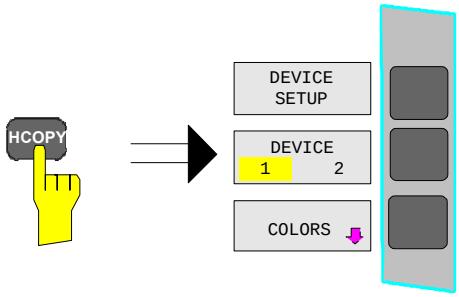
The interfaces for connecting printers are on the rear panel:



Chapter 8 contains the interface description for the connectors.

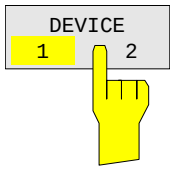
Selecting a Printer

Before a hardcopy can be printed, the printer has to be selected from the *"HCOPY"* menu.
In the following example, an HP DeskJet 660C printer that was preinstalled for LPT1 is selected as *DEVICE2* for hardcopies of the screen content.



➢ Press the *HCOPY* key.

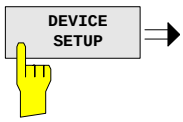
The *HCOPY* menu will open.



➢ Press the *DEVICE 1/2* softkey.

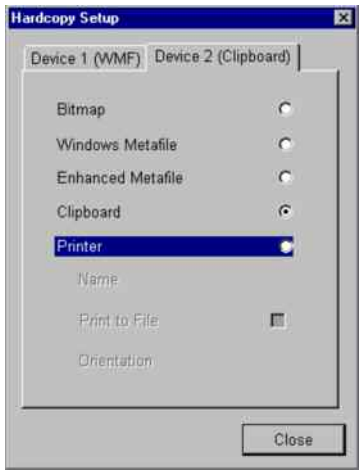
Device 2 will become the active output unit.

Note:
If the printer is to be operated as device 1, this step can be omitted.



➢ Press the *DEVICE SETUP* softkey.

The *HARDCOPY SETUP* table opens and displays the selection of output formats. The current selection *"Clipboard"* is highlighted and marked with a dot in the option button.



➢ Use the cursor key ⇩ to move the selection bar to *"Printer"* and press *ENTER.*

Windows for selecting a printer (Name), printing to file (Print to File) and selecting printout orientation (Orientation) are displayed.

➢ Use the cursor key ⇩ to set the selection bar to *"Name"* and press *ENTER* .

The list of available printer types appears.

➢ Use the cursor key ⇩ / ⇧ or the spinwheel to move the selection bar to the "HP DeskJet 660C" printer and press *ENTER.*

The list closes and the selected printer appears in the "Name" field.

Note:

If the desired printer is not available in the selection list, its driver must first be installed.
For further information, see sections "Installation of Plug&Play Printers", "Installation of Non-Plug&Play Printers" and "Installation of Network Printers".

➢ Press the cursor key ⇳ or turn the spinwheel until the *"Close"* button is reached.

Further settings can still be made:

"Print to File" redirects printing to a file. In this case, the system prompts you for a file name when printing is started.

➢ The selection is activated by pressing *ENTER* or the spinwheel.

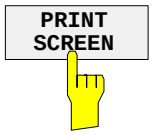
"Orientation" is used to switch between portrait and landscape format.

➢ To change the selection, open the list by pressing *ENTER* and select the desired orientation with the cursor key ⇳ / ⇱. To close the list, press *ENTER* again.

The *"Close"* button is used to complete the setup.

➢ Press *ENTER* as soon as the *"Close"* button is available.

The dialog closes. Printing will now be performed according to the selected settings.



Start printing

➢ Press the *PRINT SCREEN softkey*.

A hardcopy of the screen contents will be printed.

The factory setting for DEVICE 2 is “Clipboard”. In this case, the printout will be copied to the Windows XP clipboard which is supported by most Windows applications. The contents of the clipboard can be pasted directly into a document via EDIT – PASTE.

Table 1-1 shows the factory settings for the two output devices.

Table 1-1 Factory settings for *DEVICE 1* and *DEVICE 2* in the *HCOPY* menu

Setting	**Selection in configuration table**	**Setting for *DEVICE 1***	**Setting for *DEVICE 2***
Output device	DEVICE	WINDOWS METAFILE	CLIPBOARD
Output	PRINT TO FILE	YES	---
Orientation	ORIENTATION	---	---

Installation of Plug&Play Printers

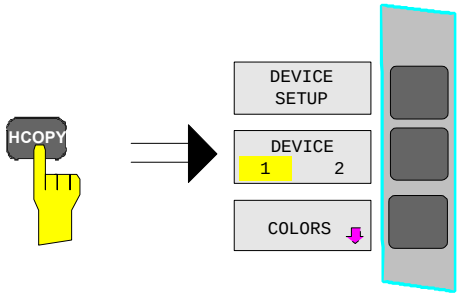
The installation of Plug&Play printers under Windows XP is quite simple:
After the printer is connected and switched on, Windows XP automatically recognizes it and installs its driver, provided the driver is included in the XP installation.
If the XP printer driver is not found, Windows XP prompts you to enter the path for the corresponding installation files. In addition to pre-installed drivers, a number of other printer drivers can be found in directory D:\I386.

When you install printer drivers that are not pre-installed on the instrument, the installation process will prompt you to specify the path containing the new driver. This can be a memory stick or USB CD-ROM drive (see section “Connection of USB Devices”).

Installation of Non-Plug&Play Printers

The dialogs below can be controlled either from the front panel or via the mouse and keyboard (see sections “Connecting a Mouse” and “Connecting a Keyboard”). Mouse and PC keyboard are absolutely essential for configuring network printers.

A new printer is installed with the *INSTALL PRINTER* softkey in the *HCOPY* menu.

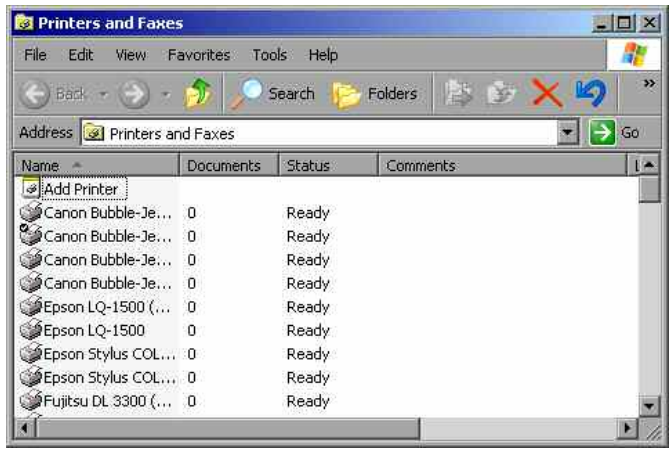


➢ Press the *HCOPY* key.

The *HCOPY* menu will open.

➢ Press the NEXT key to open the side menu.

➢ Press *INSTALL PRINTER* to open the *Printers and Faxes* dialog window.



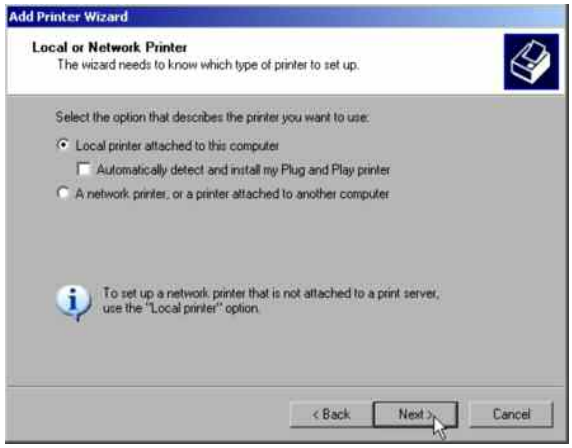
➢ Select *Add Printer* in the list using the spinwheel.

➢ Highlight the selected item with *CURSOR RIGHT* and press *ENTER* or the spinwheel to confirm the selection.

The *Add Printer Wizard* is displayed.

➢ Select *NEXT* with the spinwheel and press the spinwheel for confirmation.

Local or Network Printer can be selected.

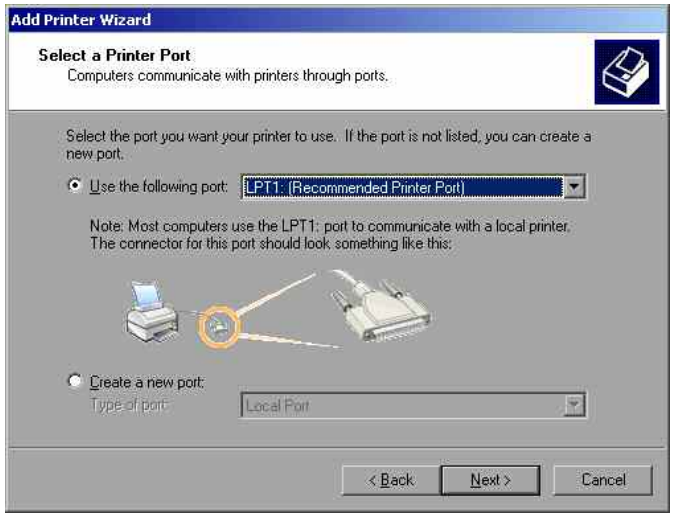


➢ To install a local printer, select *Local printer attached to this computer* with the spinwheel. Press the spinwheel for confirmation and continue with the “Local Printer” section.

➢ To install a network printer, select *A network printer or a printer attached to another computer.* Press the spinwheel for confirmation and continue with the “Network Printer” section.

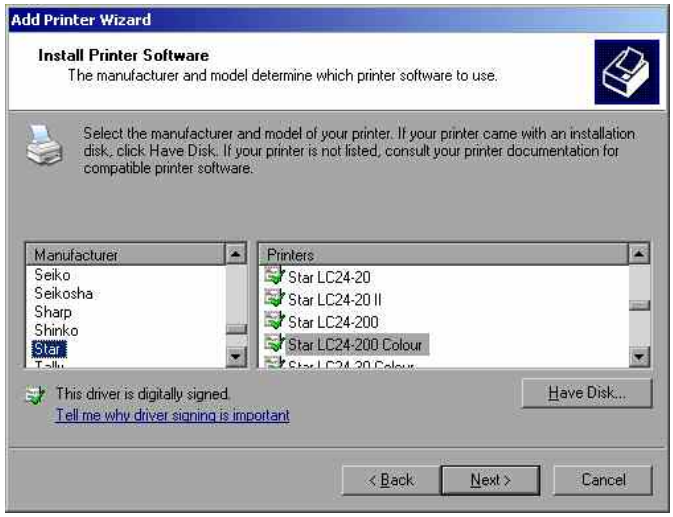
Local Printer

In the following example, a Star LC24 printer is connected to the LPT1 interface and configured as *DEVICE2* for hardcopies of screen contents. The Add Printer Wizard has already been opened as described in the section “Starting the Add Printer Wizard” .

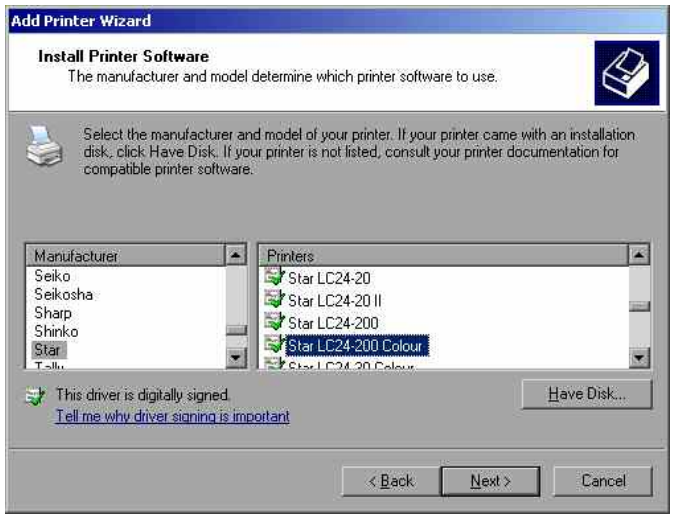


- To select the USB interface, open the list of ports by clicking the spinwheel.
  Select the printer port with spinwheel/arrow keys and confirm by pressing the spinwheel.
  The selection list is closed again.
- To select the LPT connector, the selection list need not be opened.
- Place the cursor on the *Next* button and confirm by pressing the spinwheel.

  The “Install Printer Software” dialog is opened.

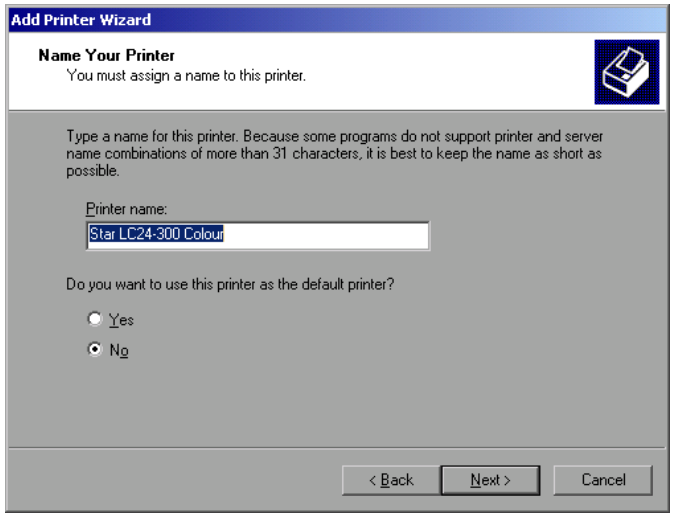


- Select the desired manufacturer (“Star”) in the Manufacturer table using the up / down keys.



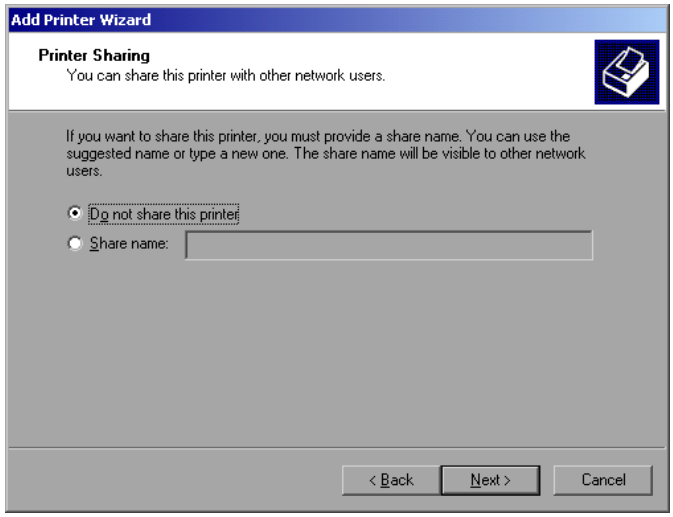
- Go to the *Printers* list with the spinwheel.
- Select the desired printer type (Star LC24-200 Colour) using the up / down keys and confirm with *ENTER*.

Note:
If the desired printer type is not in the list, the respective driver is not installed yet. In this case click the HAVE DISK button with the mouse key. You will be prompted to insert a disk with the corresponding printer driver. Press OK and select the desired printer driver.



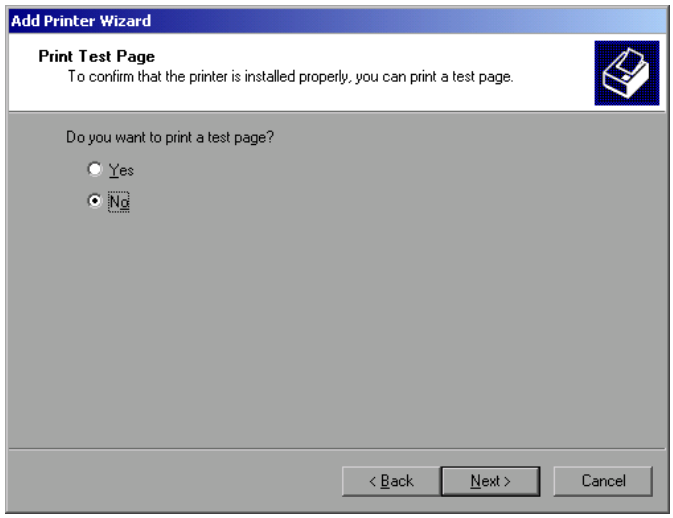
- The printer name can be changed as required in the *Printer name* entry field (max. 60 characters). A PC keyboard is required in this case.
- Use the spinwheel to select *Yes or No* for the default printer.
- Choose the desired status with the up /down keys.
- Confirm with *ENTER*.

The *Printer Sharing* dialog is opened.



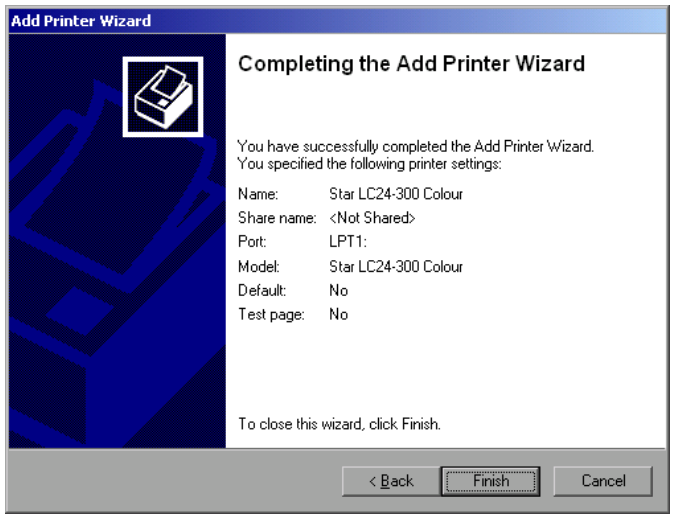
- Exit the dialog with *ENTER*.

The *Print Test Page* dialog is opened.



➢ Exit the dialog with *ENTER*.

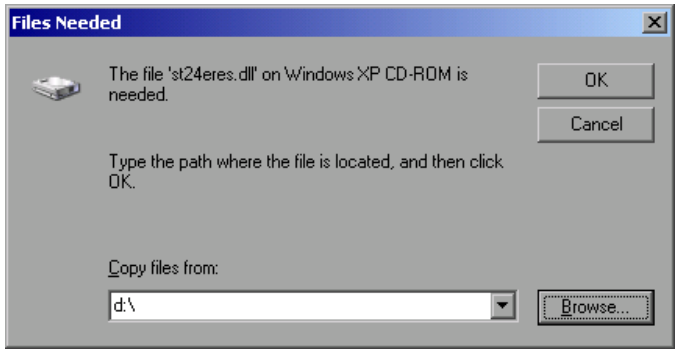
The *Completing the Add Printer Wizard* dialog is opened.



➢ Check the displayed settings and exit the dialog with *ENTER*.

The printer is installed. If Windows finds the required driver files, the installation is completed without any further queries.

If Windows cannot find the required driver files, a dialog is opened where the path for the files can be entered.

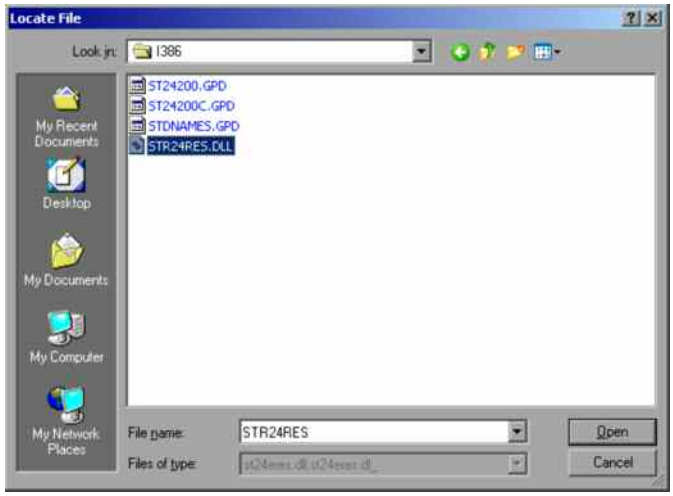


➢ Select the *Browse* button with the spinwheel and confirm with by pressing the spinwheel.

The *Locate File* dialog is opened.

➢ Turn the spinwheel to select the directory and path D:\I386 and press it to confirm the selection.

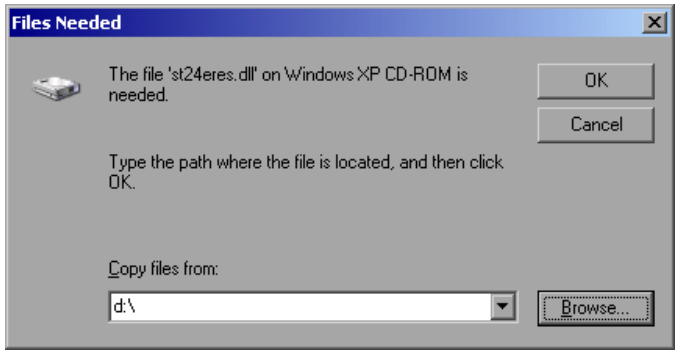
If the selected item is not printed on a blue background, it must be marked with the cursor up / down keys before it can be activated by pressing the spinwheel.



➢ Select the driver file with the spinwheel and confirm by pressing the spinwheel.

The file is included in the *Files Needed* dialog.

Note:
If the desired file is not in the D:\I386 directory, a disk with the driver file is needed. In this case, exit the dialog with ESC and repeat the selection starting from the "Files needed" dialog.

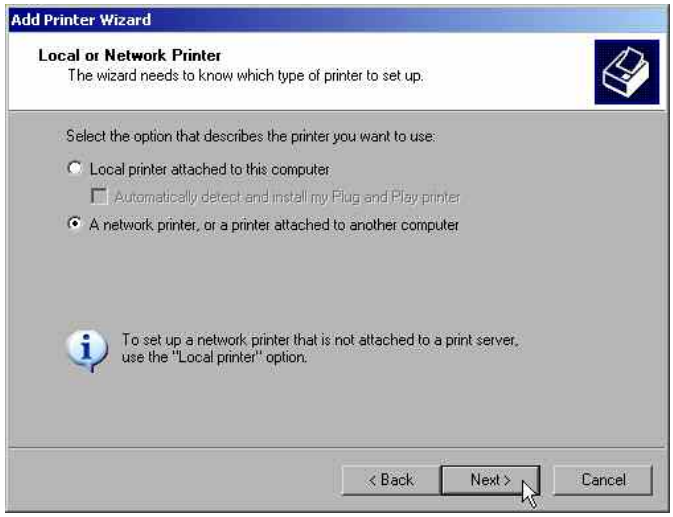


➢ Select the *OK* button with the spinwheel and press the spinwheel to confirm.

The installation is completed.

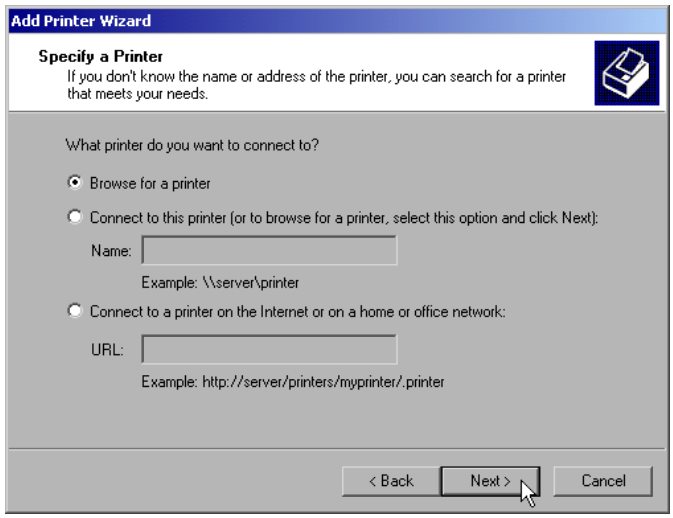
Finally, the instrument must be configured for printout with this printer using the softkeys *DEVICE SETUP* and *DEVICE 1/2* in the hardcopy main menu (see section "Selecting a printer").

Configuring a Network Printer



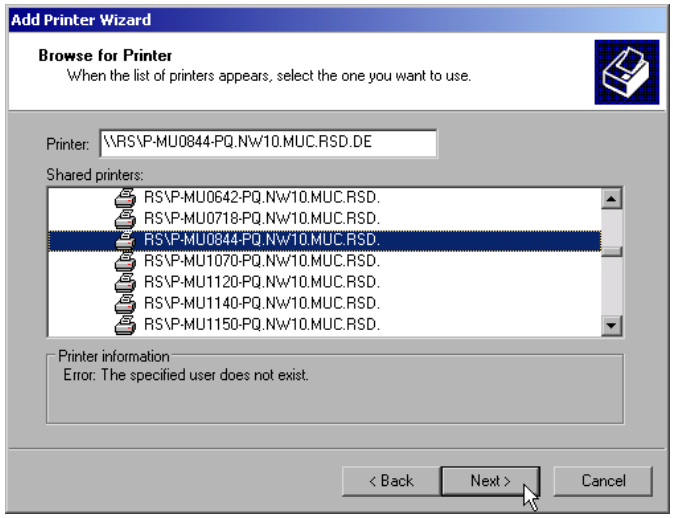
➢ To select a network printer, click the option "*A network printer or a printer attached to another computer*".

Continue with *Next*.

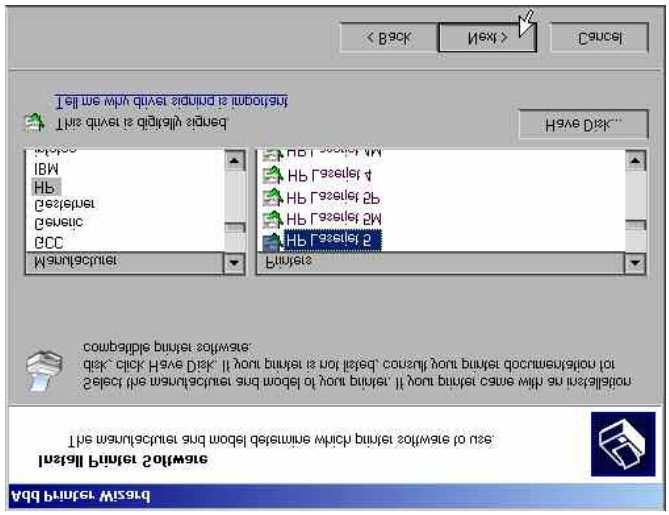


➢ Click *Browse for a printer* and then *Next*.

A list of selectable printers is displayed.



➢ Mark the desired printer and select it with OK.



- Confirm the subsequent prompt to install a suitable printer driver with "OK". The list of available printer drivers is displayed.
  The manufacturers are listed in the left-hand table, the available printer drivers in the right-hand table.
- Select the manufacturer from the *Manufacturers* table and then the printer driver from the *Printers* table.

Note:
If the desired type of output device is not shown in the list, the driver has not yet been installed. In this case, click the "HAVE DISK" button. You will be prompted to insert a disk with the corresponding printer driver. Insert the disk, select "OK" and then choose the desired printer driver.

- Click *Next*.

If one or more printers have already been installed, this window queries whether the printer last installed is to be used as the default printer for the Windows XP applications. The default selection is *No*.

- Start the printer driver installation with *Finish*.

Finally, the instrument has to be configured for printout with this printer using the softkeys *DEVICE SETUP* and *DEVICE 1/2* in the hardcopy menu (see section "Selection of a Printer").

Connection of USB Devices

Up to two USB devices can be directly connected to the analyzer via the USB interface on the rear of the R&S FSMR. This number can be increased as required by interconnecting USB hubs.
Owing to the wide variety of available USB devices, the R&S FSMR can be expanded with almost no limitations. The following list shows a selection of USB devices suitable for the R&S FSMR:

- Power Sensor R&S NRP-Z11 or R&S NRP-Z21 (Adapter Cable R&S NRP-Z4 required)
- Pendrive (memory stick) for easy data transfer from/to the PC (e.g. firmware updates)
- CD-ROM drive for easy installation of firmware applications
- PC keyboard for entering comments, file names, etc
- Mouse for easy operation of Windows dialogs
- Printer for documentation of measurement results
- Modem for remote control of the R&S FSMR over great distances

The installation of USB devices is quite simple under Windows XP since all USB devices are Plug&Play. Apart from the keyboard and the mouse, all USB devices can be connected to or disconnected from the R&S FSMR while the instrument is running.

After the instrument is connected to the USB interface, Windows XP automatically searches for a suitable device driver.

If Windows XP does not find a suitable driver, you will be prompted to specify a directory where the driver software can be found. If the driver software is on a CD, a USB CD-ROM should first be connected to drive to the R&S FSMR.

As soon as the connection between the R&S FSMR and the USB device is interrupted, Windows XP will again recognize the modified hardware configuration and will deactivate the corresponding device driver.

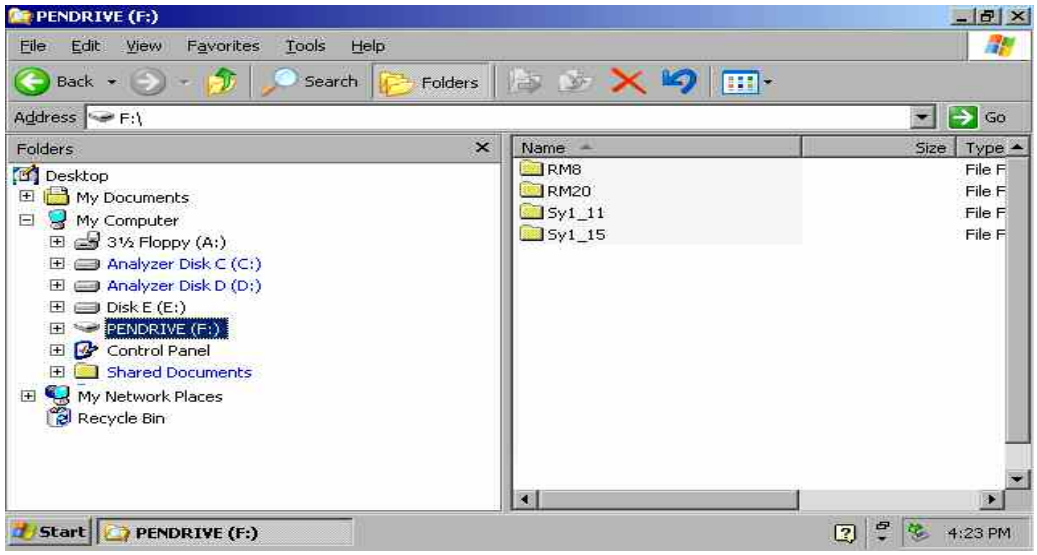
Example:

Connecting a pendrive (memory stick) to the R&S FSMR:

1. After the pendrive is connected to the USB interface, Windows XP will recognize the newly connected hardware:

2. Windows XP installs the corresponding driver.
After successful installation, XP signals that the unit is ready for operation:

3. The pendrive is now available as a new drive and is displayed in Windows Explorer:



The pendrive can be used as a normal drive to load or save files.

4. If the pendrive is no longer required or if files are to be transferred to another computer, the pendrive is simply disconnected. Windows XP will then deactivate the driver.
   If the corresponding drive is still selected in Explorer, an error message will be displayed indicating that the drive is no longer available.

Installing Windows XP Software

Windows XP Software Tested for the Instrument

The driver software that is used and the system settings of Windows XP have been fine-tuned to support the measurement functions of the R&S FSUP. Thus, flawless instrument function is ensured only if software and hardware tested or offered by Rohde & Schwarz are used.

Using other software or hardware may cause the functions of the R&S FSMR to perform improperly or fail.

The following program packages have been successfully tested for compatibility with the measurement instrument software:

- R&S FS-K3 – Software for measuring noise factor and gain
- R&S FS-K4 – Software for measuring phase noise
- R&S Power Viewer (virtual power meter for displaying results of the power sensors of the R&S NRP-Zxx series)
- Windows XP Remote Desktop
- FileShredder – For reliable deletion of files on the hard disk
- Symantec Norton AntiVirus – Virus-protection software
- McAfee Virusscan

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2 Getting Started

This chapter provides a fast introduction to operation by guiding the user step by step through measurement examples .

Before starting any measurement with the FSMR, please note the instructions given in chapter 1 of the users manual for putting the instrument into operation. In chapter 3 you will find detailed information on customizing the instrument and the display.

For a systematic explanation of all menus, functions and parameters and background information refer to the reference part in chapter 4.

Instrument overview

The R&S FSMR is a very versatile instrument that combines many measurement capabilities required for calibration, troubleshoot and development into a single box instrument. The following functions are included:

- **RF Power Meter**, for highest accuracy RF power measurement.
- **RF Level Meter**, for measurements of low level signals.
- **Modulation Analyzer**, for AM/FM and φM modulated signals.
- **Audio Analyzer**, for Audio Signal level and distortion, using the Audio input.
- **Frequency Counter**, fastest frequency measurements with „mHz“-resolution.
- **Spectrum Analyzer**, for high performance spectral analysis capabilities.

The R&S FSMR still offers an easy-to-use operation which does not require expert knowledge to perform the basic measurements.

This product note is designed to explain the functions and operation of the Measuring Receiver R&S FSMR. In the following descriptions, each step is explained in detail so that the instrument can be immediately used without the need for learning all of the available functions.

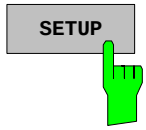
Setup the instruments

Most of the following examples use the same test setup. To perform the measurements, in addition to the Measuring Receiver R&S FSMR a signal generator and a power sensor is required. The examples in this paper will require a single, stable RF test signal at lower RF frequencies (for example 100 MHz). The generator shall offer analog modulation capabilities (at least AM modulation) at a variable modulation rate from 1 kHz to 3 kHz and 30 % modulation depth.
For the audio measurement examples a LF generator is required. Most of the R&S signal generators are equipped with a modulation generator which is sufficient for these measurements (for example R&S SML, R&S SMIQ).
The power sensor used in the examples shall be one of the sensors from the R&S NRP series. There are many different sensors available, a terminating average power sensor will best fit to the requirements (for example R&S NRP-Z21)

Select the Preset state

All of the following examples assume the standard settings for the measuring receiver. These are set with the *PRESET* key. The *PRESET* must be set to Factory default values and measuring Receiver Mode.

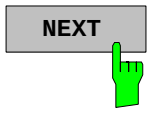
Check the *PRESET* setting with the following steps:



1. *Define Preset instrument mode*

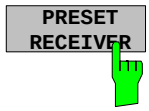
➢ *Press the SETUP key.*

The setup menu is opened.



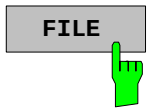
➢ Press the menu change key *NEXT*.

The submenu is opened.



➢ *Press the PRESET RECEIVER softkey.*

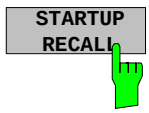
The following presets will force the instrument into the Measuring Receiver mode.



2. *Define the Startup Recall*

➢ *Press the FILE key.*

The file menu is displayed.



➢ *In the FILE menu press the STARTUP RECALL softkey.*

A table with available instrument recall states is displayed.

➢ *In the STARTUP table, highlight the entry named "FACTORY" and enable it with the Enter key as STARTUP RECALL.*

3. *Reset the instrument.*

➢ *Press the PRESET key.*

The main receiver menu is opened.The receiver mode is set.

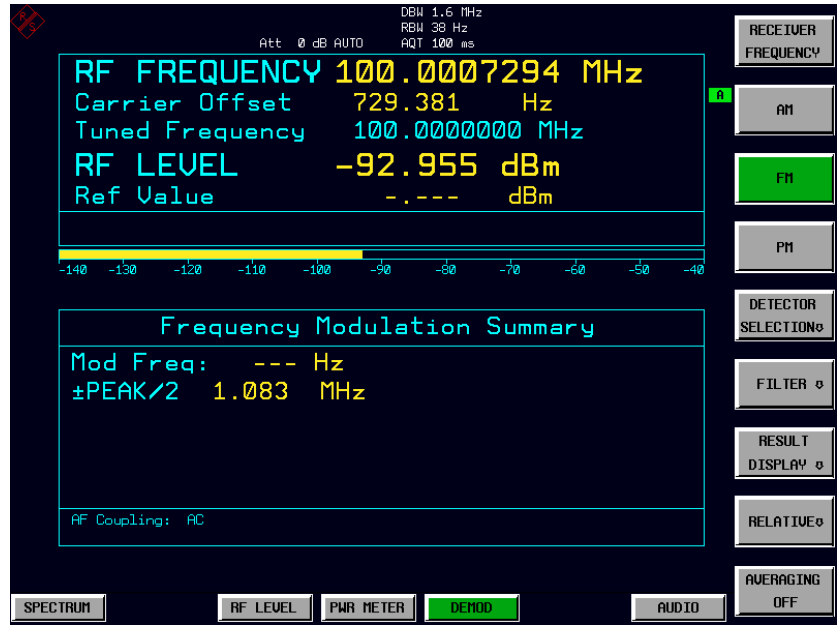


Fig.2-1 Display after selecting the default setup in receiver mode

The main default parameters are listed in the following table:

Table 2-1 Default parameters after preset in measuring recveiver mode

Parameter	Parameter Name	Value
Receiver frequency	Frequency	100 MHz
Reference Level	Ref Level	Manual -20 dBm
RF attenuation	RF ATT	Auto
Preamplifier	Preamp	Off
Demodulation	Demod	FM
Detector	Det.	+/- peak/2
Measurement time	Meas Time	100 ms
Trigger	Trigger	Free run

Measurement Examples

All of the following examples assume the standard settings for the measuring receiver. These are set with the *PRESET* key
The described measurement applications are:

- Measurement of the RF power of a signal using the Power Meter mode.
- Measurement of low level signals using the Tuned RF Level mode.
- Measurement of AM modulated signals and modulation distortion with the Modulation Analyzer mode.
- Measurement of audio signals with the Audio Analyzer mode.

Example 1: RF Power Measurements with a Power Sensor

Measurement

The FSMR includes a power meter functionality. Measurements of RF Power will be performed in the power meter mode with highest accuracy. The FSMR will automatically handle all required correction factors and compensate the measurements. The FSMR does support the following Rohde&Schwarz power sensors:

- o R&S NRP-Z11 10 MHz to 8 GHz / 200 pW to 200 mW
- o R&S NRP-Z21 10 MHz to 18 GHz / 200 pW to 200 mW
- o R&S NRP-Z51 DC to 18 GHz / 1 uW to 100 mW
- o R&S NRP-Z55 DC to 40 GHz / 1 uW to 100 mW

Main Receiver Functions

The power meter functions are available in the Measuring Receiver *POWER METER*-mode. All required settings and evaluations can be reached from the POWER METER main menu.

Measurement Setup

Fig.2-2 RF Power measurement setup

The following settings are used on the generator:

1. *PRESET* the generator.
2. Set RF Frequency to 1 GHz.
3. Set the output level to 0 dBm.

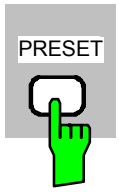
Measurement Sequence – RF Power Measurements

Connect the Power sensor with the Signal Generator output and with the Measuring Receiver power sensor connector on the front panel.

The following steps are performed:

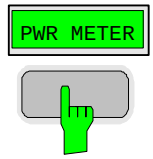
1. Zero the power sensor.
2. Connect the power sensor to the DUT.
3. Set the RF frequency.
4. Measure the RF Power

1. Zero the Power Sensor



- ***Reset the instrument.***
- *Press the PRESET key.*

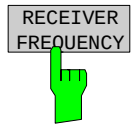
The main receiver menu is opened. The receiver mode is set.



Switching to Power Meter Mode

- *Press the PWR METER hotkey.*

The power meter menu is displayed.

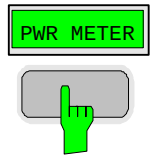


Set the measuring frequency

- Press the *FREQ* key on the front panel.

  The measuring receiver frequency menu is displayed.
- In the frequency menu press the *RECEIVER FREQUENCY* softkey.

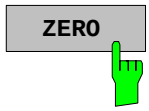
  The frequency entry is displayed. Enter the measuring frequency with the number keys and the appropiate unit key. The frequency will be used by the instrument to calculate the calibration factors for the power sensor head.
- In the RECEIVER FREQUENCY entry window key in "*1000 MHZ*".



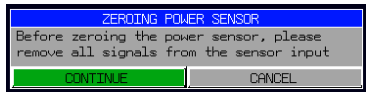
Zero the power sensor

- Press the *PWR METER* hotkey.

  The power meter menu is displayed.



- In the POWER METER menu press the *ZERO* softkey.



- In the message box, confirm CONTINUE and press ENTER.

  The zeroing of the sensor will be performed.

After the zeroing is completed, a message will appear on the screen.

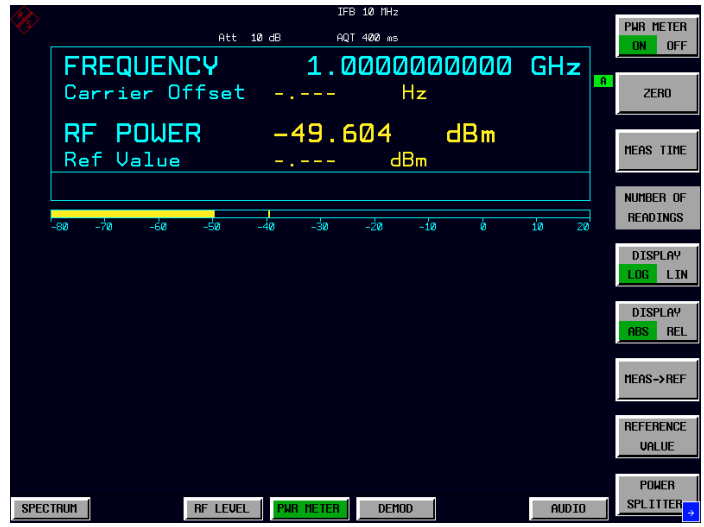
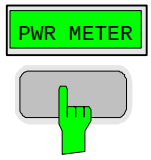
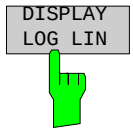


Fig.2-3 RF power measurement after Zeroing

2. *Measure the RF power in Watt*

Connect the power sensor to the signal generator RF output





Linear display – Change the Unit to Watt

- Press the *PWR METER* hotkey.

  The POWER METER menu is displayed.

- In the POWER METER menu press the *DISPLAY LOG / LIN* softkey.

  The RF power unit is changed from dB to Watt.

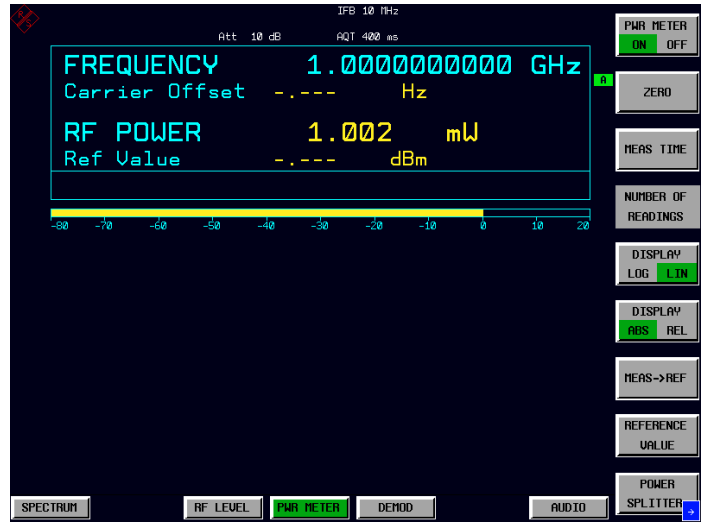


Fig.2-4 RF power measurement in UNIT Watt

Example 2: Low RF Level Measurements with Tuned RF Level Mode

Measurement

The main functionality of a measuring receiver is the RF level measurement. Measurements of low power RF signals will be performed in the Tuned RF Level mode with highest accuracy. The FSMR will automatically handle all required settings.

Main Receiver Functions

The measurement of RF levels over a wide input level range is performed in three different level ranges. To reach the highest possible accuracy, a calibration is performed with a power sensor. The FSMR does offer fully automated calibration procedures in the Tuned RF Level mode. The following example will guide through the calibration steps. All functions for Tuned RF level measurements can be reached from the RF LEVEL main menu.

Measurement Setup

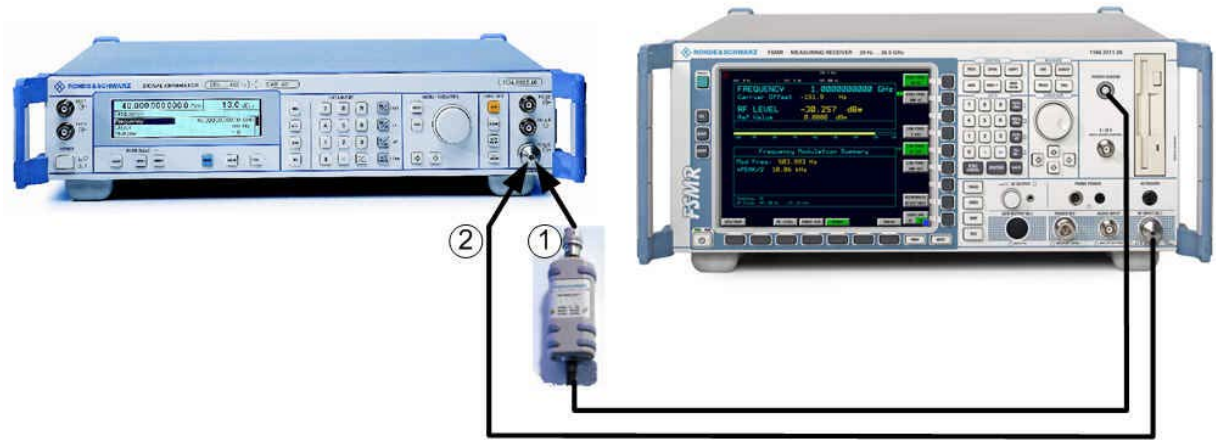


Fig.2-5 Tuned RF Level measurement setup

The following settings are used on the generator:

1. *PRESET* the generator.
2. Set RF Frequency to 300 MHz.
3. Set the output level to 0 dBm.

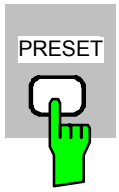
Measurement Sequence – Tuned RF Level Measurements

Connect the Power sensor with the Signal Generator output and with the Measuring Receiver power sensor connector on the front panel.

The following steps are performed:

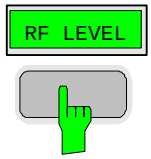
1. Calibrate the FSMR with the power meter.
2. Change the output level and perform further Range calibrations.
3. Average the results for enhanced stability.
4. Measure an unstable source (unstable frequency)

1. Calibrate the setup- absolute power calibration



- ***Reset the instrument.***
- *Press the PRESET key.*

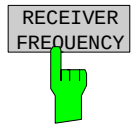
The main receiver menu is opened. The receiver mode is set.



Switching to Tuned RF Level Mode

- *Press the RF LEVEL hotkey.*

The Tuned RF level menu is displayed.



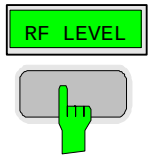
Set the measuring frequency

- Press the *FREQ* key on the front panel.

  The measuring receiver frequency menu is displayed.
- In the frequency menu press the *RECEIVER FREQUENCY* softkey.

  The frequency entry is displayed. Enter the measuring frequency with the number keys and the appropiate unit key.
- In the RECEIVER FREQUENCY entry window key in "*300 MHZ*".

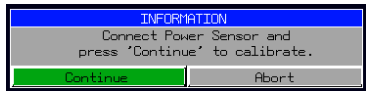
Connect the power sensor to the signal generator RF output



Calibrate the Tuned RF Level – Absolute Power calibration

- Press the *RF LEVEL* hotkey.

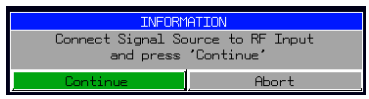
  The RF LEVEL menu is displayed.
- In the RF LEVEL menu press the *CAL ABS POWER* softkey.



The calibration of the receiver will be performed. A message box with instructions about the setup appears. The first step is a power measurement with the power sensor connected to the source.

- In the message box, confirm CONTINUE and press ENTER.

  In the next step of the calibration the receiver is connected to the source.



- ***Connect FSMR RF input to the signal generator RF output***
- In the next message box, confirm CONTINUE and press ENTER.

The FSMR is now calibrated in one RF level range (the upper level range does handle RF levels from -10 dBm to +30 dBm). Measurements in this level range can now performed with full accuracy.

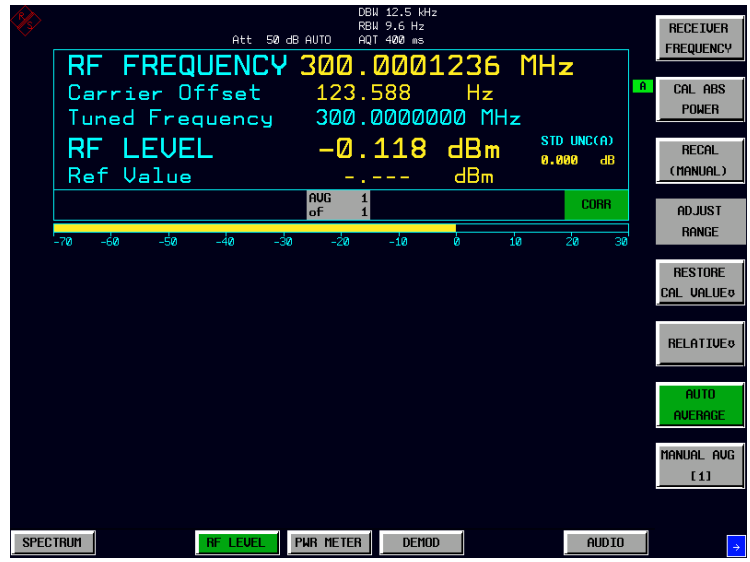


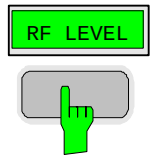
Fig.2-6 Tuned RF Level measurement after calibration

2. Range to range calibration- relative calibration

Change the signal generator output level

➢ The following settings are used on the generator:

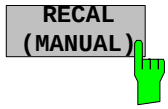
Change the signal generator RF Level in 1 dB steps down. Observe the FSMR screen for the yellow RECAL message to appear (at levels about -10 dBm). This is the point where the automated Range-to-Range calibration can be performed.



The FSMR is now ready for a RF level range change. The calibration of the level difference due to the range change will be performed.

➢ Press the *RF LEVEL* hotkey.

The RF LEVEL menu is displayed.



➢ In the RF LEVEL menu press the *RECAL (MANUAL)* softkey.

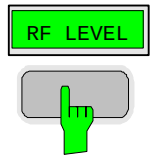
The RECAL procedure is performed. Do not change any signal generator settings at this time.

A message box appears. The instrument will perform a measurement in the calibrated range, then change the RF settings (RF attenuator, IF gain) and then measure again. After the recalibration measurements with high accuracy are available in the RF level range 2 (covers levels from -10 dBm to -50 dBm).

Change the signal generator output level further down

➢ The following settings are used on the generator:

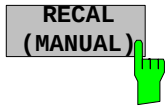
Change the signal generator RF Level in 10 dB steps down. Observe the FSMR screen for the yellow RECAL message to re-appear again (at levels about -50 dBm).



As soon as the RECAL flag appears, the FSMR is ready for a next RF level range change. The calibration of the level difference due to the range change will be performed.

➢ Press the RF LEVEL hotkey.

The RF LEVEL menu is displayed.



➢ In the RF LEVEL menu press the *RECAL (MANUAL)* softkey.

The RECAL procedure is performed.

A message box appears. The instrument will perform a measurement in the calibrated range, then change the RF settings (RF attenuator, IF gain) and then measure again. After the recalibration measurements with high accuracy are available in the RF level range 3 (covers levels from -50 dBm to noise level).

The FSMR is now calibrated in all RF level ranges (for RF levels from -140 dBm to +30 dBm). Measurements in all level ranges can now be performed with full accuracy. No further calibration is required, the Autorange function will automatically adapt the level setting of the FSMR to the input signal.

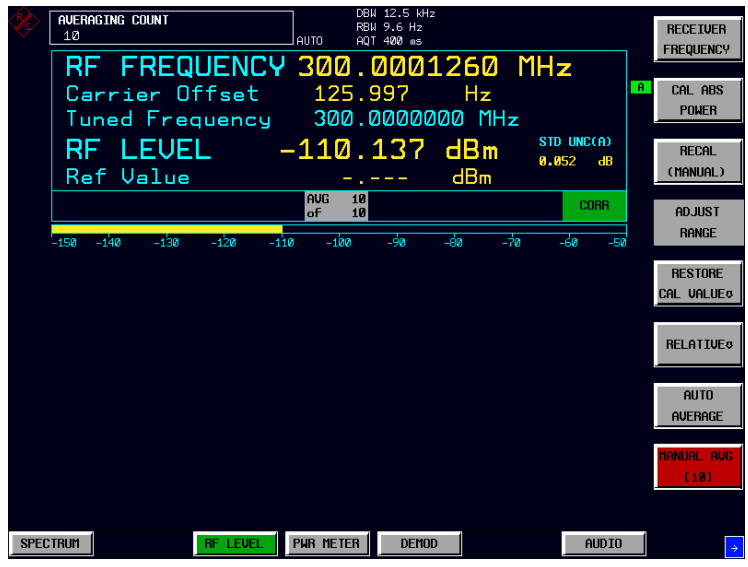


Fig.2-7 Tuned RF Level measurement at low levels

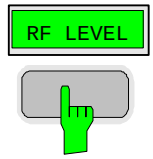
3. Average the results for enhanced stability

Change the signal generator output level further down

➢ The following settings are used on the generator:
Change the signal generator RF Level to -110 dBm).

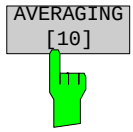
The FSMR is now performing a calibrated measurement at – 110 dBm. The reading will be flickering due to a low signal to noise ratio. For a more stable reading, the FSMR does offer several functions.

The stability of a low level measurement is mainly depending on the measurement time. A longer acquisition of the signal does allow for a more accurate measurement. The averaging of several single acquisitions will lead to an effective longer measurement time.



➢ Press the RF LEVEL hotkey.

The RF LEVEL menu is displayed.



➢ In the RF LEVEL menu press the *MANUAL AVG* softkey.

The AVERAGE will be switched on. The number of measurements can be entered in the AVERAGING COUNT box which appears on top of the screen. The default value is set to 10 Averages.

The instrument will now perform an averaged measurement. The average function is a floating average over the number of measurements chosen with the Average Count entry (default value: 10).

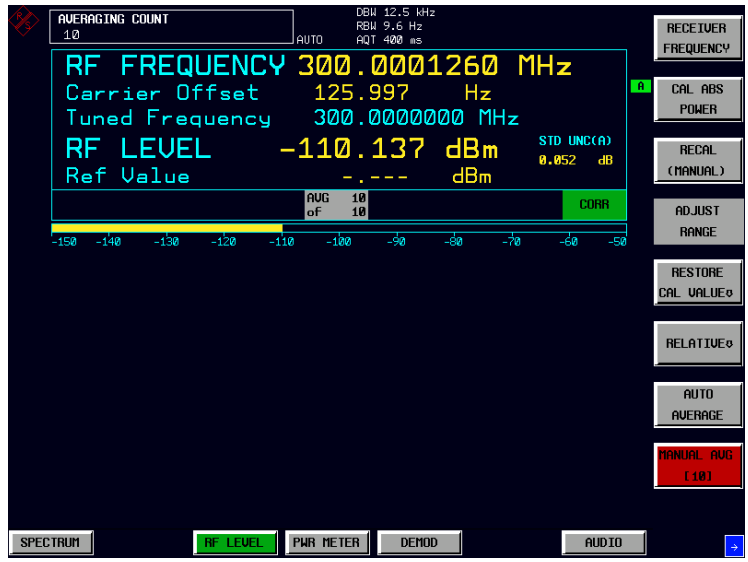


Fig.2-8 Tuned RF Level measurement with Averaging

4. Measure an unstable source (unstable in frequency)

The simulation of unstable sources requires a signal which is unstable in the frequency domain. This signal can be simulated with active frequency modulation on the signal generator.

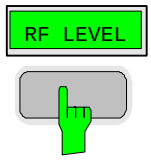
➢ The following settings are used on the generator:

1. *PRESET* the generator.
2. Set RF Frequency to 100 MHz.
3. Set the output level to 0 dBm.
4. Select FM Modulation, 3 kHz deviation.
5. Set the Modulation frequency to 1 kHz.

➢ Reset the instrument.

➢ Press the PRESET key.

The main receiver menu is opened. The receiver mode is set.

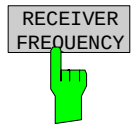


Switching to Tuned RF Level Mode

➢ Press the RF LEVEL hotkey.

The Tuned RF level menu is displayed.

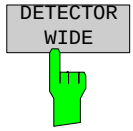
Set the measuring frequency



➢ In the RF LEVEL menu press the RECEIVER FREQUENCY softkey.

The frequency entry is displayed. Enter the measuring frequency with the number keys and the appropriate unit key.

➢ In the RECEIVER FREQUENCY entry window key in “100 MHZ”.



The measurement of an unstable signal requires the measuring receiver to use a wide bandwidth. The FSMR offers a wideband detector mode to acquire wideband signals with high accuracy

➢ In the RF LEVEL menu press the DETECTOR WIDE softkey.

The wideband detector mode acquire signals with the full acquisition bandwidth. The acquisition bandwidth (DEMOD BW) of the FSMR can be set in the BW menu, the preset value is 12.5 kHz. The bandwidth must be set wide enough to capture the maximum frequency deviation of the input signal. In this example, the frequency deviation is set to 3 kHz and the default bandwidth is 12.5 kHz.

Note: The wideband detection is not only suitable for unstable signals, it can also be used to accurately measure modulated signals

Next steps:

The following steps will be performed as described in the previous example (Tuned RF Level).

Example 3: AM Modulation and Modulation Distortion Measurements

Measurement

The FSMR includes a modulation analyzer. Measurements like AM, FM or PM modulation will be performed in the modulation analyzer mode. The instrument offers standard measurements like modulation depth, deviation and modulation frequency, but also more sophisticated function like modulation distortion or audio frequency response are available.

Main Receiver Functions

The modulation analyzer functions are available in the Measuring Receiver *DEMOD*-mode. All required settings and evaluations can be reached from the DEMOD main menu.

Measurement Setup

Fig.2-9 AM modulation measurement setup

The following settings are used on the generator:

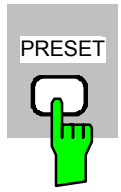
1. *PRESET* the generator.
2. Set RF Frequency to 100 MHz.
3. Set the output level to - 30 dBm.
4. Select the AM Modulation, 30% modulation depth.
5. Set the Modulation frequency to 1 kHz.

Measurement Sequence – AM Modulation Measurements

Connect the Signal Generator output with the Measuring Receiver RF Input.

The following measurement steps are performed:

1. Measure the AM modulation depht.
2. Relative Audio measurements
3. Measure the Total harmonic distortion in %.

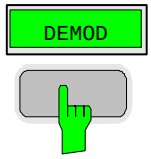


1. Measure the AM modulation depth

➢ ***Reset the instrument.***

➢ *Press the PRESET key.*

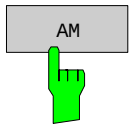
The main receiver menu is opened. The receiver mode is set.



Switching to AM demodulation

➢ *Press the DEMOD hotkey.*

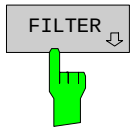
The analog demodulation menu is displayed.



➢ *In the DEMOD menu press the AM softkey.*

The modulation frequency and the AM modulation depth with peak detection measurement results are displayed in the lower window of the screen. The upper window shows the RF Frequency and the RF input level.

Limiting the bandwidth - Audio Filters

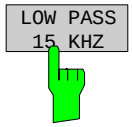


➢ Press the *DEMOD* hotkey.

The analog demodulation menu is displayed.

➢ In the DEMOD menu press the *FILTER* softkey.

The audio filter menu is displayed. To suppress unwanted broadband noise or harmonics of the demodulated signal, the bandwidth of the measurement can be limited with highpass and lowpass filters.



➢ In the FILTER menu press the *LOW PASS 15 KHZ* softkey.

The following screen is displayed:

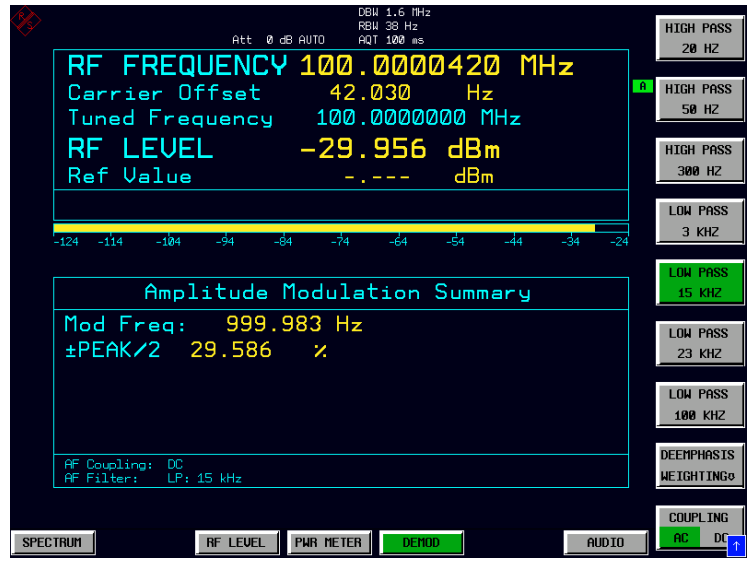
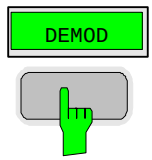


Fig.2-10 AM Modulation measurement in the *DEMOD* mode

➢ ***In the FILTER menu press the LOW PASS 15 KHZ softkey again to switch the filter off.***

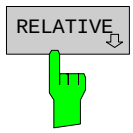


2. *Relative Audio measurements – audio frequency response*

➢ Press the *DEMOD* hotkey.

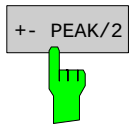
The analog demodulation menu is displayed.

➢ In the DEMOD menu press the *RELATIVE* softkey.



The RELATIVE menu is displayed.In the relative menu, only the detectors which have been switched on in the DETECTOR menu are available for relative measurements.

➢ In the RELATIVE menu press the +- *PEAK/2* softkey.



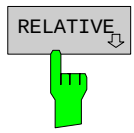
The actual measurement value of the detector will be saved as a reference value and the result display will change to a relative reading (indicated with Δ 0.00 %).

Change the modulation frequency to 50 kHz

➢ The following settings are used on the generator:

1. Select the AM Modulation, 50 kHz modulation frequency.

Relative display – Change the Unit to dB

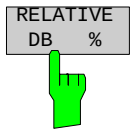


➢ Press the *DEMOD* hotkey.

The analog demodulation menu is displayed.

➢ In the DEMOD menu press the *RELATIVE* softkey.

The RELATIVE menu is displayed.



➢ In the RELATIVE menu press the +- *PEAK/2* softkey.

The actual result display will change from a relative reading indicated in % to a dB reading.

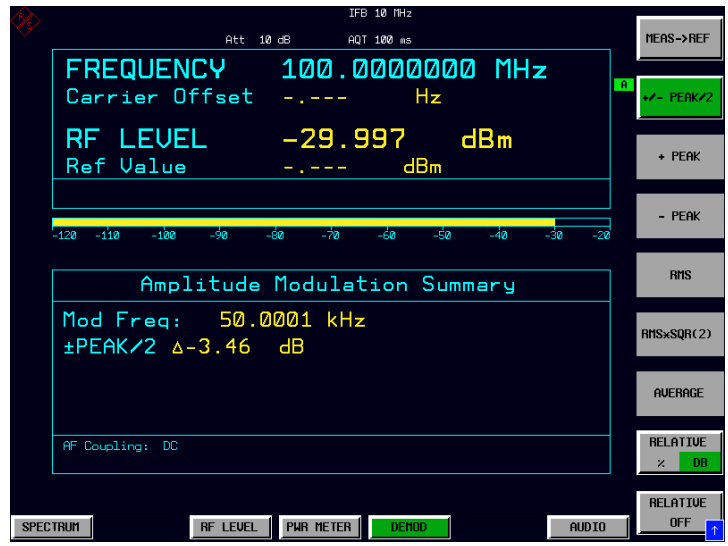
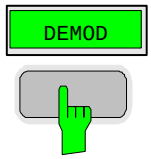
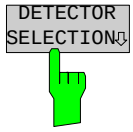


Fig.2-11 Relative measurement in the demod mode





3. Measure the harmonic distortion - Choosing the detector

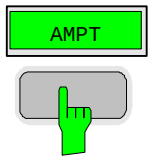
➢ Press the *DEMOD* hotkey.

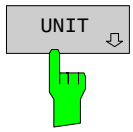
➢ In the DEMOD menu press the *DETECTOR SELECTION* softkey.

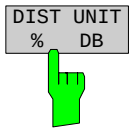
The DETECTOR SELECTION menu is displayed

The instrument is equipped with a wide range of detectors for measuring modulation signals. The peak detectors are a good choice for capturing the highest positive or negative peak within the measurement time, while the RMS and Average detectors are the best choice for measuring noise and residual modulation. The THD & SINAD detector measure the distortion of the demodulated audio signal. All detectors can be used in parallel.

➢ In the DETECTOR SELECTION menu press the *DISTORTION & SINAD* softkey.







Total Harmonic Distortion – Change the Unit to %

➢ Press the *AMPT* hardkey on the frontpanel.

The amplitude settings menu is displayed.

➢ In the AMPLITUDE menu press the *UNIT* softkey.

The measuring receiver UNIT menu is displayed.

➢ In the UNIT menu press the *DIST UNIT % / DB* softkey.

The actual result display for the THD measurement will change from a “DB” reading to a “%” reading.

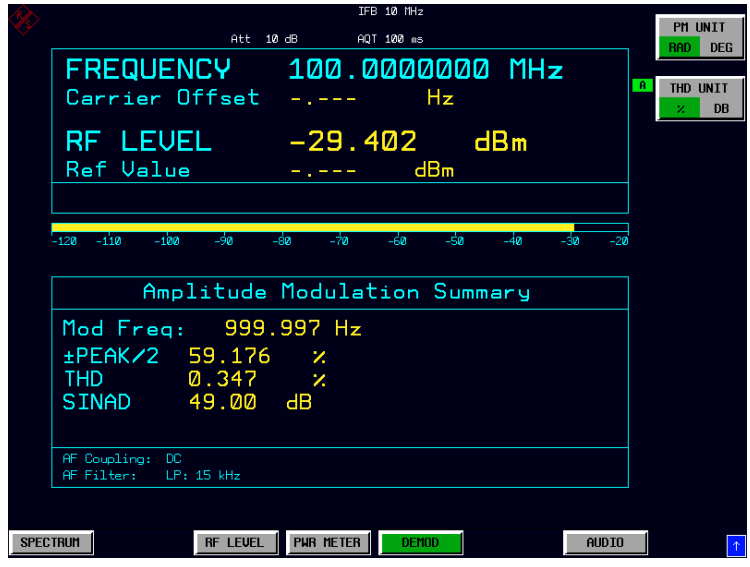


Fig.2-12 THD measurement in UNIT %

Example 4: Audio Measurements with the Audio Analyzer mode

Measurement

The FSMR includes an audio analyzer functionality. Measurements of audio signals will be performed in the audio analyzer mode with highest accuracy. The FSMR will automatically handle all required settings.

Main Receiver Functions

The audio analyzer functions are available in the Measuring Receiver *AUDIO*-mode. All required settings and evaluations can be reached from the AUDIO main menu.

Measurement Setup

Fig.2-13 Audio measurement setup

➢ ***Connect the signal generator LF (low frequency) output with the FSMR Audio input.***

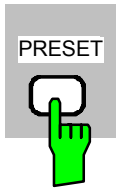
The following settings are used on the generator:

1. *PRESET* the generator.
2. Set LF output to ON .
3. Set the LF output level to 1 volt.
4. Set the LF output frequency to 1 kHz.

Measurement Sequence – Audio Measurements

The following steps are performed:

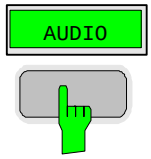
1. Measure the audio level and frequency.
2. Measure the frequency response of the audio filters.
3. Measure the influence of the input impedance.



➢ ***Reset the instrument.***

➢ *Press the PRESET key.*

The main receiver menu is opened. The receiver mode is set.



Switching to Audio Mode

➢ *Press the AUDIO hotkey.*

The audio menu is displayed. The audio measurement results are displayed in parallel, no further settings like frequency is required.

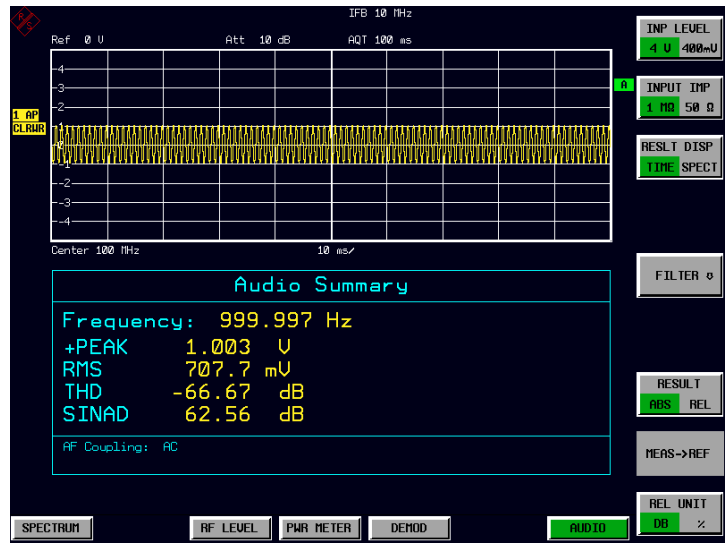
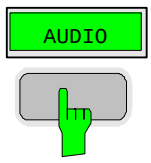


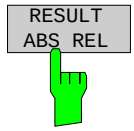
Fig.2-14 Audio measurement after Preset, Mode Audio



4. Relative Audio measurements

➢ Press the *AUDIO* hotkey.

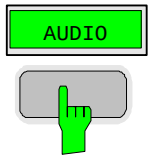
The audio menu is displayed.



➢ In the AUDIO menu press the *RESULT ABS REL* softkey.

The relative measurement function is enabled.

The actual measurement value of the detector will be saved as a reference value and the result display will change to a relative reading (indicated with Δ 0.00 dB). The unit can be changed with the *REL UNIT DB %* softkey in the audio menu.



Limiting the bandwidth - Audio Filters

➢ Press the *AUDIO* hotkey.

The audio menu is displayed.

➢ In the AUDIO menu press the *FILTER* softkey.

The audio filter menu is displayed. To suppress unwanted broadband noise or harmonics of the signal, the bandwidth of the measurement can be limited with higpass and lowpass filters.

➢ In the FILTER menu press the *LOW PASS 15 KHZ* softkey.

Change the LF output frequency to 15 kHz

The following settings are used on the generator:

- Set the LF output frequency to 15 kHz.

The audio frequency is now changed to the bandwidth of the active 15 kHz low pass filter. In the following measurement the frequency response of the audio low pass filter is measured.

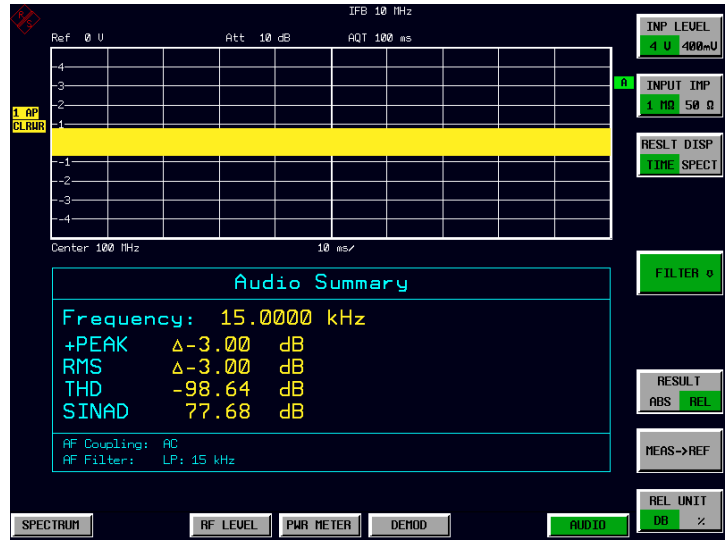


Fig.2-15 Audio measurement in relative mode

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3 Manual Operation

Chapter 3 provides an overview of the operating concept and the basic steps of manual operation of the R&S FSMR. This includes a description of the screen, of the control of menus and of the setting of parameters. An overview of the menus will be listed at the end of this chapter.

The functions of the menus are described in detail in Chapter 4. Chapter 2 contains a short introduction on step-by-step simple measurements. The remote control of the instrument is described in Chapters 5, 6 and 7

The operation of the spectrum analyzer is menu-controlled via keys, hotkeys and softkeys. The setting of the instrument and test parameters in the menus is made either directly via softkeys or by entry of values in entry fields and by selection in tables. The operating mode and the screen mode is selected via the hotkeys.
If required, data entry windows and tables are superimposed on the screen.

The Screen

The screen informs continuously on the results and parameters of the selected measuring functions. It shows the assignment of the softkeys and menus, which are required for setting the measuring parameters. The display of test results, the softkey labeling and the type of menu depend on the selected measuring function.
The screen is subdivided into three areas:

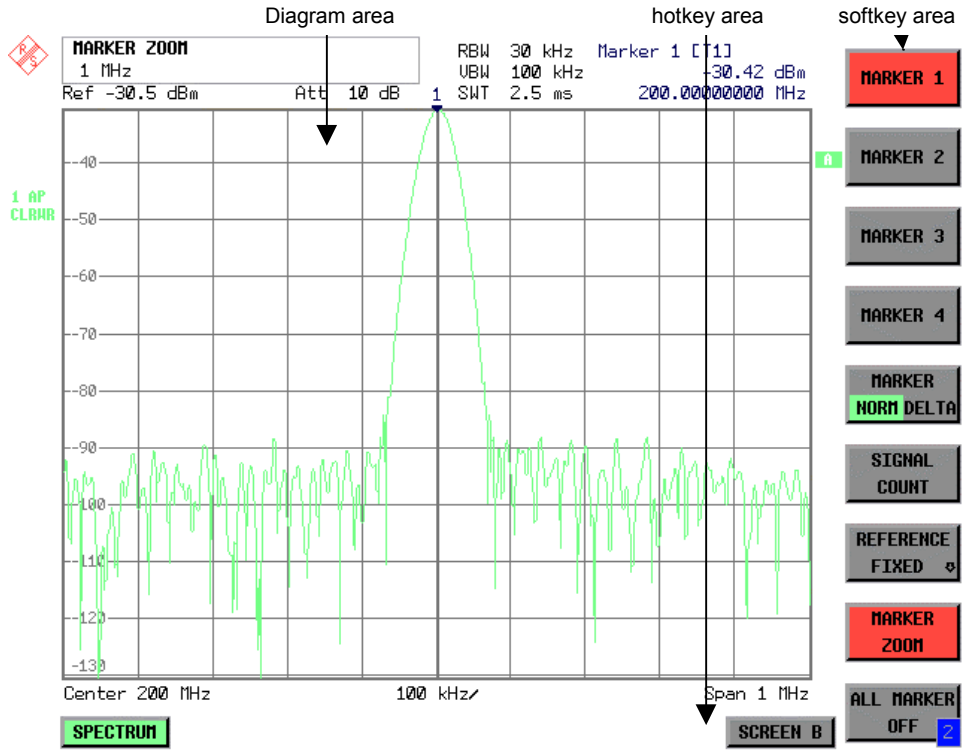


Fig. 3-1 Subdivision of screen

Diagram area This area contains the measuring diagrams and other measured-value information as well as the parameters and status information which are important for analysis of the results.
In addition, message fields, entry windows and tables may be shown in this area.

Softkey area This area contains the instrument functions which can be selected via the softkeys. The softkey area is not superimposed by other graphics.

Hotkey area This area contains the available operating modes and screen modes. The hotkey area is not superimposed by other graphics.

Diagram Area

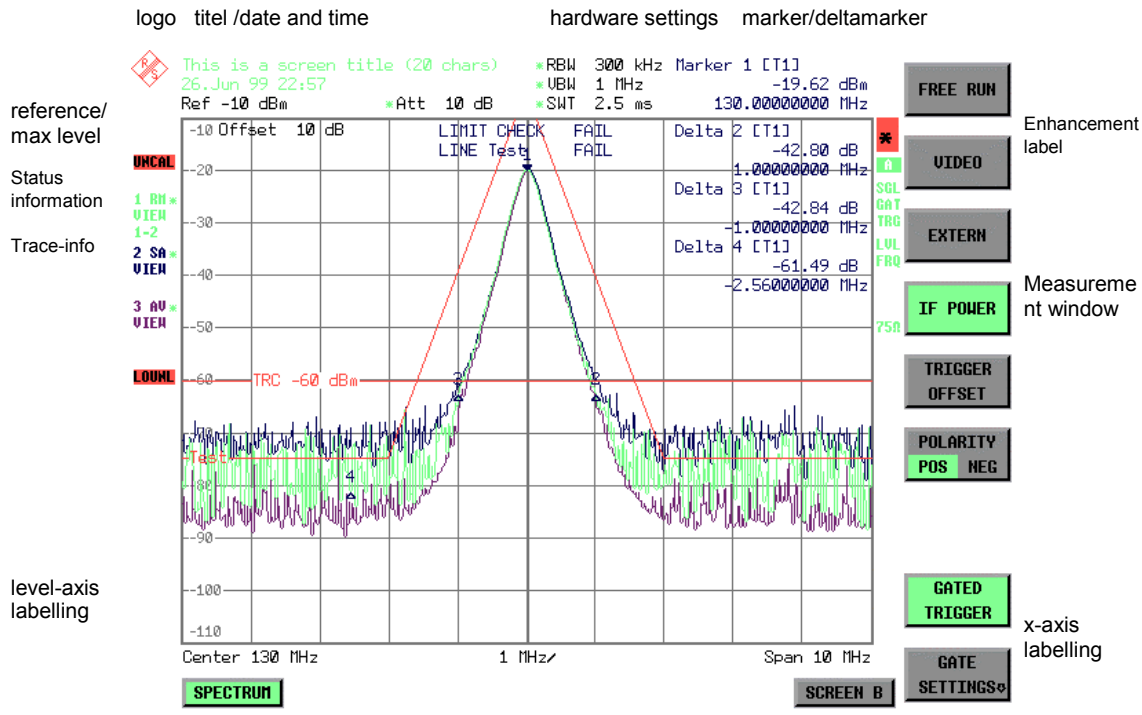


Fig. 3-2 Subdivision of the R&S FSMR screen in analyzer mode (without measuring diagram)

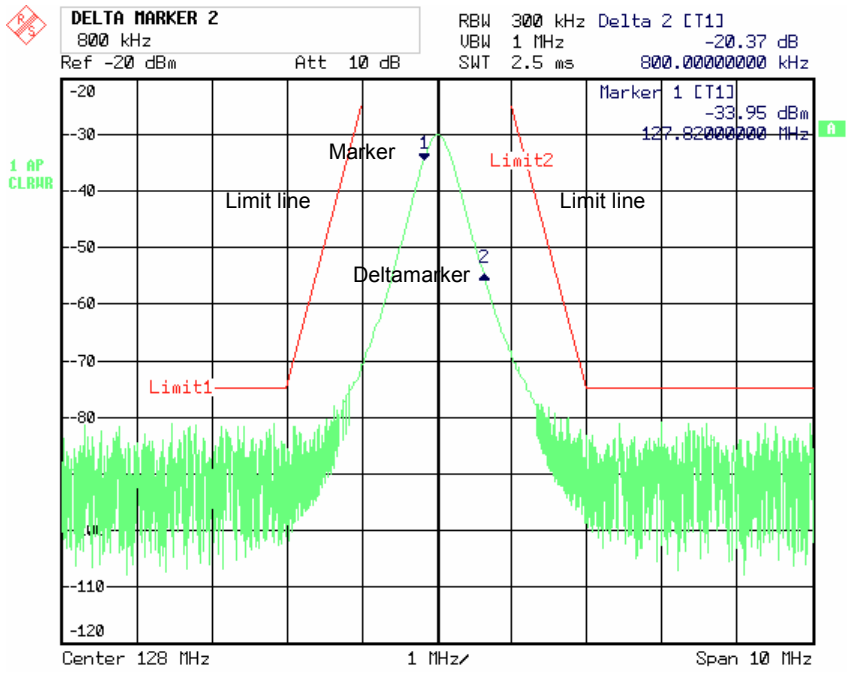


Fig. 3-3 Measuring diagram

Indications in the Diagram Area

The following graphic elements are displayed in the diagram area:

General indications Indication of the logo

Logo

Screen title Indication of selected screen title

Date / time Indication of date and time

Hardware settings

Ref Indication of the reference level

Offset Indication of the offset of reference level.

Att Indication of the set RF attenuation.

RBW Indication of the set resolution bandwidth.
If the bandwidth does not correspond to the value of the automatic coupling, a green asterisk "*" is prefixed to the field.

VBW Indication of the set video bandwidth.
If the bandwidth does not correspond to the value of the automatic coupling, a green asterisk "*" is prefixed to the field.

SWT Indication of the set sweep time.
If the sweep time does not correspond to the value of the automatic coupling an asterisk "*" is prefixed to the field. The colour of the asterisk turns red as soon as the sweep time falls below the value of the automatic coupling.

Marker/deltamarker

This label displays the position of the last selected marker or deltamarker in the x and y-directions and the marker/deltamarker index. The square brackets contain the curve which the marker is assigned to and the active measuring function of the marker indicated. The measuring function of the markers in the second field is indicated by the following abbreviations:

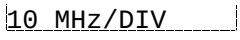
FXD	reference fixed active
PHN	phase noise measurement active
CNT	frequency counter active
TRK	signal track active
NOI	noise measurement active
MOD	measurement of AM modulation depth active
TOI	TOI measurement active (3rd order intercept)

Limit check

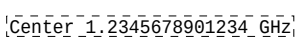
Indication of the result of the limit check.

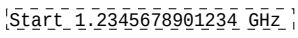
X-axis labelling

Display of the x-scaling.

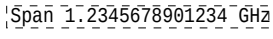


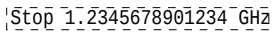
The distance between two grid lines is displayed in this label.

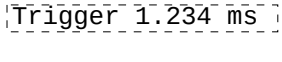




The set center frequency or start frequency is displayed in this label depending on whether the keys FREQ/SPAN or the softkeys START/STOP were last pressed.
If span = 0 Hz, the center frequency is always displayed.







The set frequency range (*SPAN*) or the stop frequency is displayed, depending on whether the keys FREQ/SPAN or the softkeys START/STOP were last pressed.
If span = 0 Hz, the trigger moment (*PRETRIGGER*) is displayed.

Status information

The status information on the left side of the diagram hint at irregularity (e.g. UNCAL)

#SMPL

"#SMPL" indicates that the relation Span / RBW is higher than 125 while the RMS detector is activated. In this case, a stable signal evaluation is no longer possible due to an insufficient number of A/D converter samples.

⇒ reduce span or increase RBW

UNCAL

"UNCAL" is indicated under the following circumstances:

- correction data are switched off (menu CAL, CAL CORR OFF).
  ⇒ switch on CAL CORR ON or PRESET
- no valid correction data. This may occur after a cold start of the instrument following a firmware update.
  ⇒ record correction data
- Sweep time too short for current instrument settings (span, resolution bandwidth, video bandwidth).
  ⇒ increase sweep time

OVLD / IFOVL

OVLD is indicated when the input mixer is overloaded.

⇒ Increase input attenuation

IFOVL is indicated when overload occurs in the IF signal path after the input mixer.

⇒ Increase reference level

LOUNL / EXREF

LOUNL is indicated when an error occurs in the frequency processing of the instrument.

EXREF is indicated when the analyzer is configured for use of an external reference signal, but no reference signal is detected at the corresponding input.

OVEN

OVEN is indicated when the crystal oscillator (option R&S FSMR-B4) has not yet reached its operating temperature. This indication vanishes after a few minutes after switch on.

Trace info:

Every active measurement curve (trace ≠ BLANK) is allocated trace information of two or three lines at the left of the diagram. The trace information has the same colour as the measurement curve.
The information on the currently selected trace is displayed in inverse video (see *TRACE - SELECT TRACE softkey*).

<n> <detector> <*>
<mode>
<trace math>

Example:

```
1 PK *
CLRWR
1-2
```

n = trace number (**1 ... 3**)

detector = selected detector
- **AP:** AUTOPEAK detector
- **PK:** MAX PEAK detector
- **MI:** MIN PEAK detector
- **SA:** SAMPLE detector
- **AV:** AVERAGE detector
- **RM:** RMS detector
- **QP:** QUASIPEAK detector

* = indicates that the selected detector does not correspond to that of the automatic coupling.

mode = indication of sweep mode
- **CLRWR:** CLEAR/WRITE
- **MAXH:** MAX HOLD
- **MINH:** MIN HOLD
- **AVG:** AVERAGE
- **VIEW:** VIEW

Trace math = trace math active
- **1 - 2** trace 1 - trace 2
- **1 - 3:** trace 1 - trace 3

Instrument settings (Enhancement Labels)

Indication of user instrument settings which influence the measuring result and which are not immediately obvious when viewing the measured values.

***** The current instrument setting does not correspond to the one which applied when one of the displayed curves had been stored. This occurs under the following circumstances:

- The instrument setting is modified while a measurement is being performed.
- The instrument setting is modified in SINGLE SWEEP mode subsequent to the end of the sweep and no new sweep is started.
- The instrument setting is modified after setting the trace to VIEW.

The display is retained until the cause is eliminated by the user. I.e., either a new sweep is started (SINGLE SWEEP mode), or the trace of interest is switched to BLANK.

A / B Identification for screen A / B. When screen A / B is activated for the entry of test parameters, this label is highlighted.

SGL The sweep is set to SINGLE SWEEP.

GAT The frequency sweep is controlled via the *EXT TRIG/GATE* input of the instrument.

TRG The instrument is not triggered in *FREE RUN* mode.

LVL A level offset ≠ 0 dB has been set.

FRQ A frequency offset ≠ 0 Hz has been set.

PRN A printer output is active.

75 Ω The input impedance of the instrument is set to 75 Ω.

EXT The instrument is configured for operation with external reference

PA The RF preamplification is switched on (option B23 or B25).

Entry fields:

Entry window The data entry window is superimposed in the left upper corner of the diagram area, if required. It covers the display of the title and the time. The field is used to enter numeric or alphanumeric device parameters.

Tables The tables are superimposed in the diagram area, if required. They are used for displaying and configuring device parameters.

Message windows:

Message field

Message fields provide notes on measurements, e.g. results of the limit check (PASS/FAIL).
These notes are no error messages, which are indicated as system messages.

They can be masked out by pressing the *ESC* key.

System messages

System messages indicate warnings and error messages.

Message without action field:
These system messages contain only arbitrary information. They hint at events which are of interest for the user but do not affect the measurement or functioning of the instrument.

They are deleted either automatically after a predefined time has passed (3 seconds) or upon any keystroke or mouse click.

Message with action field:
These system messages require a decision to be taken by the user. They are not deleted until any action has been selected. Deletion of the message initiates the action selected and appropriate measures to be taken. The action field consists of one (OK), two (OK/CANCEL) or three (arbitrary) buttons.
The user may select one of the buttons using the cursor keys and initiate the associated action by means of the unit keys. The ESC key is used to acknowledge the message without releasing any action.

Traces:

1 to 3

Up to 3 traces in each measurement diagram can be displayed simultaneously.

Limit lines

Limit lines are used to mark level curves or spectral distributions which must not be exceeded or dropped below.

The R&S FSMR provides two display modes:

- Full Screen: 1 window, the measurement is performed in the active diagram.
- Split Screen: 2 windows, the measurements are performed in both diagrams.

Full Screen

In the full-screen mode, the settings and measurements are performed in the active visible window. All indications on the screen refer to this window. The designation (SCREEN A or SCREEN B) is inserted as enhancement label A or B on the right diagram margin.
Switching between the windows is by means of *SCREEN A/B* hotkey. The current measurement is terminated when its window is blanked out.
Switching from split-screen to full-screen mode is performed in menu *DISP*.

Split Screen

In Split Screen mode, the screen is divided into two halves.

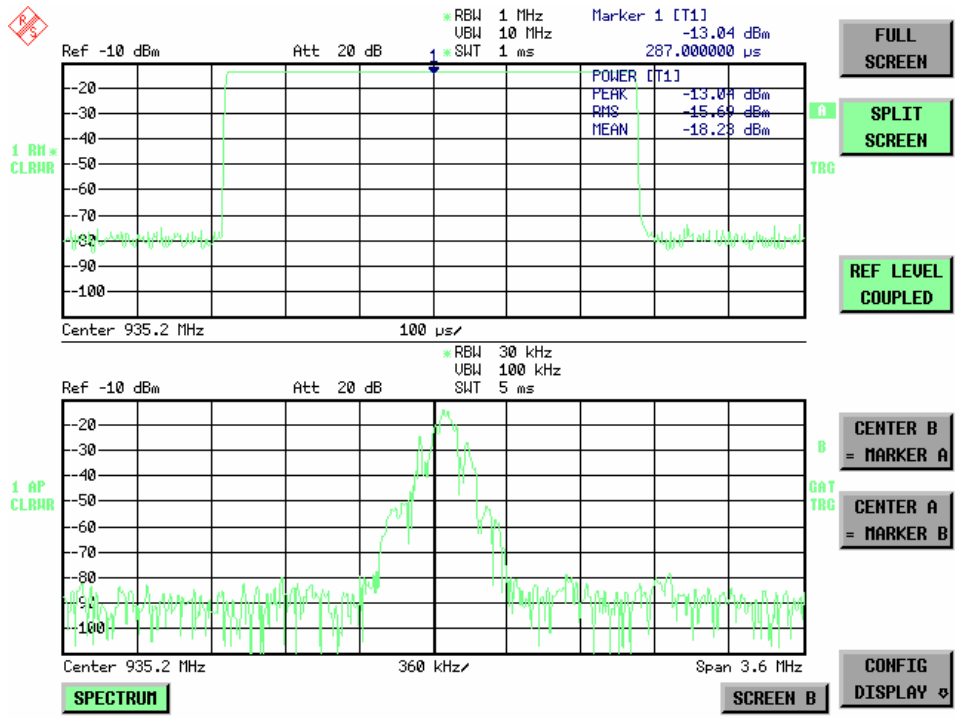


Fig.3-4 Subdivision of the screen in Split Screen mode

The upper half is assigned Screen A, the lower one Screen B. The settings for measurement can be selected independently for both screens. E.g., a spectrum may be displayed in Screen A and a time amplitude in the time range is displayed in Screen B.

The indications which are valid only for one window appear in the margin of the associated diagram. Indications which are valid for the two windows are displayed between the diagrams.

The window for entry of the measuring parameters or the marker operation is selected using the *SCREEN A/B* hotkey. The measurements are simultaneously performed in the two windows irrespective of the currently active one.
Switching from full-screen to split-screen mode is performed in menu *DISP*.

Softkey Area

The softkeys are assigned to the nine keys on the right side of the display
The setup of the softkey area is independent of the operating mode. It consists of the following graphic elements:

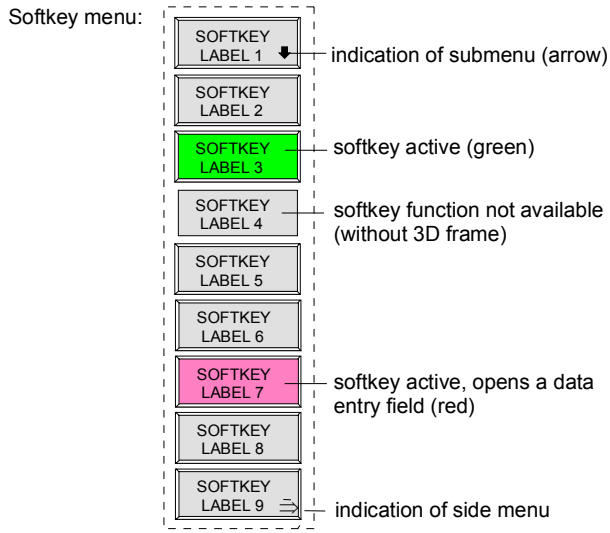


Fig.3-5 Setup of the softkey area

The softkeys have different functions depending on the instrument state. Therefore, their labeling can be varied. The labeling of all softkeys which call a submenu includes a ⇓ arrow.
The function and current state of the softkeys is indicated in the label by different texts and colors. The color assignment is factory-set as follows:

Table 3-1 Factory-set color assignment of soft keys

Softkey color	Meaning
gray	Softkey switched off
green	Softkey switched on
red	Softkey switched on and data entry active

These colors can be changed by the user as desired in the *DISP - CONFIG DISPLAY* menu.

A softkey is switched on or off by pressing the respective hardkey (see following section "Setting the Parameters").

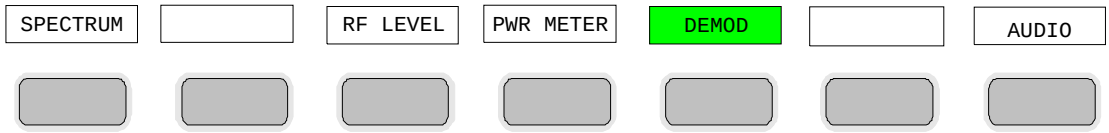
Softkeys are masked out, too, if the functionality which they represent is not available. A distinction has to be made between two cases:

- If an instrument function depends on an option, and if this option is not fitted, the associated softkey is masked out,.
- If the instrument function is not available temporarily due to specific settings, the softkey is displayed without the 3D frame.

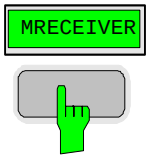
The label ⇒ on the right lower corner of the softkey area indicates that a side menu is available. The side menu is called by pressing the *NEXT* key.

Hotkey Area

Hotkeys are allocated to the eight k eys on the bottom margin of the screen. They change between modes and the active diagrams.
The menu only shows the hotkeys which are actually used:



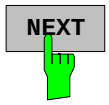
A keystroke activates the associated hotkey. An activated hotkey changes its frame:



Calling and Changing the Menus

The operation of the s pectrum analyzer is menu-controlled via k eys and s oftkeys. Various softkey menus are displayed depending on the instrument status. The individual menus constitute the so-called menu tree. The top menu (the root of the menu tree) is always called by means of a keystroke. Arrows at the lower edge of the softkey area indicate whether a supplementary menu can be entered or not.
Softkeys with an arrow allow for branching into further menus (so-called submenus): The field "→" at the lower right side of the softkey area indicates that this menu has a side menu.

The menu change keys on the front panel below the softkey area allow for switching between the main menu and the side menus and submenus.

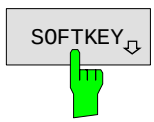


The *NEXT* key calls the side menu.

The *PREVIOUS* key returns to the next higher menu.

Several menus provide for automatic change, i.e., return to the next higher menu is caused automatically after pressing a softkey.

Selection of a submenu is always effected via a softkey.



The labeling of all softkeys which call a submenu includes a ⇓ arrow.

Setting Parameters

Parameters are set either by simple selection (selection parameters) or by (alpha)numeric entries in data entry windows or tables.

The numeric keypad on the front panel, an external keyboard (optional), a spinwheel and the cursor keys are provided for the entry of instrument parameters in an entry window or in a table.

The external keyboard is optional. If it is not fitted, the help line editor is called automatically for entry of alphanumeric parameters. The help line editor provides for selection of individual letters and a number of special characters which are copied into the actual entry window.

Numeric Keypad

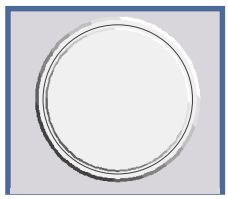
The numeric keypad is provided for entry of numeric parameters. It contains the following keys:

- Number keys 0 to 9
- Decimal point
  Inserts a decimal point "." at the cursor position.
- Sign key
  Changes the sign of the mantissa or exponent of a numeric parameter.
  A "-" is inserted at the cursor position in case of an alphanumeric parameter.
- Unit keys (*GHz/-dBm*, *MHz/dBm*, *kHz/dB* and *Hz/dB*)
  - Provide the numeric value entered with the selected unit and terminate the entry.
    The unit keys are allassigned the value "1" for dimensionless quantities or for level entries (e.g., in dB). The unit keys thus assume the function of an *ENTER* key. The same applies for an alphanumeric entry.
  - Open and close the selection windows of tables.
- *BACK* key
  - Deletes the character left to the cursor with numeric entry.
  - Allows for toggling between the current and the previous values subsequent or prior to entry (UNDO function).
- *ESC/CANCEL* key
  - Aborts the entry before it has been terminated. The previous value is restored.
  - Closes the entry field after termination of input.
  - Closes system messages.
- *ENTER* key
  - Terminates the input of dimensionless quantities. The new value is set.

  Note: *The ENTER keys assumes the function of the Hz key for frequency input, and the function of the µs(kHz) key for time input.*

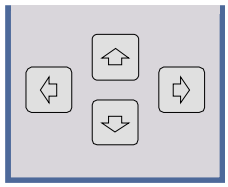
Spinwheel and Cursor Keys

The spinwheel and the cursor keys are arranged besides the numeric keypad.



The spinwheel has various functions:

- With numeric entry, the instrument parameter is incremented (turning clockwise) or decremented (turning counterclockwise) at a defined step size.
- In tables, the spinwheel can be used to shift the cursor horizontally or vertically when no entry window is open. The direction (horizontal/ vertical) is switched over using the cursor keys.
- The spinwheel is used with the help- line editor to select the individual letters.
- It can be used to shift markers, display lines, limit lines etc.
- Pressing the spinwheel terminates the input of parameters.



In tables, the cursor keys are used to shift the cursor between the lines and columns of the table.

The keys ◁ and ▷ are used to shift the cursor inside the entry window to reach a particular position in the string.

The keys △ and ▽

- increase or decrease the value of a parameter for numeric input .
- switch between editing line and help line editor for alphanumeric input.

Selection and Setting of Parameters via Keys or Softkeys

The selection of parameters and their settings is effected by means of a key, a softkey or in a table depending on the hierarchical level of the menu they are assigned to. Selection and setting of parameters in tables is described in section "Selection and Setting of Parameters in Tables" .

Selection via key

Most keys of the network analyzer are used to enter menus where the selection and the settings are made. Few settings can be made directly by means of a keystroke, only.

Example: Call up of preset settings

➢ Press *PRESET* key

The spectrum analyzer is brought into a predefined initial state.

Selection via softkey

In most cases the selection is made by pressing the respective softkey. There are various alternatives of making the selection:

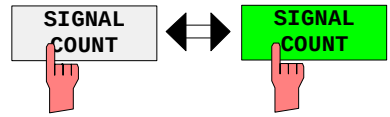
1. The softkey is active or inactive.

Example: Switching on/off the frequency counter

➢ Press *MKR* key.

➢ Press *SIGNAL COUNT* softkey.

Each time the softkey is pressed, the marker info list is switched on or off. If the softkey is active (= marker info list on), it is illuminated.



2. The softkey acts like a toggle switch, each pressing changes the active selection.

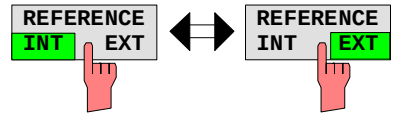
Example: Selection of the reference (internal or external)

➢ Press *SETUP* key.

➢ Press *GENERAL SETUP* softkey, the *GENERAL SETUP* submenu is opened.

➢ Press *REFERENCE INT/EXT* softkey.

With each pressing, the checkmark on the softkey changes from INT (internal reference) to EXT (external reference) and vice versa. When in the active setting the softkey menu item is illuminated.



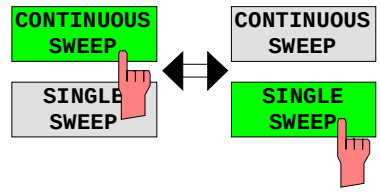
3. Various softkeys act like selection switches. Only one softkey may be active at a time.

Example: sweep setting

➢ Press *SWEEP* key.

➢ Press *CONTINUOUS SWEEP* softkey.

The continuous sweep is thus set. The *CONTINOUS SWEEP* softkey is colored (factory-set: green). The second alternative, a series of n sweeps according to the trigger definition, can be selected via the *SINGLE SWEEP* softkey in the same menu. Only one of the two softkeys can be active at a time, the softkeys thus act like selection switches.



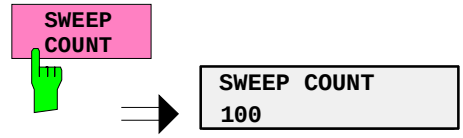
4. The softkey is used to select the parameter, the setting is made in an alphanumeric data entry window.

Example: SWEEP COUNT parameter

➢ Press *SWEEP* key

➢ Press *SWEEP COUNT* softkey.

The window for entering the number of sweeps for the SINGLE SWEEP mode is opened. The softkey is colored (factory-set: red). (Data entry is described in the next section).



4. The softkey is used to select the parameter, the setting is made in an (alpha)numeric data entry window. The softkey function is switched on. To switch off the function, the softkey has to be pressed again.

Example: parameter MARKER

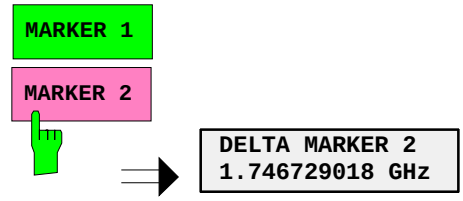
➢ Press *MRK* key.

➢ Press *MARKER 1* softkey.

The window for entering the marker frequency is opened. The softkey is colored (factory set: red).
Marker 1 is switched on and the peak search is started.

➢ Press *MARKER 2* softkey.

The entry window for the marker frequency of marker 2 is opened. The softkey is colored (red), marker 2 is switched on, and the *MARKER 1* softkey turns green.



➢ Press *MARKER 1* softkey again.

Marker 1 is switched off.

5. The softkey selects the parameter, the setting is made in a selection table.

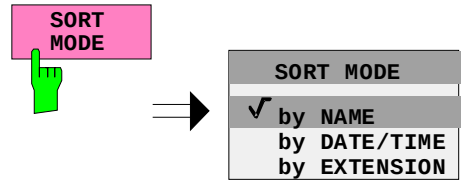
Example: Selection of the sorting criteria of a file list

➢ Press *FILE* key.

➢ Press *FILE MANAGER* softkey.

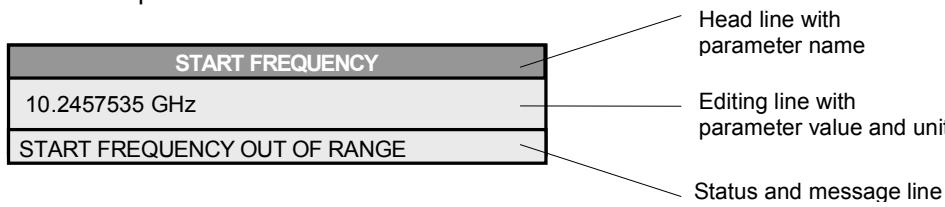
➢ Press *SORT MODE* softkey.

A selection table is displayed. The softkey is colored (factory-set: red). (operation see below).



Editing of Numeric Parameters

The entry of numeric values is always made in a data entr y window, which is displayed automatically after selection of the parameter.



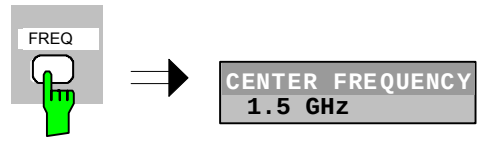
The headline indicates the nam e of the ins trument parameter, which has been s elected. The entry is made in the editing line. Subs equent to calling the entry window, the current parameter value including the unit is displayed left-justified in the editing line. Status and error messages which refer to the current entry are displayed in the third and (optionally) fourth line.

Note: *Entry windows may be represented transparent (cf. DISPLAY - CONFIG DISPLAY menu)*

Entry of a numeric value

➢ Call data entry window (cf. selection of parameters)
The editing line indicates the current value

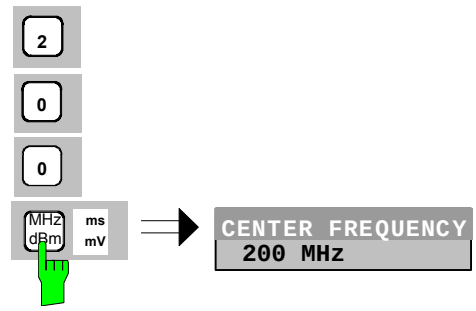
Example: center frequency (frequency-sweep mode)



Entry via number keys

➢ Enter required value via number keys.

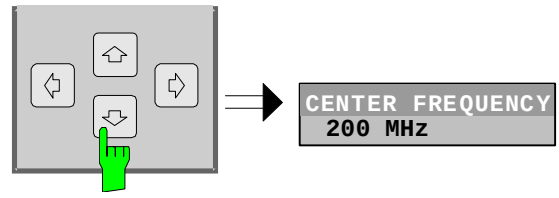
Example:



Entry via cursor keys

➢ Cursor ⇧ or ⇩ until obtaining the required value.

Example:



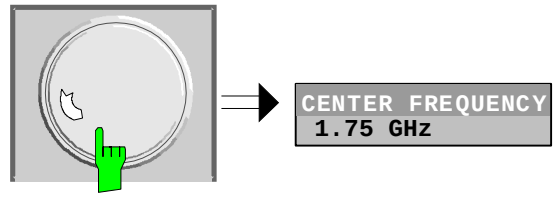
Entry via spinwheel

➢ Rotate the spinwheel until reaching the required value.

The variation step size increases with increasing rotational speed.

Turning the spinwheel clockwise increases the value, turning it counterclockwise decreases the value.

Example:



Note: *When the value is modified by means of the spinwheel or the cursor keys the new value is immediately set.*

Terminating the entry

➢ Press one of the unit keys

The unit is entered in the entry window and the new setting is accepted by the instrument.

For dimensionless quantities:

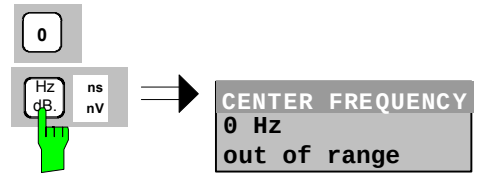
➢ Press the ENTER key or the spinwheel

The new setting is accepted by the instrument.

A few data entry windows close automatically whereas others like the entry window for the start frequency remain open even after termination of the entry. They can be closed by pressing the *ESC* key.

If an error occurs, a corresponding error message is displayed in the status line of the entry window, e.g., "Out of range", "Value adjusted", etc. In this case, the new value is not accepted for the instrument setting.

Example:



Correcting the entry

Deleting an entry

➢ Position the cursor beside the digit which is to be deleted using the cursor keys ⇦ or ⇨ .

➢ Press the *BACK* key. The entry left to the cursor is deleted.

➢ Enter new numbers. The number is inserted to the left of the cursor, the other numbers are shifted right.

Restoring the original value

- Press the *BACK* key

  For numerous parameters, the data administration of the instrument stores the previously valid parameter value in addition to the current value. The BACK key can be used to toggle between these two values. This applies for terminated entries as long as the data entry window is displayed.

Aborting the entry

- Press *ESC* key

  The original parameter value is restored. The new entry is deleted.

- Press *ESC* key again

  The entry window is closed, the original value remains active.

or

- Press any key or any softkey (even the softkey which has opened the entry window).

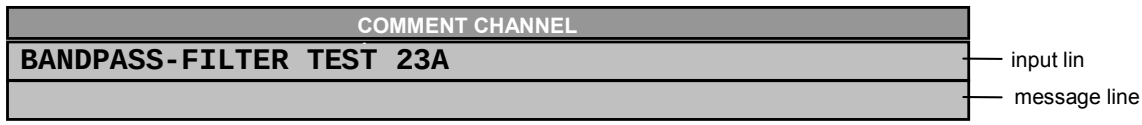
  The entry is aborted and the entry window is closed. The original value remains active.

Entry of Alphanumeric Parameter

A help-line editor or an external keyboard (optional) are provided for the entry of alphanumeric instrument parameters.
The spinwheel and the exponent key have no function with alphanumeric entry. All unit keys assume the function of an ENTER key.

The entry is always made in a data entry window which is displayed automatically upon selection of the parameter. The editing line comprises 60 characters. Up to 256 characters may be entered. If a text exceeds 60 characters the contents is shifted automatically 20 characters left or right when the left or right margin of the editing line is touched by the cursor.

Editing with External Keyboard



Entry of text

- Select parameter.
  The data entry is active automatically upon calling the data entry window. The cursor is positioned at the beginning of the previous entry.
- Press the required character on the keyboard.
  The character is inserted prior to the cursor.
- Enter further characters

Correcting the entry

- Delete the entry using the *DELETE* key or *BACKSPACE* key.

Terminating the entry

- Press the *ENTER* key of the external keyboard
  The data entry window is closed and the new value is accepted for the instrument.

Aborting the entry

- Press the **ESC** key on the front panel

or

- any softkey.

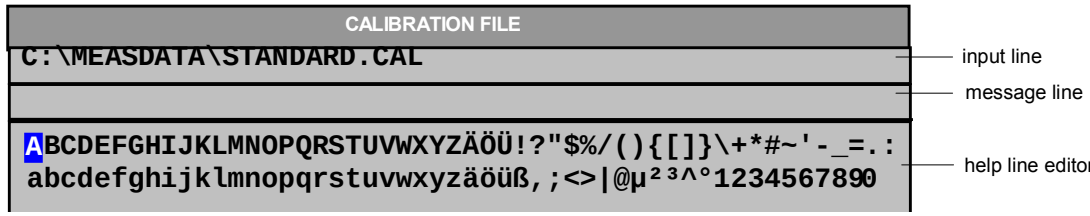
  The data entry window is closed, the original value is retained.

Editing with Help Line Editor

If the external keyboard is not fitted, the help line editor is called automatically with entry of alphanumeric parameters. The help line editor is an extension of the alphanumeric entry window. It contains the complete alphabet with uppercase and lowercase letters as well as special characters in two lines of 52 characters, each. Individual letters and a series of special characters can be selected in the help line editor and copied into the entry line.

The help line editor comes in two versions:

Version 1:



The cursor keys ⇧ or ⇩ toggle between entry in the editing line and selection in the help line editor.

Entry of text

- Select parameter.
  The data entry is active automatically upon calling the data entry window. The cursor is positioned on the left in the editing line.
- Position the cursor in the help line editor using the cursor key. ⇩
  The cursor marks the first letter of the editor.
- Locate the cursor on the character which is to be entered into the editing line using the cursor keys ⇦ or ⇨ or the spinwheel.
- Press the *ENTER* key or the spinwheel
  The character is entered in the editing line.

Correcting the entry

- Locate the cursor in the editing line using the cursor key ⇧ .
- Position the cursor after the character which is to be deleted using the cursor keys ⇦ and ⇨ .
- Press the *BACK* key.
  The entry left to the cursor is deleted.

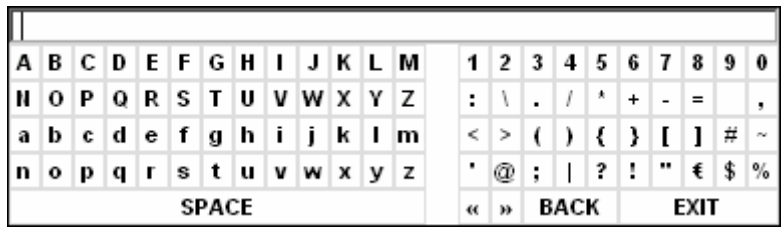
Terminating the entry

- Locate the cursor in the editing line using the cursor key ⇧ .
- Press any unit key or the spinwheel.
  The data entry window is closed, the new entry is accepted by the instrument.

Aborting the entry

- Press the *ESC* key.
  The data entry window is closed, the previous entry is retained.

Version 2:



The entry area consists of two parts:

- the editing line
- the character selection field

The cursor keys ⇳ or ⇵ are used to toggle between entry in the editing line and the character selection field .

Entry of text

- Select parameter.
  The data entry is active automatically upon calling the data entry window. In tables, the help line editor is accessed by the cursor key ⇵ .
  In the editing line, the cursor is positioned at the beginning of the current entry.
- Position the cursor to the character selection field using the cursor key ⇵ .
  The cursor highlights the first letter of the editor.
- Position the cursor to the character to be entered in the editing line by means of the cursor keys ⇦ or ⇨ or the spinwheel.
- Press the *ENTER* key or the spinwheel.
  The character will be entered in the editing line.

Correcting the entry (Version 1)

- Move to the character << in the character selection field using the spinwheel.
- Position the cursor behind the character to be deleted by moving and pressing the spinwheel on << and >>.
- Move to the *BACK* field using the spinwheel and press the spinwheel.
  The entry to the left of the cursor in the editing line will be deleted.

Correcting the entry (Version 2)

- Position the cursor to the editing line by means of the cursor key .
- Position the cursor after the character to be deleted by means of the cursor keys and or with the spinwheel.
- Press the *BACK* key.
  The entry to the left of the cursor will be deleted.

Terminating the entry (Version 1)

- Select the EXIT field using the spinwheel and press the spinwheel.
  The data entry window will be closed; the new entry will be accepted by the instrument.

Terminating the entry (Version2)

- Move the cursor to the editing line using the cursor key .
- Press one of the unit keys or the spinwheel.
  The data entry window will be closed; the new entry will be accepted by the instrument.

Interrupting the entry

- Press the *ESC* key.
  The data entry window will be closed; the previous entry will be retained.

Selection and Setting of Parameters via Tables

The spectrum analyzer uses numerous tables for display and configuration of instrument parameters.

The tables differ considerably in the num ber of lines, columns and inscriptions. The basic steps of operation for the selection and setting of parameters are, however, the same for all tables. Shown below is the typical entry of parameters into a table.

Note:

Most of the tables are coupled to a softkey menu which provides further functions for editing table entries such as deletion of tables , copying of lines or columns, marking of table elements , restoring default states.

The definition of individual tables and the operation of particular editing functions can be looked up in the description of the corresponding softkey menu.

1. Activating the table

- If the menu has only one table, the latter is activated automatically subsequent to c alling this menu in most cases and the m arking cursor is positioned to the top field of the left column.
- If the m enu contains various tables, the table of interest must be selected using the s oftkey which is labeled w ith the title of the table.

2. Selection of the parameter

marking cursor

LIMIT LINES				
NAME	COMPATIBLE	LIMIT CHECK	TRACE	MARGIN
GSM22UP	√	off	1	0 dB
√ LP1GHz		on	2	0 dB
√ LP1GHz	√	off	1	0 dB
MIL461A		off	2	-10 dB

Selection of the par ameter (or the s etting) is made using the marking cursor.

- Press the cursor keys to move to the wanted field.

  or

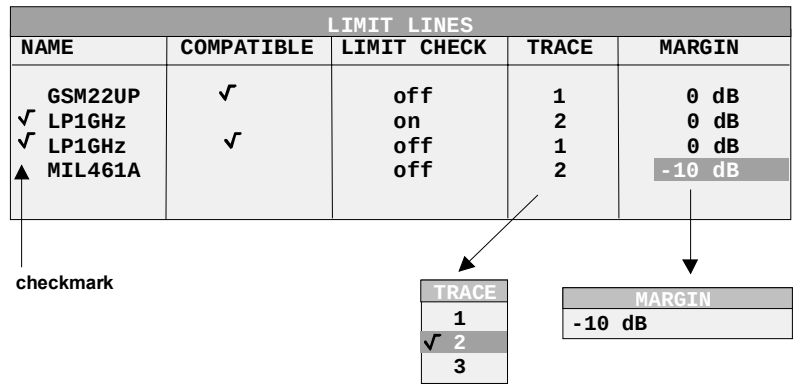
- Rotate the spinwheel until the wanted field is marked. The cursor keys are used to specify the direction of the spinwheel movement (horizontal or vertical)

  When shifting the cursor, elements may be s kipped which can not be edited. Table elements, which can not be s elected are indicated by a different color.

➢ Press the *ENTER* key or the spinwheel.
The parameter/the setting has been selected.

The selected parameter can be edited the way described below:

3. Editing the marked parameter



a) Toggling between two states

If an element of a table can be switched on and off only, the unit keys are used to toggle between these two states.

➢ Press one of the unit keys.
The table element is switched on and provided with a checkmark. (√).

➢ Press one of the unit keys once more.
The table element is switched off.

or

➢ Press one of the unit keys.
The table element is switched on, "on" is displayed.

➢ Press one of the unit keys once more.
The table element is switched off, "off" is displayed

b) Opening a data entry window

If a table entry consists of an (alpha-) numeric value, the corresponding entry window will be opened after selecting the numeric value by pressing the *ENTER* key or the spinwheel.

Note 1: *For numeric instrument parameters, the editing operation may be started by entering any number or letter on the front panel or on the external keyboard. In this case, the data entry window is opened automatically.*

Note 2: *For alphanumeric table fields for which the help line editor version 2 is required, the help line editor will be opened by pressing the CURSOR DOWN key after ENTER.*

c) Opening a selection table

If a table entry may have various states (e.g., colors from a color pallet, fixed filter bandwidths, etc.), a table indicating all possible states is displayed with selection. The current state is and marked by a checkmark and by the cursor.

- Set the cursor to the desired setting.
- Press one of the unit keys.
  The setting is switched on and marked (√). The selection table closes and the value is transferred to the original table. The cursor is positioned automatically on the next table element.

Abortion of entry

- Press the *ESC* key.

  The current entry/selection is aborted and the original setting is restored.

Scrolling

Some tables contain more entries than can be displayed on one screen page. In this case, a **scrollbar** is displayed at the right margin of the table, whose slider shows the current position in the text.

- Actuate the *PAGE UP* or *PAGE DOWN* softkeys.

  The table is paged forward or back by one page.

- Press cursor key ⇧ or ⇩.

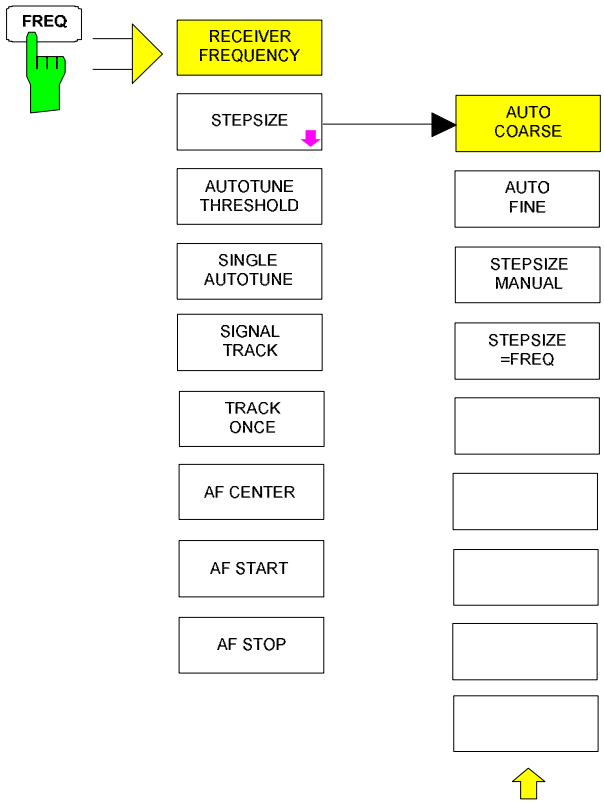
  The table is scrolled up or down by one line.

Menu Overview Receiver Mode

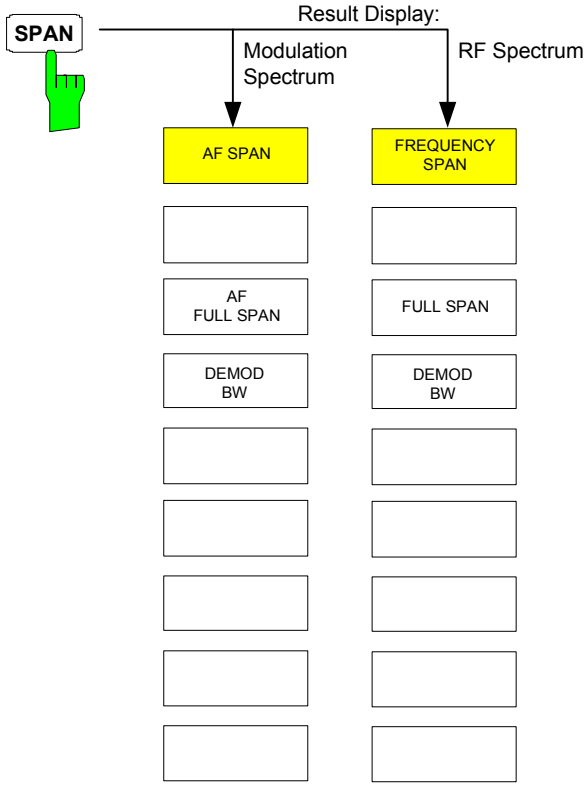
The following sections gives a graphical overview of the R&S FSMR menus. Side menus are marked by an arrow directed to the left/right, submenus by an arrow showing upwards.
The menus appear in the order corresponding to the arrangement of keys on the front panel. The available hotkeys and the LOCAL menu appearing during the remote control of the instrument are also displayed.

The functions of menus are described in detail in Chapter 4. The IEC/IEEE-bus command associated with each softkey is indicated. In addition, the softkey list at the of Chapter 6 gives the assignment of IEC/IEEE-bus commands to softkeys.

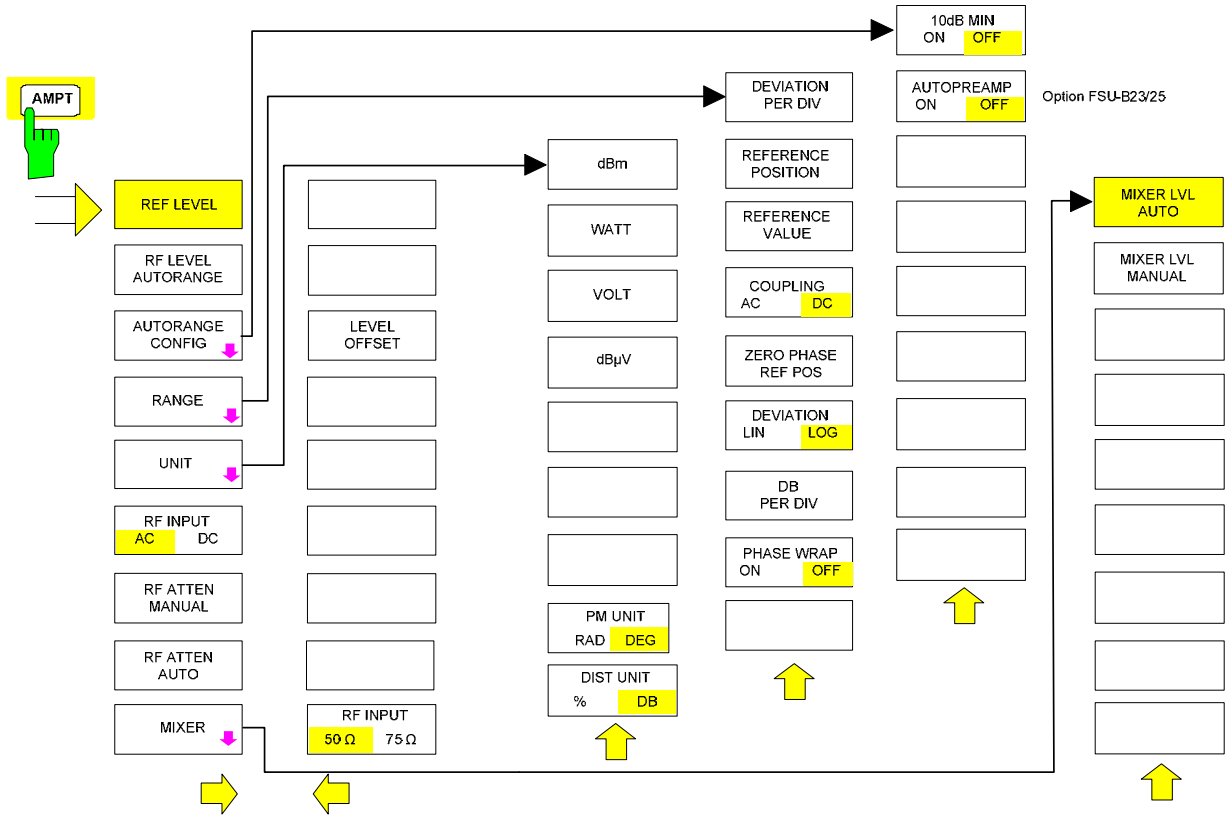
FREQ Key



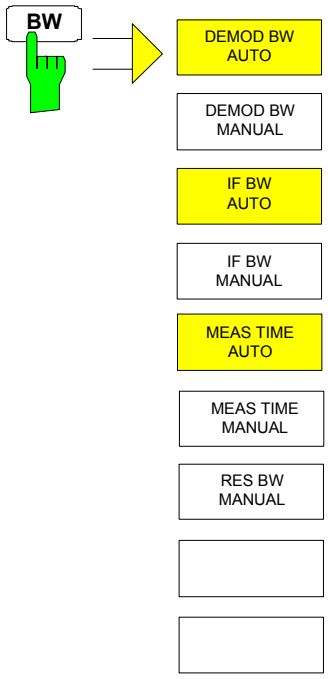
SPAN Key


SPAN
Result Display:
Modulation Spectrum
RF Spectrum
AF SPAN
FREQUENCY SPAN
AF FULL SPAN
FULL SPAN
DEMOD BW
DEMOD BW

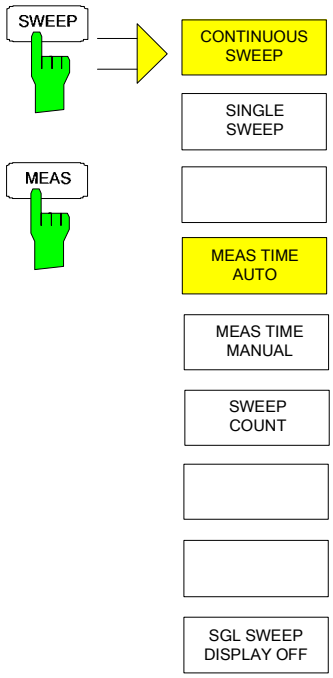
AMPT Key


AMPT
REF LEVEL
RF LEVEL AUTORANGE
AUTORANGE CONFIG
RANGE
UNIT
RF INPUT AC DC
RF ATTEN MANUAL
RF ATTEN AUTO
MIXER
LEVEL OFFSET
RF INPUT 50 Ω 75 Ω
dBm
WATT
VOLT
dBµV
PM UNIT RAD DEG
DIST UNIT % DB
DEVIATION PER DIV
REFERENCE POSITION
REFERENCE VALUE
COUPLING AC DC
ZERO PHASE REF POS
DEVIATION LIN LOG
DB PER DIV
PHASE WRAP ON OFF
10dB MIN ON OFF
AUTOPREAMP ON OFF
Option FSU-B23/25
MIXER LVL AUTO
MIXER LVL MANUAL

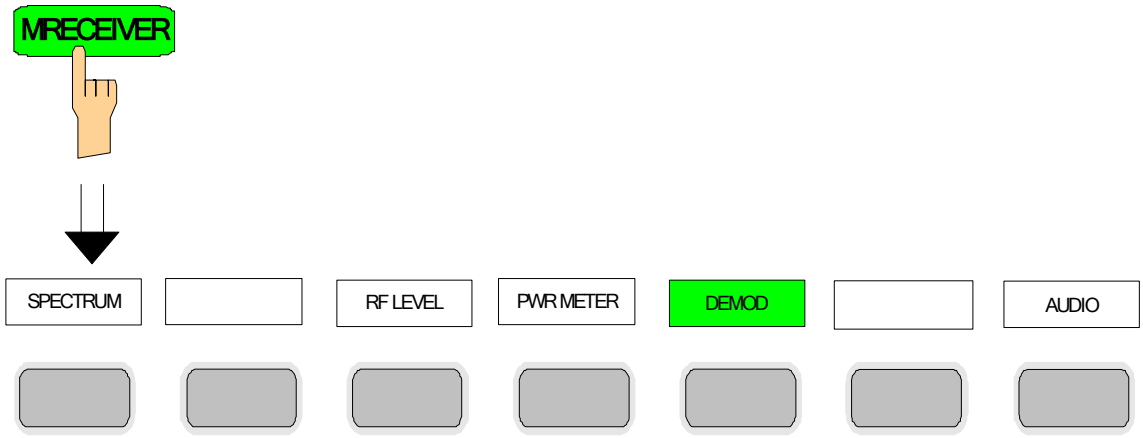
BW Key


BW
DEMOD BW AUTO
DEMOD BW MANUAL
IF BW AUTO
IF BW MANUAL
MEAS TIME AUTO
MEAS TIME MANUAL
RES BW MANUAL

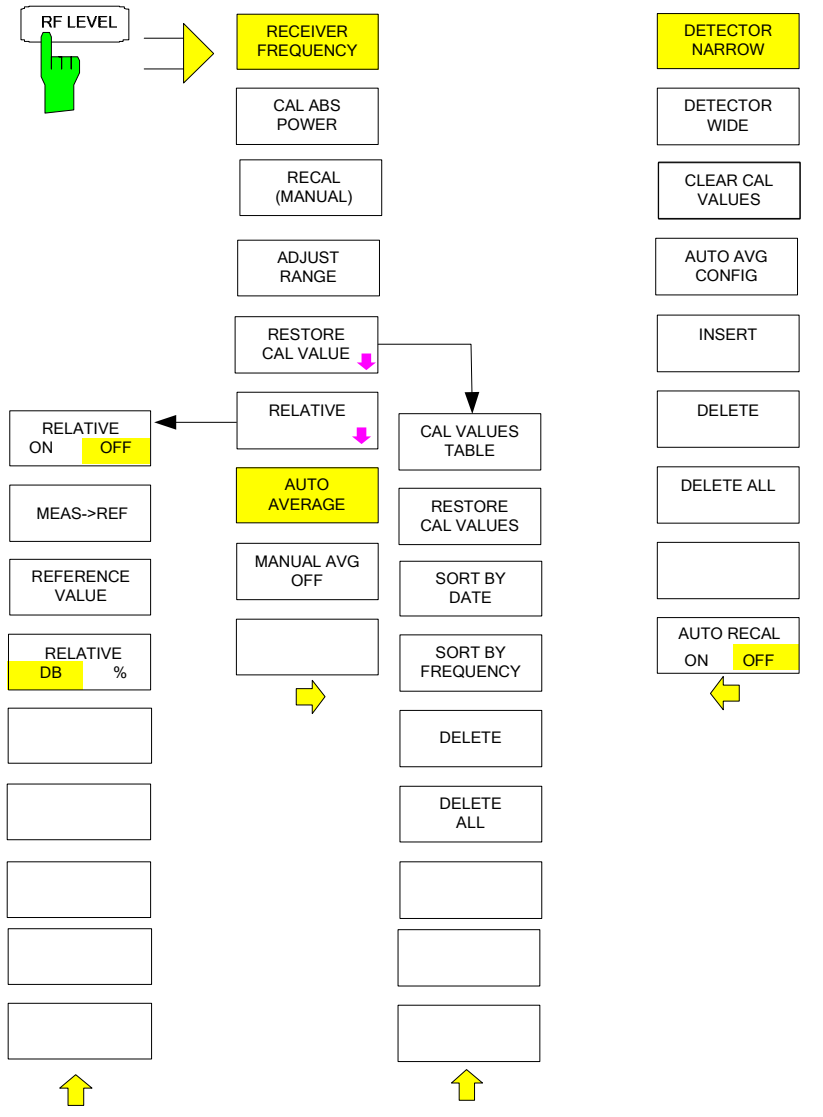
SWEEP/MEAS Keys



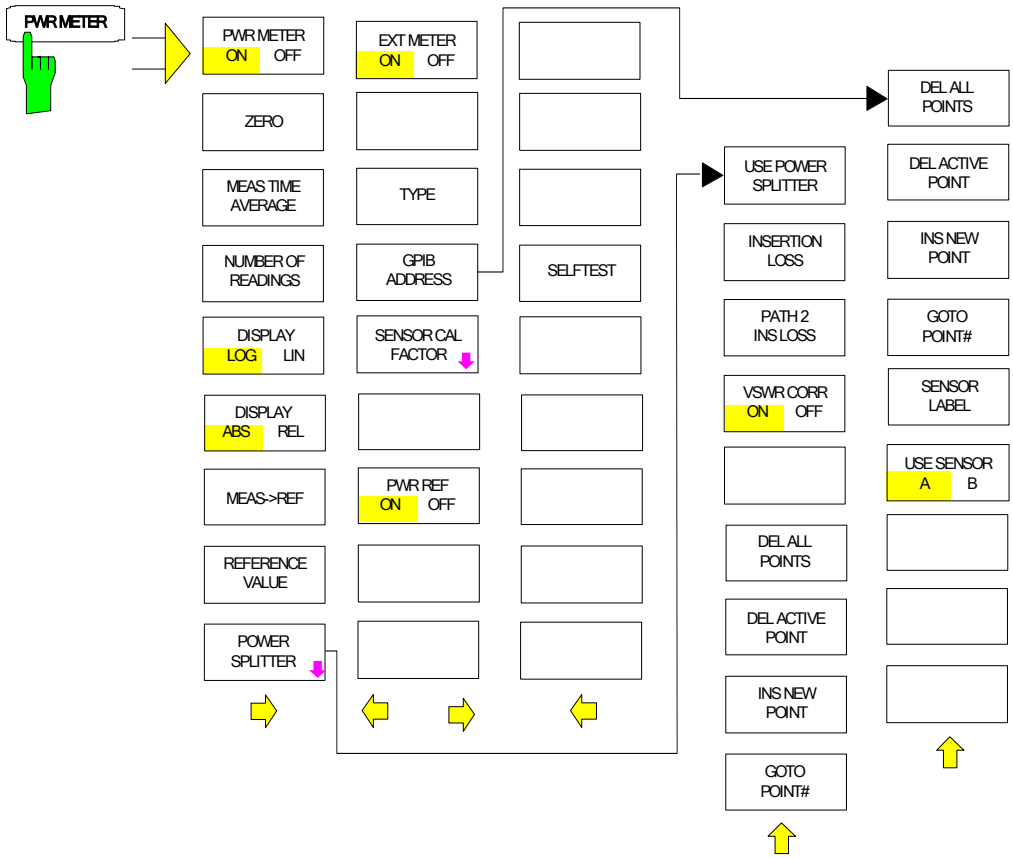
Hotkey Menus



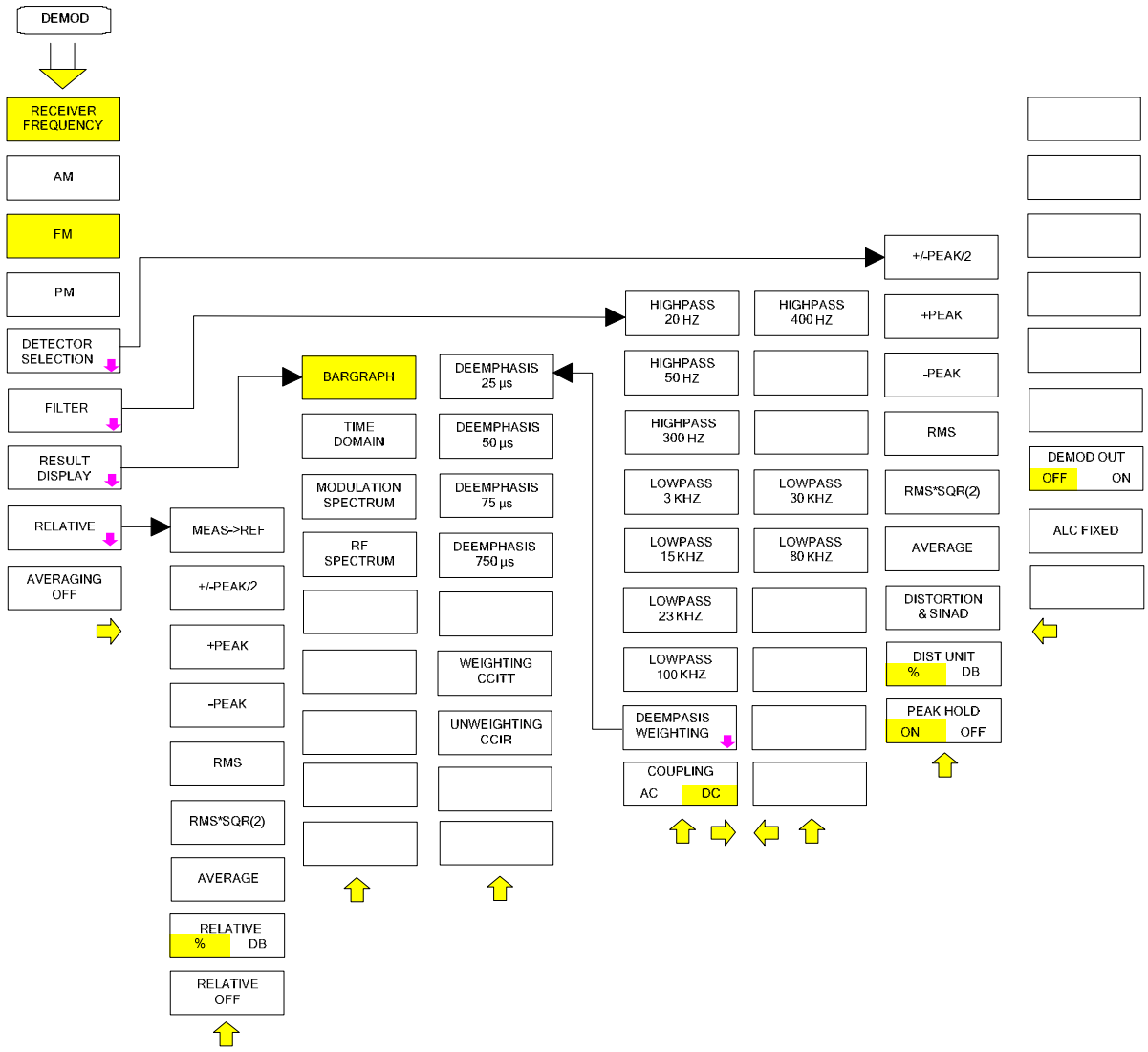
RF LEVEL Key



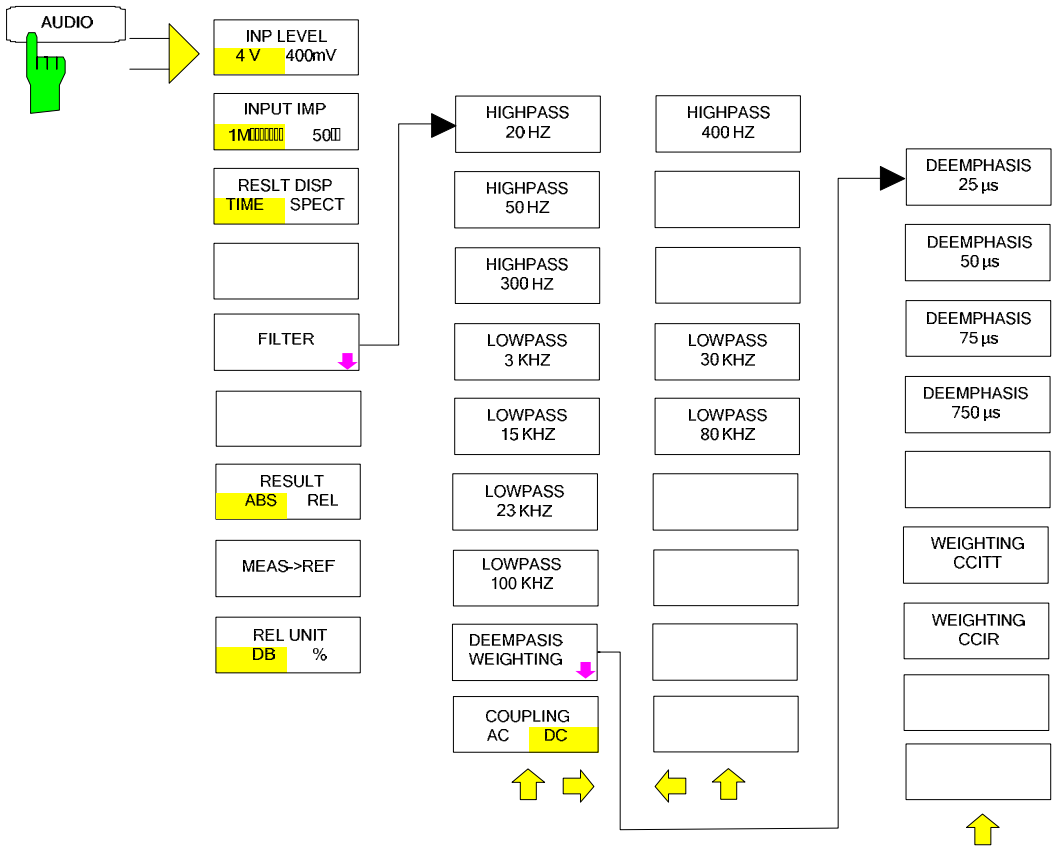
PWR METER Key



DEMOD Key

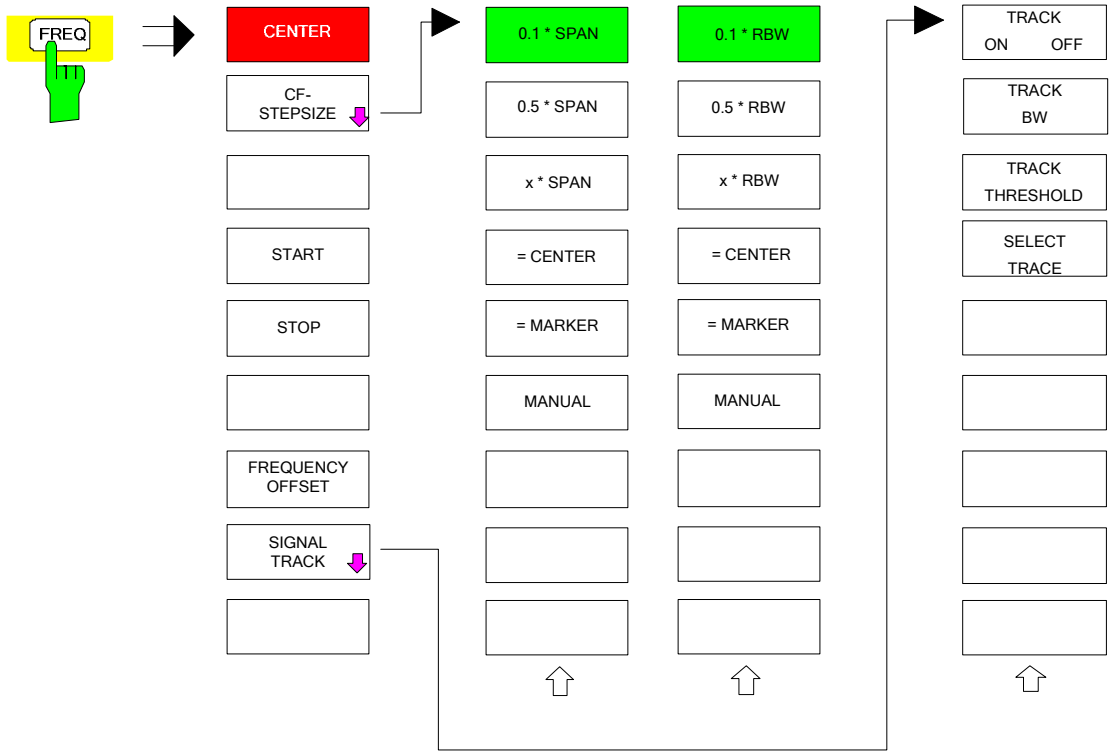

DEMOD
RECEIVER FREQUENCY
AM
FM
PM
DETECTOR SELECTION
FILTER
RESULT DISPLAY
RELATIVE
AVERAGING OFF
MEAS->REF
+/-PEAK/2
+PEAK
-PEAK
RMS
RMS*SQR(2)
AVERAGE
RELATIVE % DB
RELATIVE OFF
BARGRAPH
TIME DOMAIN
MODULATION SPECTRUM
RF SPECTRUM
DEEMPHASIS 25 µs
DEEMPHASIS 50 µs
DEEMPHASIS 75 µs
DEEMPHASIS 750 µs
WEIGHTING CCITT
UNWEIGHTING CCIR
HIGHPASS 20 HZ
HIGHPASS 50 HZ
HIGHPASS 300 HZ
LOWPASS 3 KHZ
LOWPASS 15 KHZ
LOWPASS 23 KHZ
LOWPASS 100 KHZ
DEEMPASIS WEIGHTING
COUPLING AC DC
HIGHPASS 400 HZ
LOWPASS 30 KHZ
LOWPASS 80 KHZ
+/-PEAK/2
+PEAK
-PEAK
RMS
RMS*SQR(2)
AVERAGE
DISTORTION & SINAD
DIST UNIT % DB
PEAK HOLD ON OFF
DEMOD OUT OFF ON
ALC FIXED

AUDIO Key

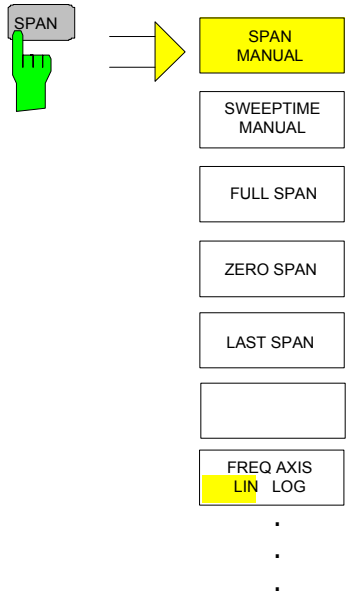

AUDIO
INP LEVEL
4 V 400mV
INPUT IMP
1M 50
RESLT DISP
TIME SPECT
FILTER
RESULT
ABS REL
MEAS->REF
REL UNIT
DB %
HIGHPASS
20 HZ
HIGHPASS
50 HZ
HIGHPASS
300 HZ
LOWPASS
3 KHZ
LOWPASS
15 KHZ
LOWPASS
23 KHZ
LOWPASS
100 KHZ
DEEMPASIS
WEIGHTING
COUPLING
AC DC
HIGHPASS
400 HZ
LOWPASS
30 KHZ
LOWPASS
80 KHZ
DEEMPHASIS
25 µs
DEEMPHASIS
50 µs
DEEMPHASIS
75 µs
DEEMPHASIS
750 µs
WEIGHTING
CCITT
WEIGHTING
CCIR

Menu Overview Spectrum Analysis Mode

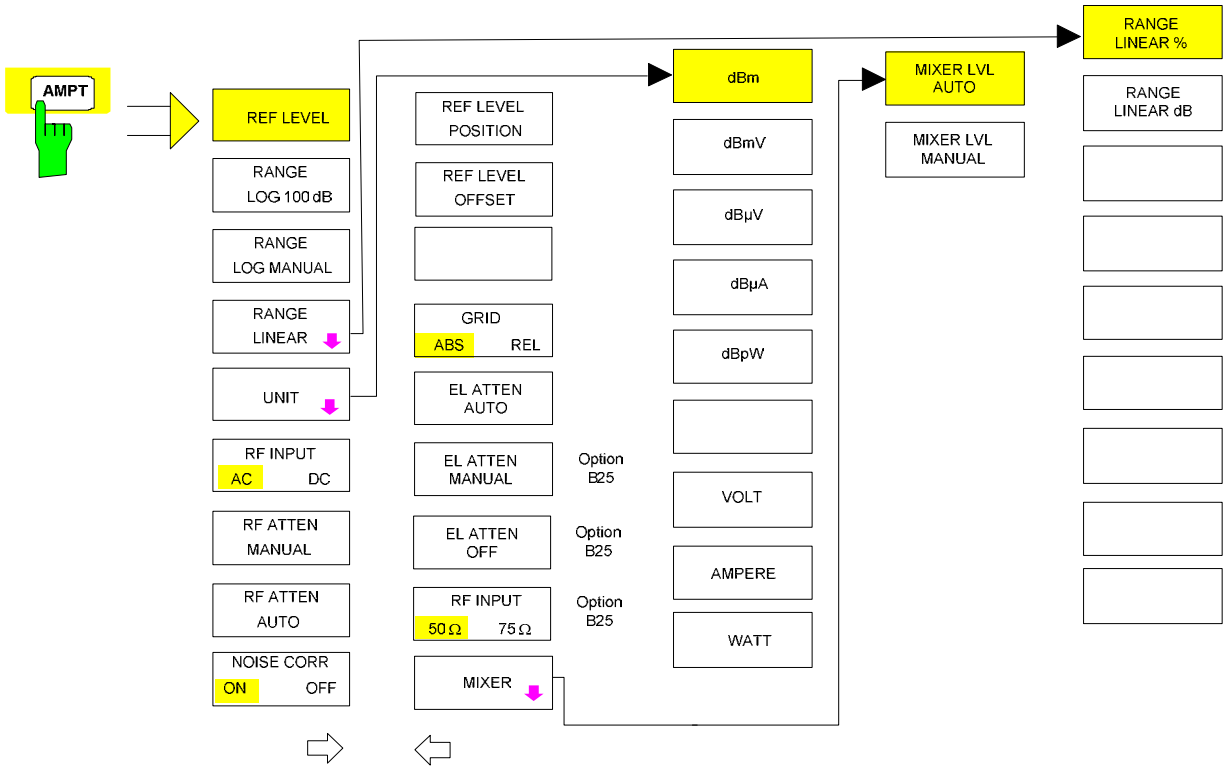
FREQUENCY Key



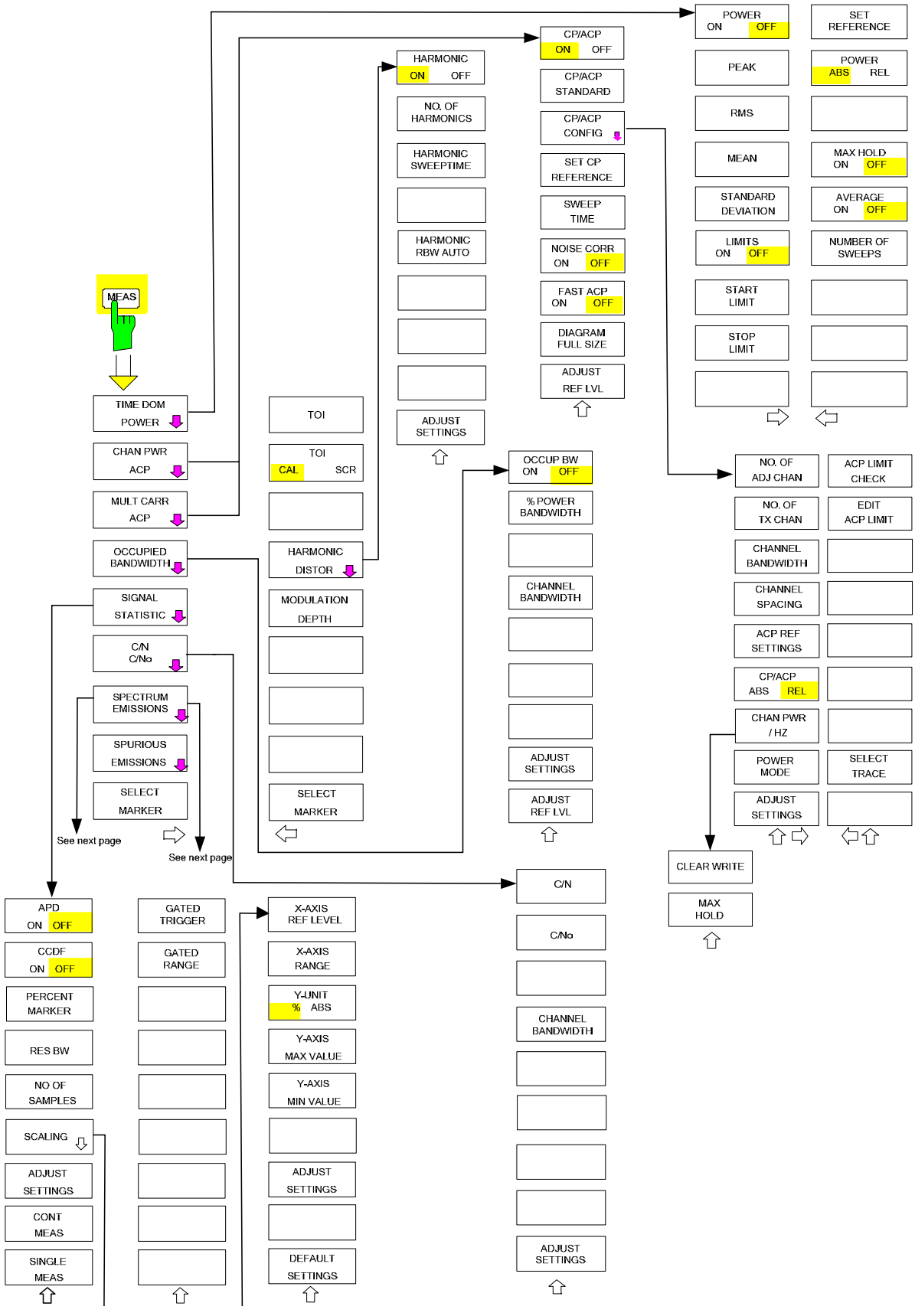
SPAN Key

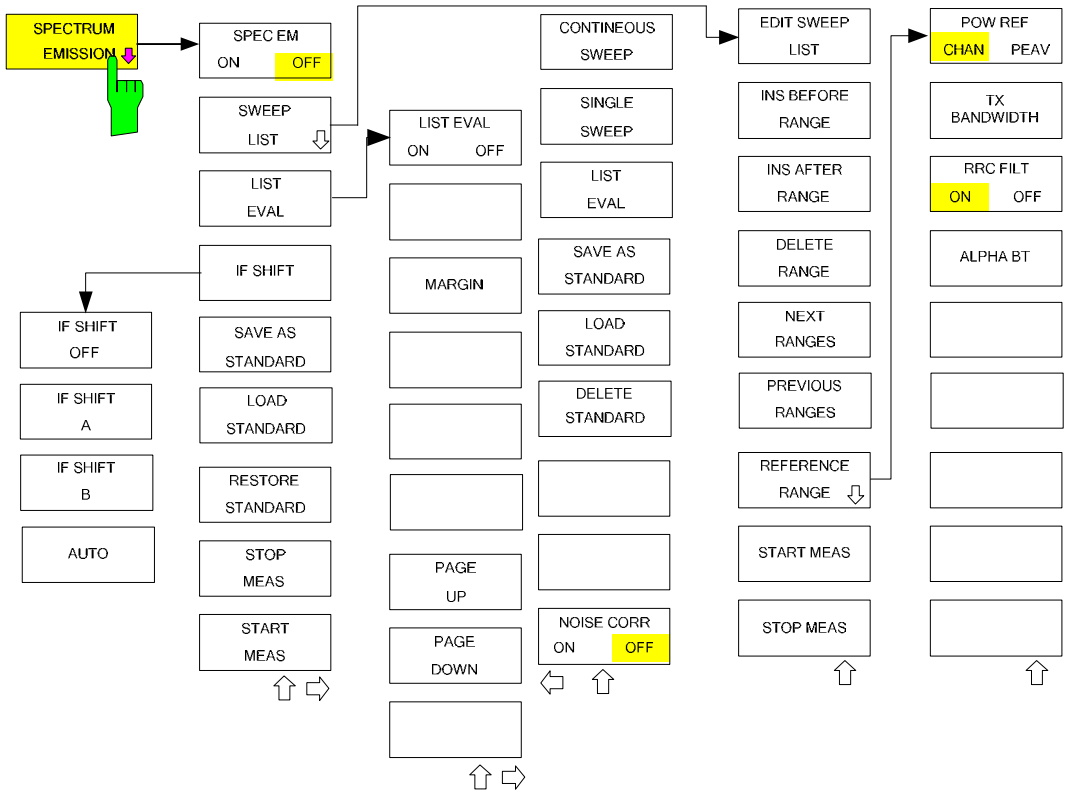

SPAN
SPAN MANUAL
SWEEPTIME MANUAL
FULL SPAN
ZERO SPAN
LAST SPAN
FREQ AXIS
LIN LOG

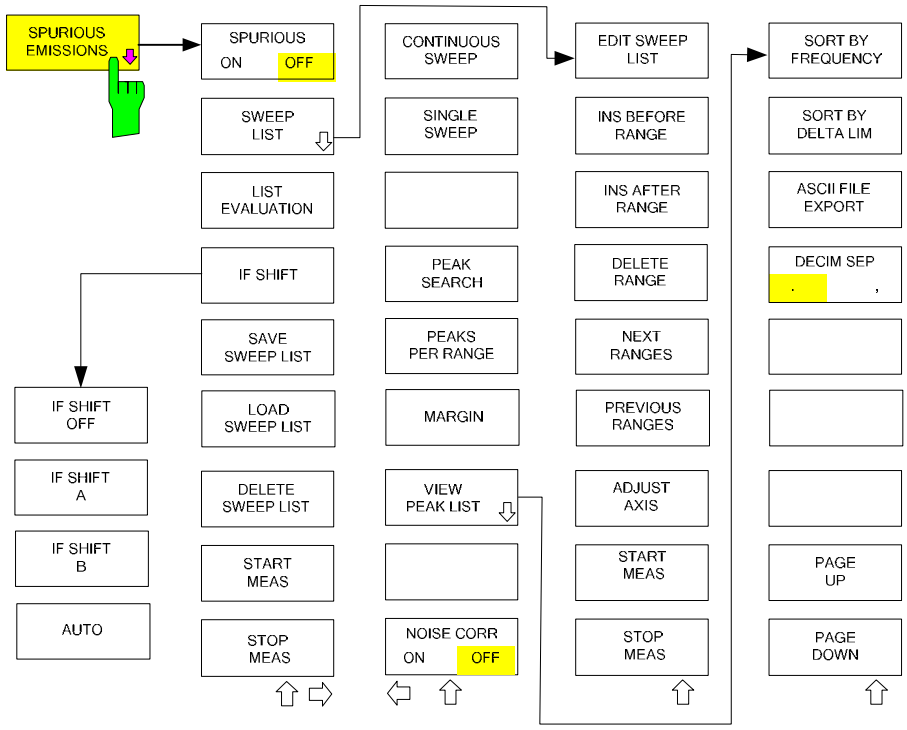
AMPT Key


AMPT
REF LEVEL
RANGE
LOG 100 dB
RANGE
LOG MANUAL
RANGE
LINEAR
UNIT
RF INPUT
AC DC
RF ATTEN
MANUAL
RF ATTEN
AUTO
NOISE CORR
ON OFF
REF LEVEL
POSITION
REF LEVEL
OFFSET
GRID
ABS REL
EL ATTEN
AUTO
EL ATTEN
MANUAL
Option
B25
EL ATTEN
OFF
Option
B25
RF INPUT
50 Ω 75 Ω
Option
B25
MIXER
dBm
dBmV
dBµV
dBµA
dBpW
VOLT
AMPERE
WATT
MIXER LVL
AUTO
MIXER LVL
MANUAL
RANGE
LINEAR %
RANGE
LINEAR dB

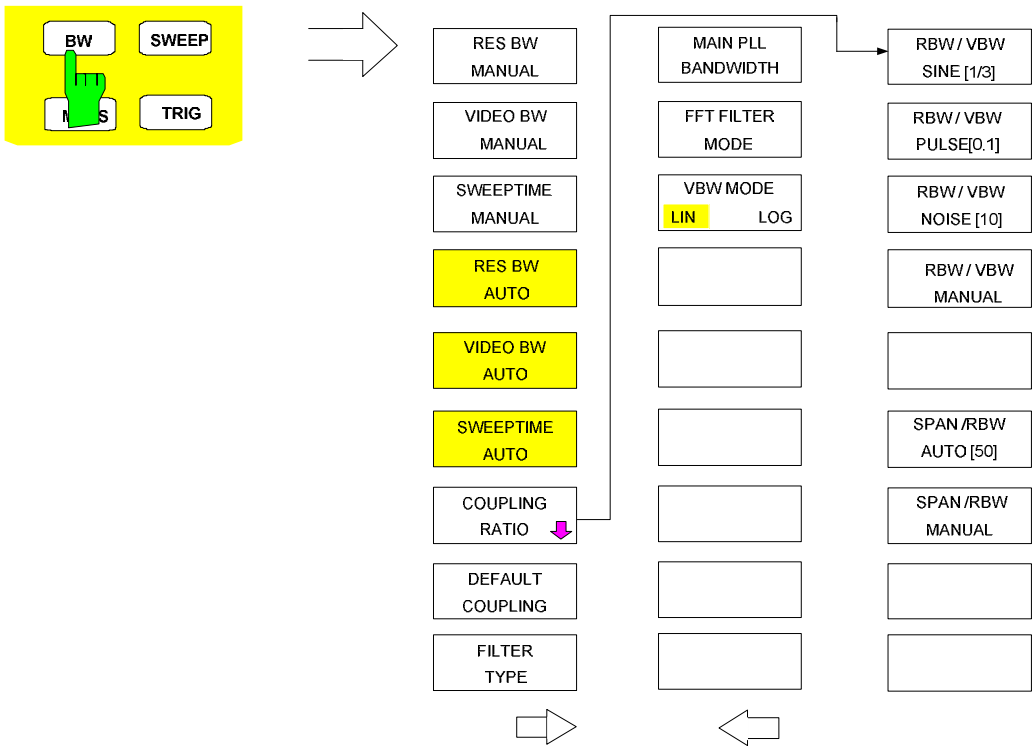
MEAS Key


MEAS
TIME DOM POWER
CHAN PWR ACP
MULT CARR ACP
OCCUPIED BANDWIDTH
SIGNAL STATISTIC
C/N C/No
SPECTRUM EMISSIONS
SPURIOUS EMISSIONS
SELECT MARKER
See next page
See next page
TOI
TOI CAL SCR
HARMONIC DISTOR
MODULATION DEPTH
SELECT MARKER
HARMONIC ON OFF
NO. OF HARMONICS
HARMONIC SWEEPTIME
HARMONIC RBW AUTO
ADJUST SETTINGS
CP/ACP ON OFF
CP/ACP STANDARD
CP/ACP CONFIG
SET CP REFERENCE
SWEEP TIME
NOISE CORR ON OFF
FAST ACP ON OFF
DIAGRAM FULL SIZE
ADJUST REF LVL
OCCUP BW ON OFF
% POWER BANDWIDTH
CHANNEL BANDWIDTH
ADJUST SETTINGS
ADJUST REF LVL
POWER ON OFF
PEAK
RMS
MEAN
STANDARD DEVIATION
LIMITS ON OFF
START LIMIT
STOP LIMIT
SET REFERENCE
POWER ABS REL
MAX HOLD ON OFF
AVERAGE ON OFF
NUMBER OF SWEEPS
NO. OF ADJ CHAN
NO. OF TX CHAN
CHANNEL BANDWIDTH
CHANNEL SPACING
ACP REF SETTINGS
CP/ACP ABS REL
CHAN PWR / HZ
POWER MODE
ADJUST SETTINGS
ACP LIMIT CHECK
EDIT ACP LIMIT
SELECT TRACE
CLEAR WRITE
MAX HOLD
APD ON OFF
CCDF ON OFF
PERCENT MARKER
RES BW
NO OF SAMPLES
SCALING
ADJUST SETTINGS
CONT MEAS
SINGLE MEAS
GATED TRIGGER
GATED RANGE
X-AXIS REF LEVEL
X-AXIS RANGE
Y-UNIT % ABS
Y-AXIS MAX VALUE
Y-AXIS MIN VALUE
ADJUST SETTINGS
DEFAULT SETTINGS
C/N
C/No
CHANNEL BANDWIDTH
ADJUST SETTINGS

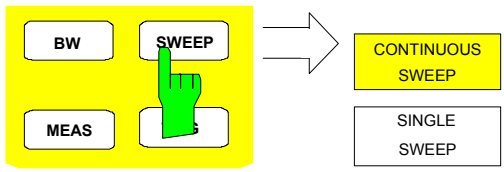

SPECTRUM EMISSION
SPEC EM ON OFF
SWEEP LIST
LIST EVAL
IF SHIFT
IF SHIFT OFF
IF SHIFT A
IF SHIFT B
AUTO
SAVE AS STANDARD
LOAD STANDARD
RESTORE STANDARD
STOP MEAS
START MEAS
LIST EVAL ON OFF
MARGIN
PAGE UP
PAGE DOWN
CONTINEOUS SWEEP
SINGLE SWEEP
LIST EVAL
SAVE AS STANDARD
LOAD STANDARD
DELETE STANDARD
NOISE CORR ON OFF
EDIT SWEEP LIST
INS BEFORE RANGE
INS AFTER RANGE
DELETE RANGE
NEXT RANGES
PREVIOUS RANGES
REFERENCE RANGE
START MEAS
STOP MEAS
POW REF CHAN PEAV
TX BANDWIDTH
RRC FILT ON OFF
ALPHA BT


SPURIOUS EMISSIONS
SPURIOUS ON OFF
SWEEP LIST
LIST EVALUATION
IF SHIFT
SAVE SWEEP LIST
LOAD SWEEP LIST
DELETE SWEEP LIST
START MEAS
STOP MEAS
IF SHIFT OFF
IF SHIFT A
IF SHIFT B
AUTO
CONTINUOUS SWEEP
SINGLE SWEEP
PEAK SEARCH
PEAKS PER RANGE
MARGIN
VIEW PEAK LIST
NOISE CORR ON OFF
EDIT SWEEP LIST
INS BEFORE RANGE
INS AFTER RANGE
DELETE RANGE
NEXT RANGES
PREVIOUS RANGES
ADJUST AXIS
START MEAS
STOP MEAS
SORT BY FREQUENCY
SORT BY DELTA LIM
ASCII FILE EXPORT
DECIM SEP . ,
PAGE UP
PAGE DOWN

BW Key


BW
SWEEP
TRIG
RES BW MANUAL
VIDEO BW MANUAL
SWEEPTIME MANUAL
RES BW AUTO
VIDEO BW AUTO
SWEEPTIME AUTO
COUPLING RATIO
DEFAULT COUPLING
FILTER TYPE
MAIN PLL BANDWIDTH
FFT FILTER MODE
VBW MODE
LIN
LOG
RBW / VBW SINE [1/3]
RBW / VBW PULSE[0.1]
RBW / VBW NOISE [10]
RBW / VBW MANUAL
SPAN /RBW AUTO [50]
SPAN /RBW MANUAL

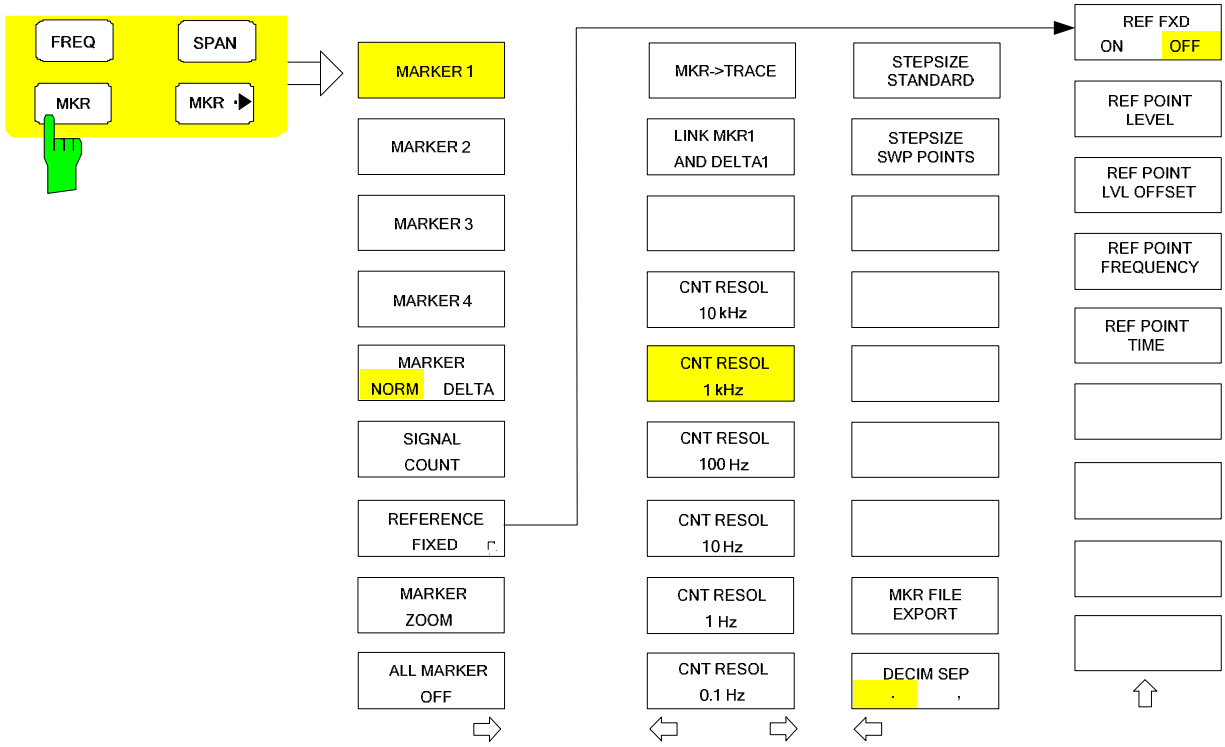
SWEEP Key



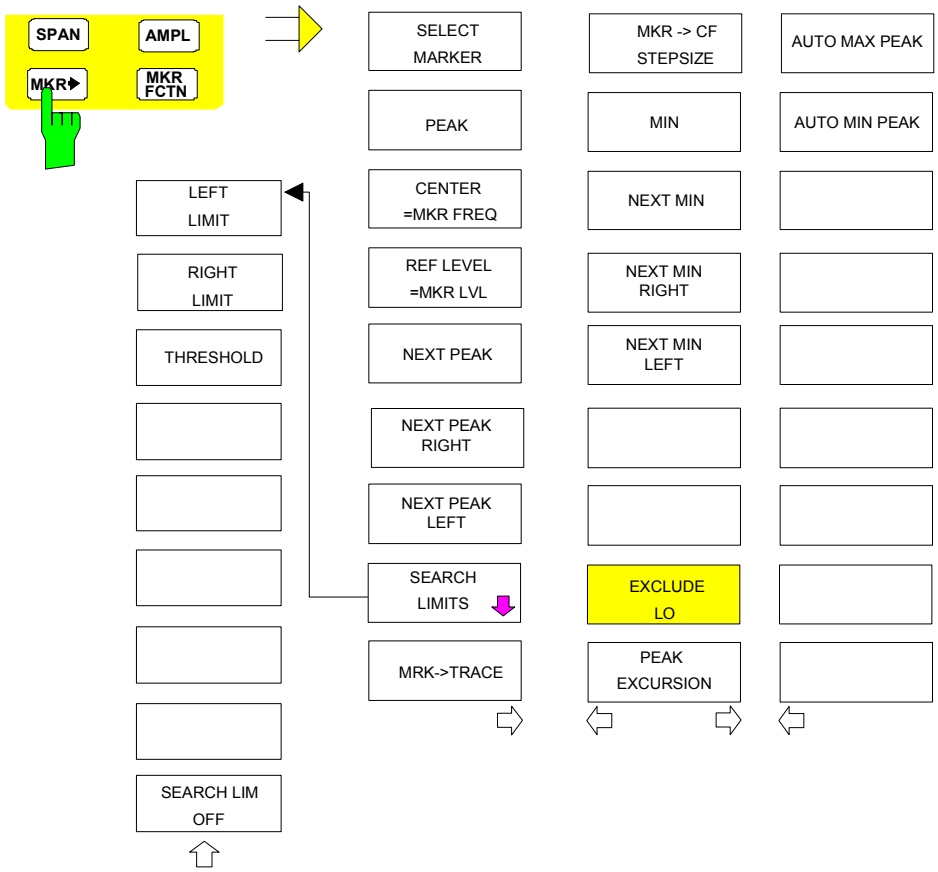
- CONTINUOUS SWEEP
- SINGLE SWEEP
- CONTINUE SGL SWEEP
- SWEEPTIME MANUAL
- SWEEPTIME AUTO
- SWEEP COUNT
- SWEEP POINTS
-
- SGL SWEEP DISP OFF

Menu Overview another Keys

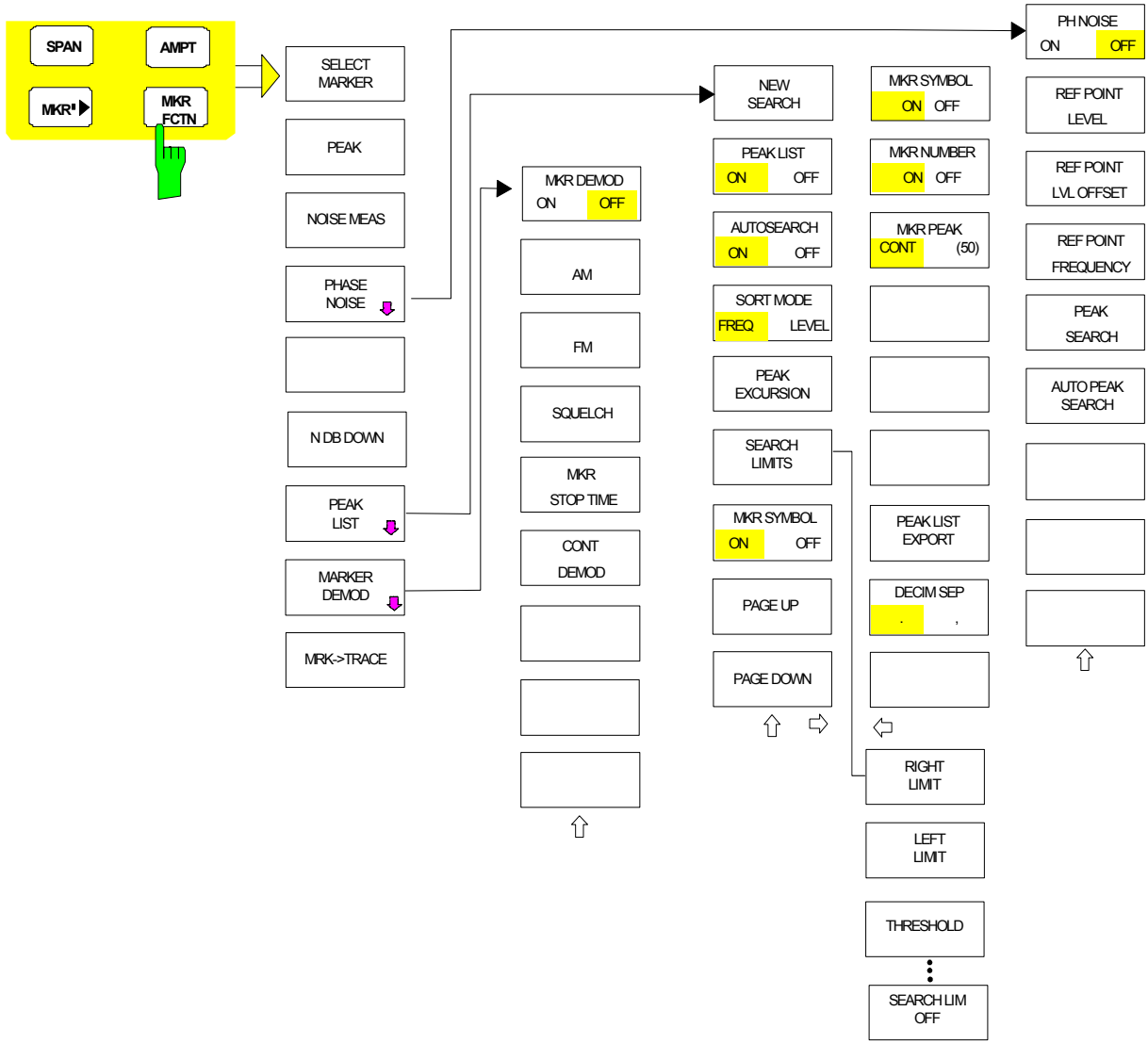
MKR Key



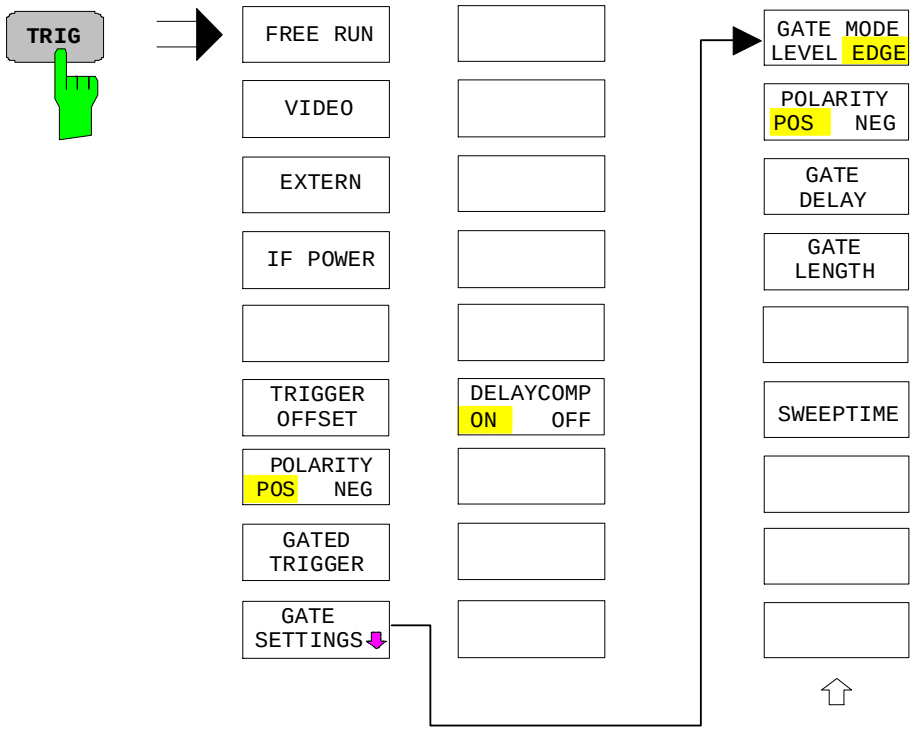
MKR-> Key


SPAN
AMPL
MKR
MKR FCTN
SELECT MARKER
PEAK
CENTER =MKR FREQ
REF LEVEL =MKR LVL
NEXT PEAK
NEXT PEAK RIGHT
NEXT PEAK LEFT
SEARCH LIMITS
MRK->TRACE
MKR -> CF STEPSIZE
MIN
NEXT MIN
NEXT MIN RIGHT
NEXT MIN LEFT
EXCLUDE LO
PEAK EXCURSION
AUTO MAX PEAK
AUTO MIN PEAK
LEFT LIMIT
RIGHT LIMIT
THRESHOLD
SEARCH LIM OFF

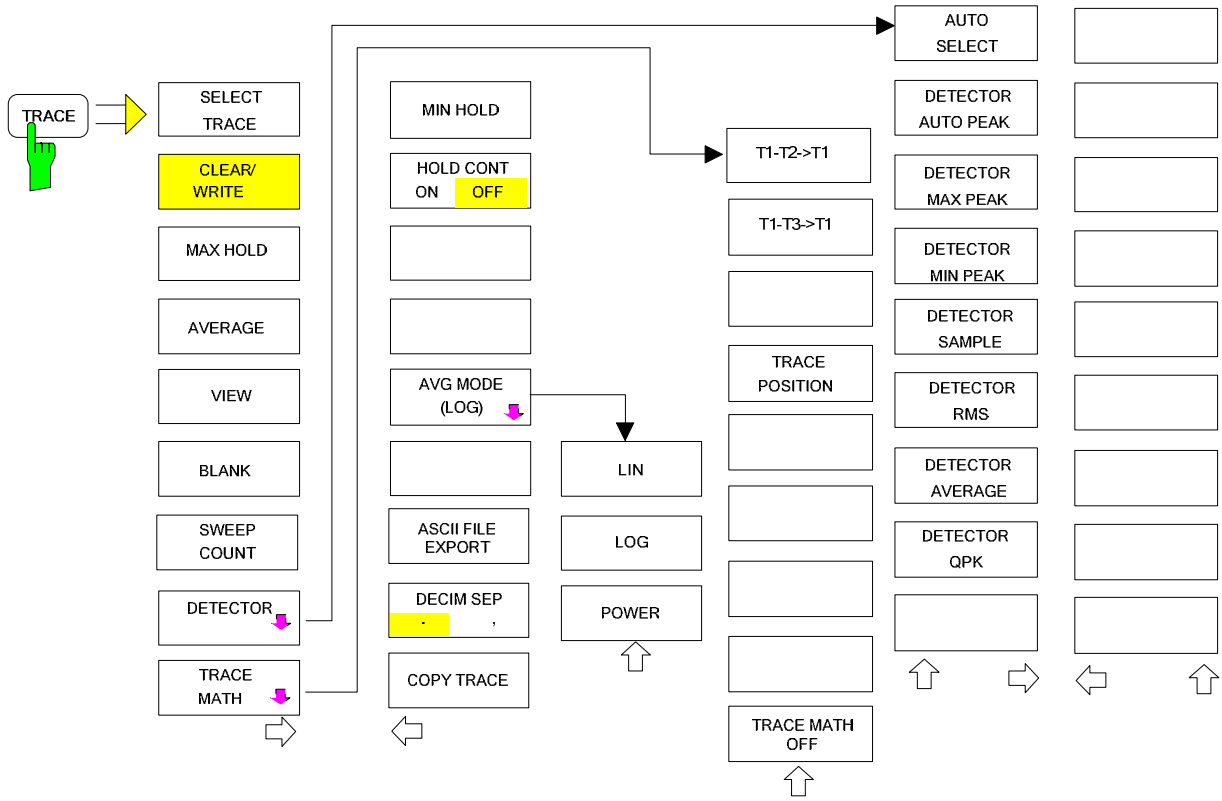
MKR FCTN Key


SPAN
AMPT
MKR
MKR FCTN
SELECT MARKER
PEAK
NOISE MEAS
PHASE NOISE
N DB DOWN
PEAK LIST
MARKER DEMOD
MRK->TRACE
MKR DEMOD ON OFF
AM
FM
SQUELCH
MKR STOP TIME
CONT DEMOD
NEW SEARCH
PEAK LIST ON OFF
AUTOSEARCH ON OFF
SORT MODE FREQ LEVEL
PEAK EXCURSION
SEARCH LIMITS
MKR SYMBOL ON OFF
PAGE UP
PAGE DOWN
MKR SYMBOL ON OFF
MKR NUMBER ON OFF
MKR PEAK CONT (50)
PEAK LIST EXPORT
DECIM SEP . ,
RIGHT LIMIT
LEFT LIMIT
THRESHOLD
SEARCH LIM OFF
PH NOISE ON OFF
REF POINT LEVEL
REF POINT LVL OFFSET
REF POINT FREQUENCY
PEAK SEARCH
AUTO PEAK SEARCH

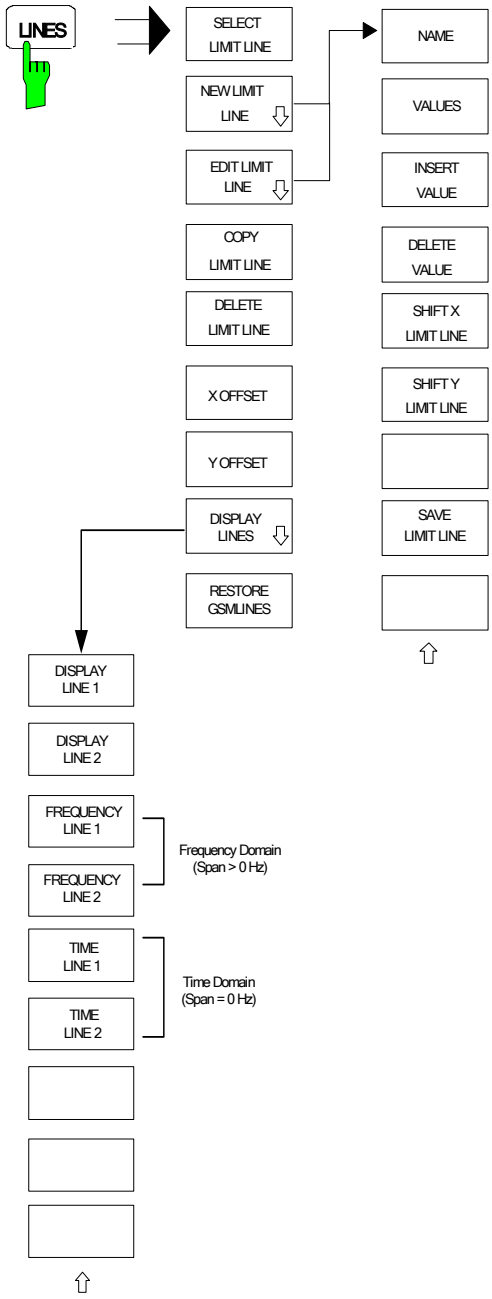
TRIG Key


TRIG
FREE RUN
VIDEO
EXTERN
IF POWER
TRIGGER OFFSET
POLARITY POS NEG
GATED TRIGGER
GATE SETTINGS
DELAYCOMP ON OFF
GATE MODE LEVEL EDGE
POLARITY POS NEG
GATE DELAY
GATE LENGTH
SWEEPTIME

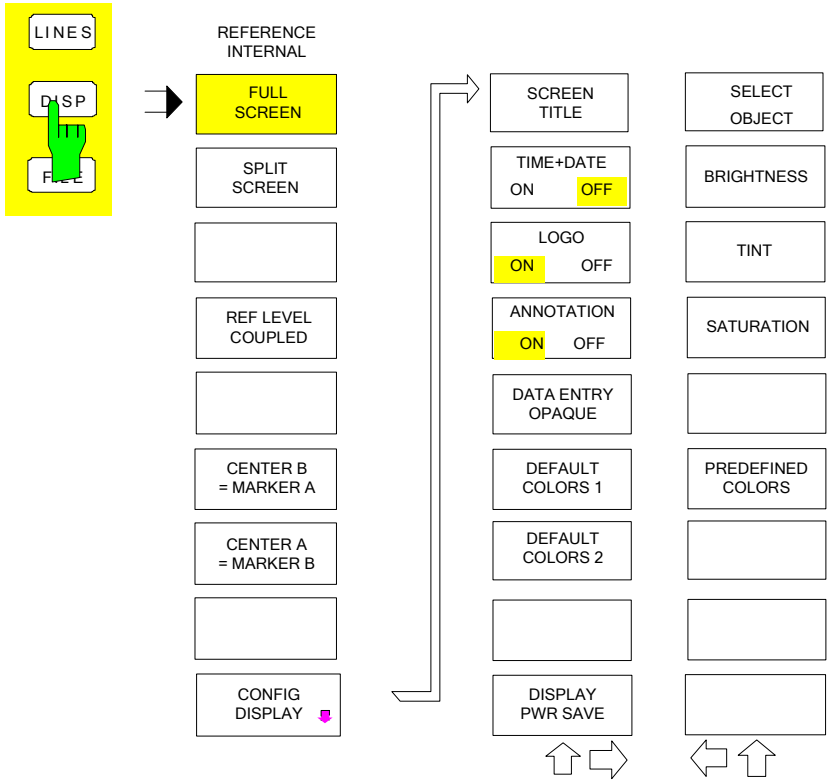
TRACE Key


TRACE
SELECT TRACE
CLEAR/ WRITE
MAX HOLD
AVERAGE
VIEW
BLANK
SWEEP COUNT
DETECTOR
TRACE MATH
MIN HOLD
HOLD CONT ON OFF
AVG MODE (LOG)
ASCII FILE EXPORT
DECIM SEP . ,
COPY TRACE
LIN
LOG
POWER
T1-T2->T1
T1-T3->T1
TRACE POSITION
TRACE MATH OFF
AUTO SELECT
DETECTOR AUTO PEAK
DETECTOR MAX PEAK
DETECTOR MIN PEAK
DETECTOR SAMPLE
DETECTOR RMS
DETECTOR AVERAGE
DETECTOR QPK

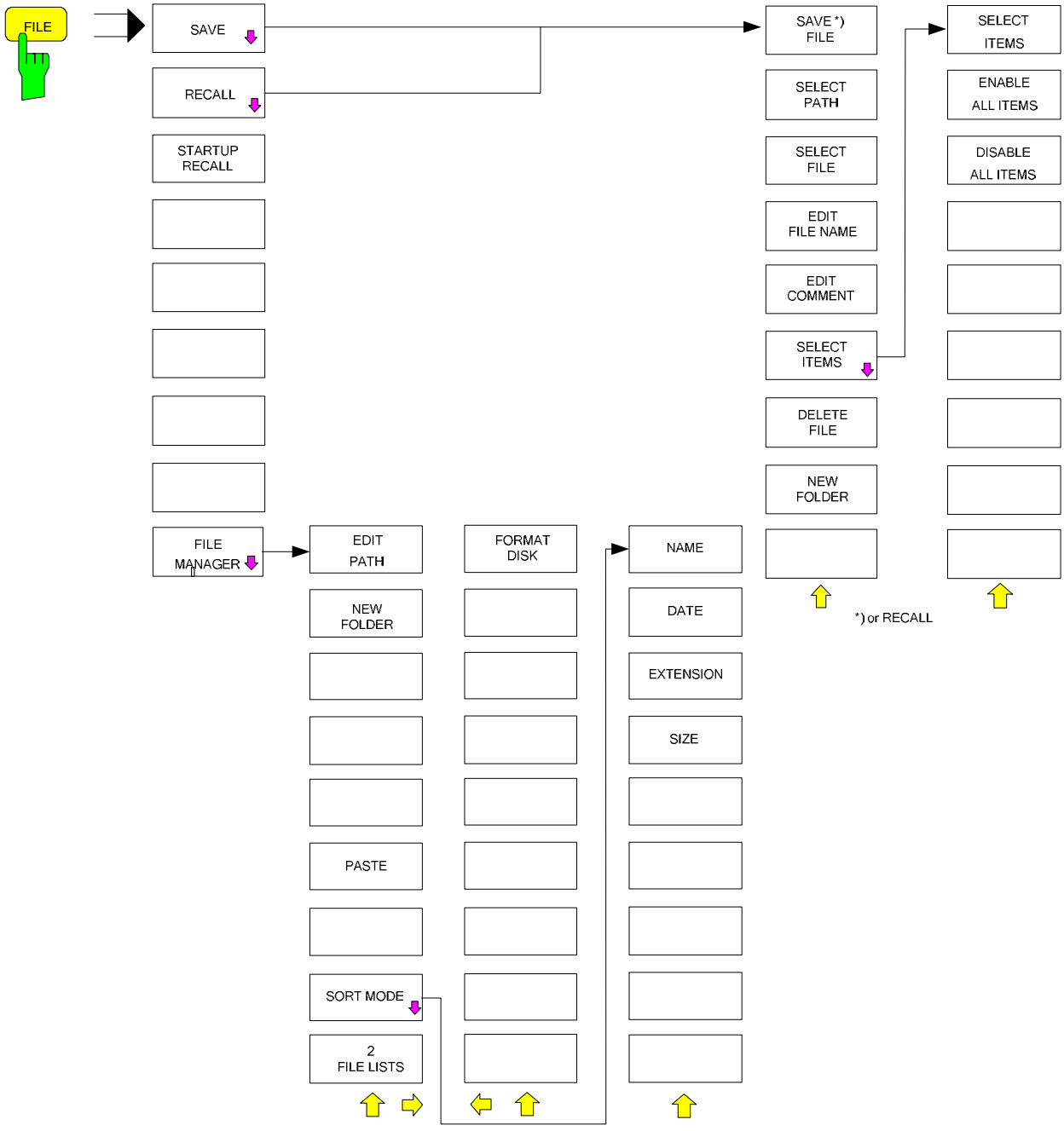
LINES Key


LINES
SELECT LIMIT LINE
NEW LIMIT LINE
EDIT LIMIT LINE
COPY LIMIT LINE
DELETE LIMIT LINE
X OFFSET
Y OFFSET
DISPLAY LINES
RESTORE GSMLINES
NAME
VALUES
INSERT VALUE
DELETE VALUE
SHIFT X LIMIT LINE
SHIFT Y LIMIT LINE
SAVE LIMIT LINE
DISPLAY LINE 1
DISPLAY LINE 2
FREQUENCY LINE 1
FREQUENCY LINE 2
Frequency Domain (Span > 0 Hz)
TIME LINE 1
TIME LINE 2
Time Domain (Span = 0 Hz)

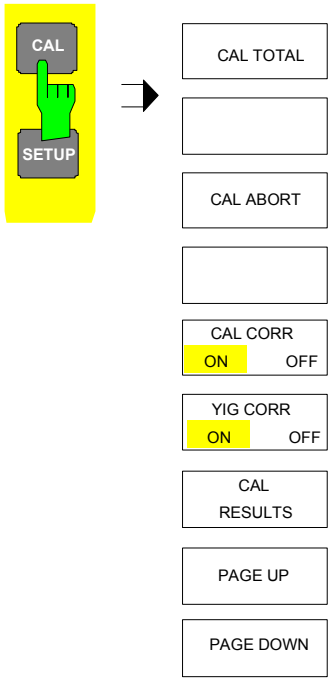
DISP Key


LINES
DISP
REFERENCE
INTERNAL
FULL
SCREEN
SPLIT
SCREEN
REF LEVEL
COUPLED
CENTER B
= MARKER A
CENTER A
= MARKER B
CONFIG
DISPLAY
SCREEN
TITLE
TIME+DATE
ON OFF
LOGO
ON OFF
ANNOTATION
ON OFF
DATA ENTRY
OPAQUE
DEFAULT
COLORS 1
DEFAULT
COLORS 2
DISPLAY
PWR SAVE
SELECT
OBJECT
BRIGHTNESS
TINT
SATURATION
PREDEFINED
COLORS

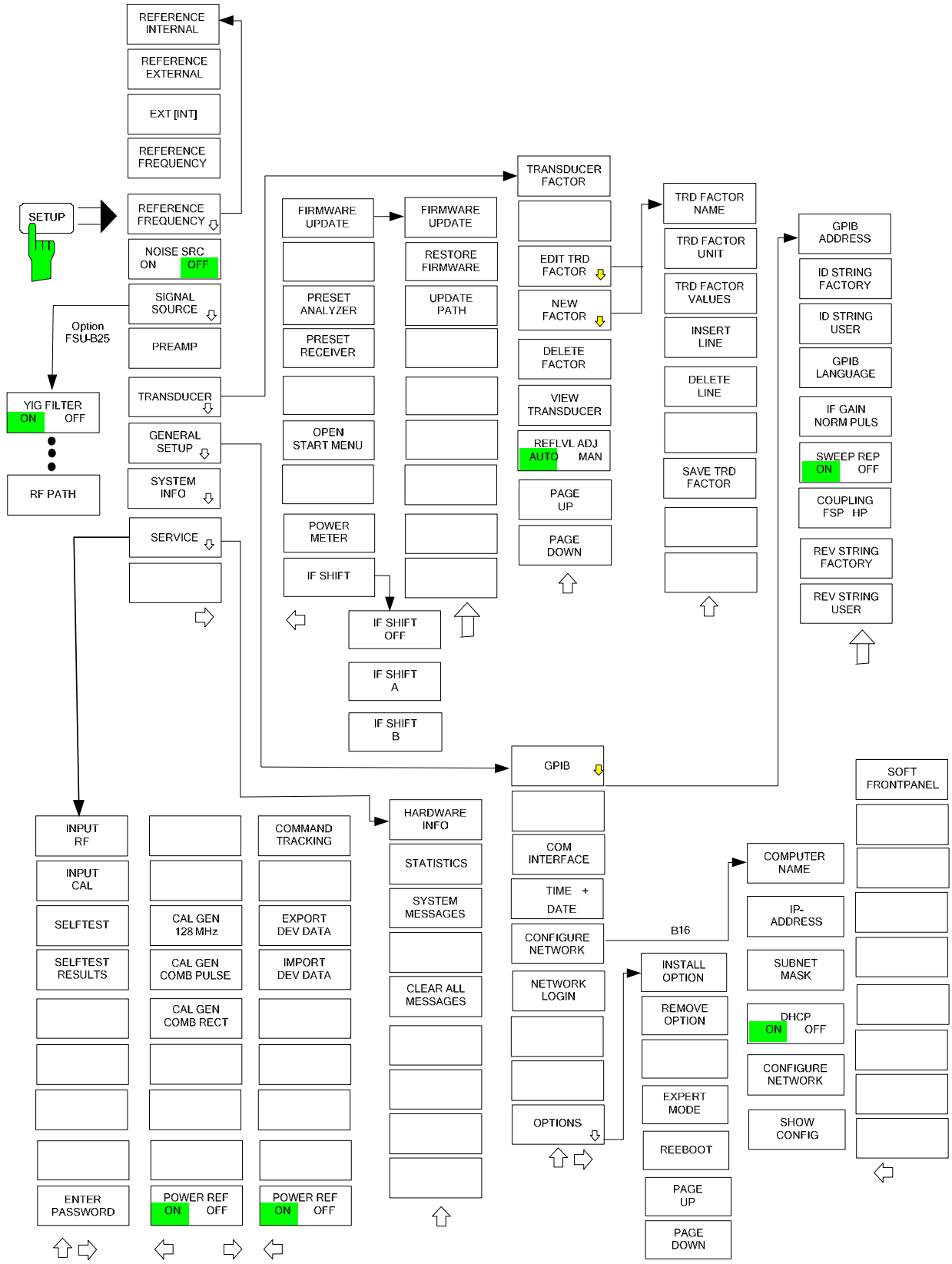
FILE Key


FILE
SAVE
RECALL
STARTUP RECALL
FILE MANAGER
EDIT PATH
NEW FOLDER
PASTE
SORT MODE
2 FILE LISTS
FORMAT DISK
NAME
DATE
EXTENSION
SIZE
SAVE *) FILE
SELECT PATH
SELECT FILE
EDIT FILE NAME
EDIT COMMENT
SELECT ITEMS
DELETE FILE
NEW FOLDER
*) or RECALL
SELECT ITEMS
ENABLE ALL ITEMS
DISABLE ALL ITEMS

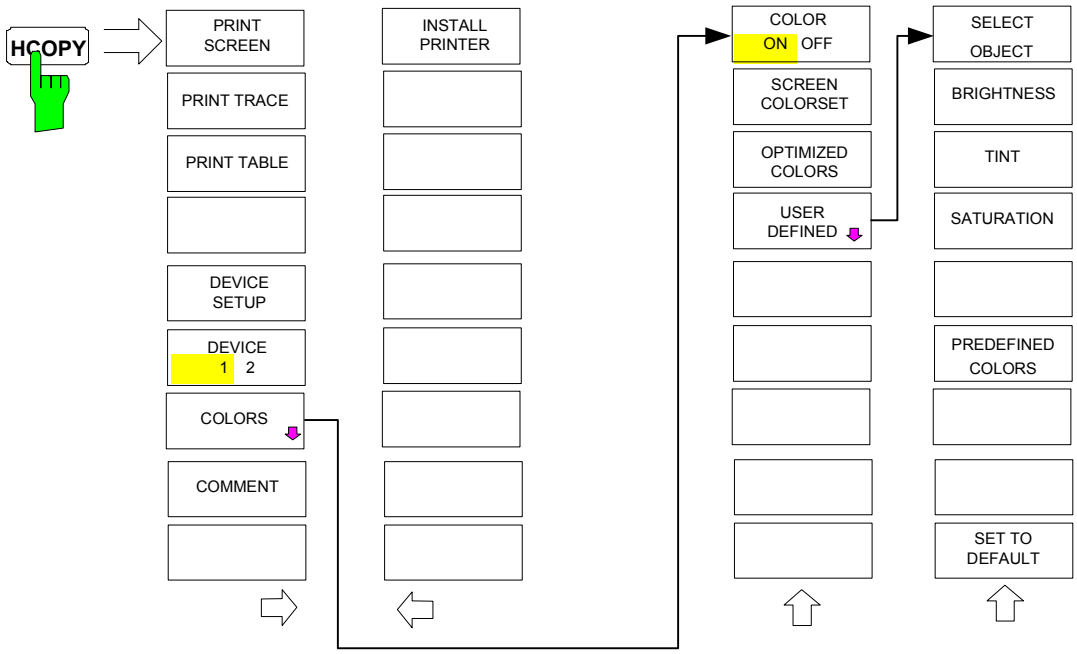
CAL Key


CAL
SETUP
CAL TOTAL
CAL ABORT
CAL CORR
ON
OFF
YIG CORR
ON
OFF
CAL
RESULTS
PAGE UP
PAGE DOWN

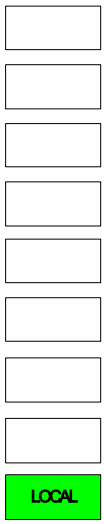
SETUP Key


SETUP
REFERENCE INTERNAL
REFERENCE EXTERNAL
EXT [INT]
REFERENCE FREQUENCY
REFERENCE FREQUENCY
NOISE SRC ON OFF
SIGNAL SOURCE
PREAMP
Option FSU-B25
YIG FILTER ON OFF
RF PATH
TRANSDUCER
GENERAL SETUP
SYSTEM INFO
SERVICE
FIRMWARE UPDATE
PRESET ANALYZER
PRESET RECEIVER
OPEN START MENU
POWER METER
IF SHIFT
FIRMWARE UPDATE
RESTORE FIRMWARE
UPDATE PATH
IF SHIFT OFF
IF SHIFT A
IF SHIFT B
TRANSDUCER FACTOR
EDIT TRD FACTOR
NEW FACTOR
DELETE FACTOR
VIEW TRANSDUCER
REFLVL ADJ AUTO MAN
PAGE UP
PAGE DOWN
TRD FACTOR NAME
TRD FACTOR UNIT
TRD FACTOR VALUES
INSERT LINE
DELETE LINE
SAVE TRD FACTOR
GPIB ADDRESS
ID STRING FACTORY
ID STRING USER
GPIB LANGUAGE
IF GAIN NORM PULS
SWEEP REP ON OFF
COUPLING FSP HP
REV STRING FACTORY
REV STRING USER
GPIB
COM INTERFACE
TIME + DATE
CONFIGURE NETWORK
NETWORK LOGIN
OPTIONS
B16
INSTALL OPTION
REMOVE OPTION
EXPERT MODE
REEBOOT
PAGE UP
PAGE DOWN
COMPUTER NAME
IP-ADDRESS
SUBNET MASK
DHCP ON OFF
CONFIGURE NETWORK
SHOW CONFIG
SOFT FRONTPANEL
HARDWARE INFO
STATISTICS
SYSTEM MESSAGES
CLEAR ALL MESSAGES
INPUT RF
INPUT CAL
SELFTEST
SELFTEST RESULTS
ENTER PASSWORD
CAL GEN 128 MHz
CAL GEN COMB PULSE
CAL GEN COMB RECT
POWER REF ON OFF
COMMAND TRACKING
EXPORT DEV DATA
IMPORT DEV DATA
POWER REF ON OFF

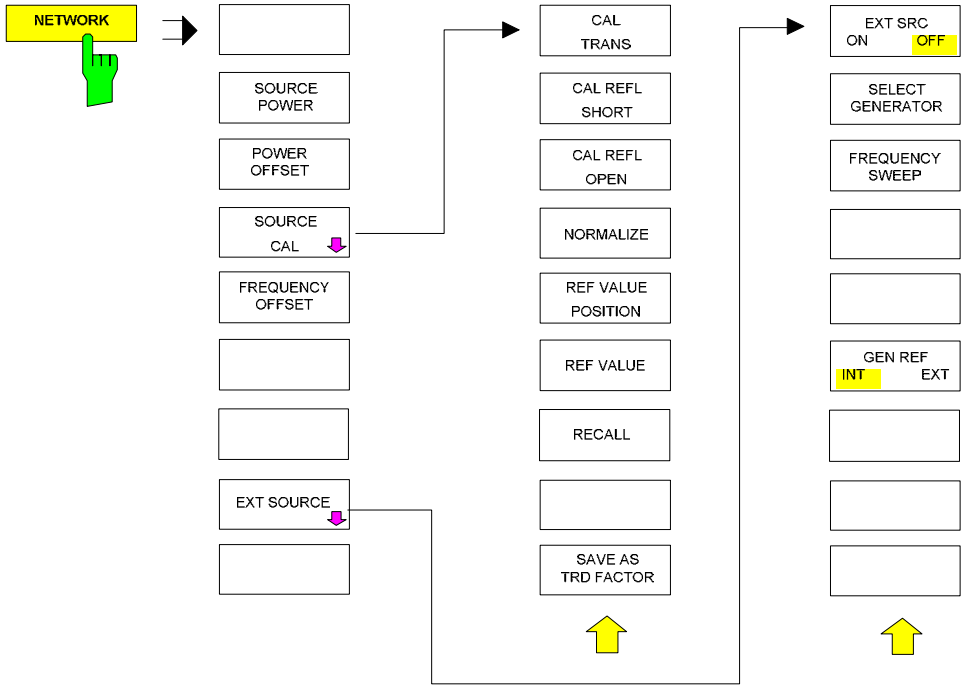
HCOPY Key


HCOPY
PRINT SCREEN
PRINT TRACE
PRINT TABLE
DEVICE SETUP
DEVICE 1 2
COLORS
COMMENT
INSTALL PRINTER
COLOR ON OFF
SCREEN COLORSET
OPTIMIZED COLORS
USER DEFINED
SELECT OBJECT
BRIGHTNESS
TINT
SATURATION
PREDEFINED COLORS
SET TO DEFAULT

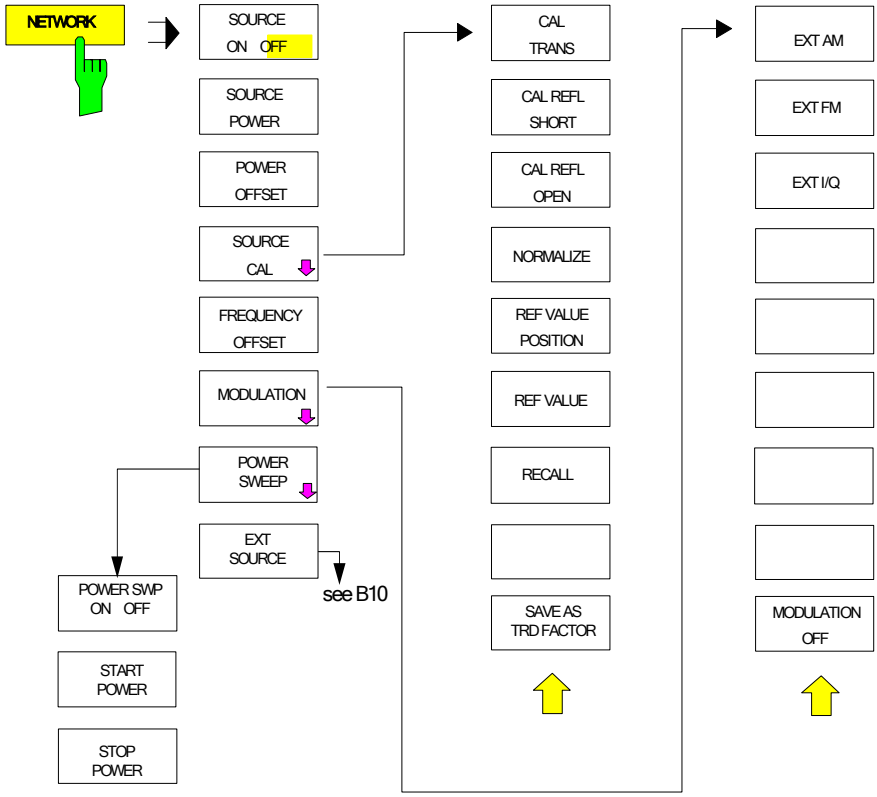
LOCAL Menu



Menu Overview Ext. Generator Control



Menu Overview Option Network Mode



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