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Content of the Manual

Operating Manual

Introduction

This operating manual provides information about:

- Technical characteristics of the instrument
- Putting into operation
- Basic operating procedures and control elements
- Operation via menus and remote control

By way of an introduction, a typical R&S FS300 measurement is described.

The operating manual also contains information about maintenance and troubleshooting based on the warnings and error messages issued by the instrument.
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For the R&S FS300 a calibration cycle of 1 year is recommended.

## Frequency

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</tr>
<tr>
<td>Reference frequency</td>
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<tr>
<td>Aging</td>
<td>2•10^{-6}/year</td>
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</tr>
<tr>
<td>Temperature drift</td>
<td>1•10^{-6}</td>
<td>5 to 30° C</td>
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<tr>
<td>Frequency counter</td>
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<tr>
<td>Resolution</td>
<td>1 Hz, 10 Hz, 100 Hz, 1 kHz</td>
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<tr>
<td>Frequency span</td>
<td>1 kHz to 3 GHz, 0 Hz</td>
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<td>Spectral purity</td>
<td></td>
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<td>SSB phase noise</td>
<td>&lt; -90 dBc/(1 Hz)</td>
<td>10 kHz offset from carrier</td>
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<td>Residual FM</td>
<td>&lt; 100 Hz, typ. 60 Hz</td>
<td>1 kHz resolution bandwidth, 1 kHz video bandwidth</td>
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<td>Sweep time</td>
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<td>SPAN ≥ 1 kHz</td>
<td>100 ms to 1000 s</td>
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<td>SPAN = 0 Hz</td>
<td>100 µs to 20 s</td>
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<td>in 1, 2, 3, 5 steps</td>
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<td>&gt; 137 dB</td>
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<td>Maximum input level</td>
<td></td>
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<tr>
<td>50 MHz - 3 GHz</td>
<td>+33 dBm</td>
</tr>
<tr>
<td>10 MHz - 50 MHz</td>
<td>+26 dBm</td>
</tr>
<tr>
<td>9 kHz - 10 MHz</td>
<td>+20 dBm</td>
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<td>Intermodulation-free range</td>
<td></td>
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<tr>
<td>1 MHz to 100 MHz</td>
<td>≤ -60 dBc</td>
</tr>
<tr>
<td>100 MHz to 3 GHz</td>
<td>≤ -70 dBc</td>
</tr>
<tr>
<td>Harmonic distortion</td>
<td>≤ -60 dBc</td>
</tr>
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<td>Residual spurious</td>
<td>≤ -85 dBm</td>
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<td>Other input related spurious</td>
<td>≤ -60 dBc</td>
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<td>Displayed average noise level</td>
<td>≤ -110 dBm, typ. -120 dBm</td>
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<td>1 dB compression point of 1st mixer</td>
<td>-10 dBm</td>
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<td>Reference level range</td>
<td>-110 to +36 dBm</td>
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<td>Input attenuation</td>
<td>0 to 70 dB in 2 dB steps</td>
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<td>Display range</td>
<td>80 dB, 40 dB, 16 dB, 8 dB, linear</td>
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<td>Linear V, W</td>
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<td>Level uncertainty</td>
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### Markers

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<th>marker and 1 delta marker</th>
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<tr>
<td>Marker functions</td>
<td>peak, next peak, marker to center, marker to reference</td>
</tr>
<tr>
<td>Marker displays</td>
<td>normal, delta, noise marker, frequency counter</td>
</tr>
<tr>
<td>Trigger</td>
<td>free-running, video, external, line</td>
</tr>
</tbody>
</table>

### Inputs

#### RF Input

<table>
<thead>
<tr>
<th>Connector</th>
<th>type N female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input impedance</td>
<td>50 Ω</td>
</tr>
<tr>
<td>VSWR</td>
<td>&lt; 1.5</td>
</tr>
<tr>
<td>Max. input power</td>
<td>+33 dBm</td>
</tr>
<tr>
<td>Maximum permitted DC voltage</td>
<td>30 V</td>
</tr>
</tbody>
</table>

#### External trigger input

<table>
<thead>
<tr>
<th>Connector</th>
<th>BNC female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger voltage</td>
<td>TTL-voltages</td>
</tr>
</tbody>
</table>

#### External reference input

<table>
<thead>
<tr>
<th>Connector</th>
<th>BNC female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference frequency</td>
<td>10 MHz ± 50 Hz</td>
</tr>
<tr>
<td>Input voltage</td>
<td>0.5 to 2 V into 50 Ω</td>
</tr>
</tbody>
</table>

### Output

#### Reference output

<table>
<thead>
<tr>
<th>Connector</th>
<th>BNC female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference frequency</td>
<td>10 MHz</td>
</tr>
<tr>
<td>Output level</td>
<td>&gt; 0.5 V into 50 Ω</td>
</tr>
</tbody>
</table>
Interfaces

<table>
<thead>
<tr>
<th>USB Host</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>USB protocol</td>
</tr>
<tr>
<td>Command set</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>USB Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>USB protocol</td>
</tr>
</tbody>
</table>

Power Supply

<table>
<thead>
<tr>
<th>AC supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 to 240 V (AC), 50 to 60 Hz, autoranging</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 35 VA</td>
</tr>
</tbody>
</table>

General Data

<table>
<thead>
<tr>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
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<tr>
<td>Resolution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace storage</td>
</tr>
<tr>
<td>Setup storage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
</tr>
<tr>
<td>Storage temperature range</td>
</tr>
<tr>
<td>Climatic humidity</td>
</tr>
<tr>
<td>Mechanical resistance</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>Radiated susceptibility</td>
</tr>
<tr>
<td>Safety</td>
</tr>
<tr>
<td>Dimensions (W x H x D)</td>
</tr>
<tr>
<td>Weight</td>
</tr>
</tbody>
</table>
Safety Instructions

Note

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

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

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Observe operating instructions</td>
</tr>
<tr>
<td>△ 32 kg</td>
<td>Weight indication for units &gt; 18 kg</td>
</tr>
<tr>
<td>△</td>
<td>PE terminal</td>
</tr>
<tr>
<td>△</td>
<td>Ground terminal</td>
</tr>
<tr>
<td>♂</td>
<td>Danger! Shock hazard</td>
</tr>
<tr>
<td>△</td>
<td>Warning! Hot surfaces</td>
</tr>
<tr>
<td>△</td>
<td>Ground</td>
</tr>
<tr>
<td>♂</td>
<td>Attention! Electrostatic sensitive devices require special care</td>
</tr>
</tbody>
</table>
Safety Instructions

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:
   - IP degree of protection 2X, pollution severity 2, overvoltage category 2, only for indoor use, altitude max. 2000 m.
   - Unless specified otherwise in the data sheet, a tolerance of ±10 % shall apply to the nominal voltage and of ±5 % to the nominal frequency.

2. For measurements in circuits with voltages $V_{\text{rms}} > 30 \text{ V}$, suitable measures should be taken to avoid any hazards (using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).

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

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

5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.
   - If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.

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

7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.
   - Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.

8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device.
   - In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.
   - If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.

9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.
   - Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.
   - Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.
   - Only original parts may be used for replacing parts relevant to safety (e.g., power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety (visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

10. Ensure that the connections with information technology equipment comply with IEC950/EN60950.
11. Lithium batteries must not be exposed to high temperatures or fire. Keep batteries away from children. If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (see spare part list). Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only. Do not short-circuit the battery.

12. Equipment returned or sent in for repair must be packed in the original packing or in packing with electrostatic and mechanical protection.

13. Electrostatics via the connectors may damage the equipment. For the safe handling and operation of the equipment, appropriate measures against electrostatics should be implemented.

14. The outside of the instrument is suitably cleaned using a soft, lint-free dust-cloth. Never use solvents such as thinners, acetone and similar things, as they may damage the front panel labeling or plastic parts.

15. Any additional safety instructions given in this manual are also to be observed.
Dear Customer,

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

Certificate No.: 2002-77

This is to certify that:

<table>
<thead>
<tr>
<th>Equipment type</th>
<th>Stock No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS300</td>
<td>1147.0991.03</td>
<td>Spectrum Analyser</td>
</tr>
</tbody>
</table>

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits (73/23/EEC revised by 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN61010-1 : 2001-12

For the assessment of electromagnetic compatibility, the limits of radio interference for Class B equipment as well as the immunity to interference for operation in industry have been used as a basis.

Affixing the EC conformity mark as from 2002

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

Munich, 2003-08-28
Central Quality Management FS-QZ/Becker
Support Center Address

Support Center

Telephone: +49 (0180) 512 42 42 within EC

Fax: +49 (089) 4129-13777

E-mail: CustomerSupport@rsd.rohde-schwarz.com

Information

Should you have any technical questions concerning this Rohde & Schwarz product, please contact the hotline of Rohde & Schwarz Vertriebs-GmbH, Support Center.

Our hotline team will answer your questions and find solutions to your problems.

You can reach the hotline Monday through Friday from 8:00 until 17:00 CET.

If you need assistance outside office hours, please leave a message or send us a fax or e-mail. We will contact you as soon as possible.

If you wish to receive the latest news about and updates for a specific instrument, please send us a short e-mail indicating the instrument. We will then send you up-to-date information on a regular basis.
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Siehe Slovenia

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siehe Greece

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**Operating manual, 09/2004**

0-23 E-1007.9900.15
<table>
<thead>
<tr>
<th>Country</th>
<th>Company Name</th>
<th>Address</th>
<th>Phone Numbers</th>
<th>Email Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brasil</td>
<td>ROHDE &amp; SCHWARM DO BRASIL LTDA.</td>
<td>Av. Alfredo Egidio de Souza Aranha, 177, 1° andar - Santo Amaro</td>
<td>+55 (11) 56 44 86 11 (general)</td>
<td><a href="mailto:sales-brazil@rsdb.rohde-schwarz.com">sales-brazil@rsdb.rohde-schwarz.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>04726-170 Sao Paulo – SP</td>
<td>+55 (11) 56 44 86 25 (sales)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+55 (11) 56 44 86 36</td>
<td></td>
</tr>
<tr>
<td>Brunei</td>
<td>GKL Equipment PTE. Ltd.</td>
<td>#11-01 BP Tower</td>
<td>+65 (6) 276 06 26</td>
<td><a href="mailto:gkleqpt@singnet.com.sg">gkleqpt@singnet.com.sg</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>396 Alexandra Road</td>
<td>+65 (6) 276 06 29</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>+359 (2) 963 43 34</td>
<td><a href="mailto:rs-bulgaria@rsbg.rohde-schwarz">rs-bulgaria@rsbg.rohde-schwarz</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000 Sofia</td>
<td>+359 (2) 963 21 97</td>
<td></td>
</tr>
<tr>
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<td>+1 (613) 592 80 00</td>
<td><a href="mailto:cgwarnauth@rscanada.ca">cgwarnauth@rscanada.ca</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kanata, Ontario K2K 2M5</td>
<td>+1 (613) 592 80 90</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saint-Laurent, Pq</td>
<td>+1 (514) 331 59 91</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Montreal H4R 2V6</td>
<td></td>
<td></td>
</tr>
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<td>+56 (2) 339 20 00</td>
<td><a href="mailto:dymeq@dymeq.com">dymeq@dymeq.com</a></td>
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<td></td>
<td></td>
<td>Santiago</td>
<td>+56 (2) 339 20 10</td>
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<td>China</td>
<td>ROHDE &amp; SCHWARZ China Ltd.</td>
<td>227 Huangpi North Road</td>
<td>+86 (21) 63 75 91 70</td>
<td><a href="mailto:info.rschina@rsbp.rohde-schwarz.com">info.rschina@rsbp.rohde-schwarz.com</a></td>
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<td>ROHDE &amp; SCHWARZ China Ltd.</td>
<td>2 Jiangtai Road</td>
<td>+86 (10) 64 31 28 28</td>
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<td>Chao Yang District</td>
<td>+86 (10) 64 37 98 88</td>
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<td>183 Tianhe North Road</td>
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<td></td>
<td>Guangzhou 510075</td>
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<td>China</td>
<td>ROHDE &amp; SCHWARZ China Ltd.</td>
<td>Unit G, 28/F, First City Plaza</td>
<td>+86 (28) 86 52 76 05 to 09</td>
<td><a href="mailto:rsbpc@mail.sc.cninfo.net">rsbpc@mail.sc.cninfo.net</a></td>
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<td>308 Shuncheng Avenue</td>
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<td>Chengdu 610017</td>
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<td>ROHDE &amp; SCHWARZ China Ltd.</td>
<td>Room 10125, Jianguo Hotel Xi’an</td>
<td>+86 (29) 321 82 33</td>
<td><a href="mailto:sherry.yu@rsbp.rohde-schwarz.com">sherry.yu@rsbp.rohde-schwarz.com</a></td>
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<td>ROhde &amp; Schwarz China Ltd.</td>
<td>Room 1002 Jiabin Road</td>
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<td><a href="mailto:jessica.lia@rsbp.rohde-schwarz.com">jessica.lia@rsbp.rohde-schwarz.com</a></td>
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<td>Ecuador</td>
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<tr>
<td>Germany</td>
<td>Zweigniederlassungen der Rohde &amp; Schwarz Vertriebs-GmbH/Branch offices of Rohde &amp; Schwarz Vertriebs-GmbH</td>
<td>+49 (30) 34 79 48-0</td>
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<tr>
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<td>Zweigniederlassung Nord, Geschäftsstelle Berlin</td>
<td>+49 (30) 34 79 48-0</td>
<td></td>
<td><a href="mailto:info.rsv@rohde-schwarz.com">info.rsv@rohde-schwarz.com</a></td>
</tr>
</tbody>
</table>
## List of Rohde & Schwarz Offices

### Germany
- **Zweigniederlassung Büro Bonn**
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  - Postfach 140264 · D-53057 Bonn
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  - +91 (11) 26 32 63 73
  - sales@rsindia.rohde-schwarz.com
  - services@rsindia.rohde-schwarz.com
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<td>ROHDE &amp; SCHWARZ India Pvt. Ltd.</td>
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<td>+91 (22) 26 73 20 81</td>
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<td>PT ROHDE &amp; SCHWARZ Indonesia</td>
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<td>Iran</td>
<td>ROHDE &amp; SCHWARZ IRAN</td>
<td>+98 (21) 872 42 96</td>
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<td>Israel</td>
<td>EASTRONICS LTD.</td>
<td>+972 (3) 645 87 77</td>
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<td>Messtechnik/T&amp;M Equipment</td>
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<td>J.M. Moss (Engineering) Ltd.</td>
<td>+972 (3) 631 20 57</td>
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<tr>
<td>Jordan</td>
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<td>Jabal Amman, Second Circle</td>
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<td><a href="mailto:jocrown@go.com.io">jocrown@go.com.io</a></td>
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</tr>
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<td>Kuwait</td>
<td>Group Five Trading &amp; Contracting Co.</td>
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<td>Latvia</td>
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<tr>
<td>Lebanon</td>
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<td>+966 (1) 465 64 28 Ext. 303</td>
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<td>Lebanon</td>
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<tr>
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<td>ROHDE &amp; SCHWARZ DANMARK A/S</td>
<td>+370 (5) 239 50 10</td>
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<tr>
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<td>Lukiskiu 5-228</td>
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<td>siehe Slovenia</td>
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<tr>
<td>Malaysia</td>
<td>DAGANG TEKNIK SDN. BHD.</td>
<td>+60 (3) 78 03 55 68</td>
</tr>
<tr>
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<tr>
<td></td>
<td>Selangor Darul Ehsan</td>
<td><a href="mailto:maryanne@danik.com.my">maryanne@danik.com.my</a></td>
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<tr>
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<td>47301 Petaling Jaya</td>
<td></td>
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<tr>
<td>Malta</td>
<td>ITEC International Technology Ltd</td>
<td>+356 (21) 37 43 00</td>
</tr>
<tr>
<td></td>
<td>B'Kara Road</td>
<td>oder 37 43 29</td>
</tr>
<tr>
<td></td>
<td>San Gwann SGN 08</td>
<td>+356 (21) 37 43 53</td>
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<td><a href="mailto:sales@itec.com.mt">sales@itec.com.mt</a></td>
</tr>
<tr>
<td>Mexico</td>
<td>Rohde &amp; Schwarz de Mexico (RSMX)</td>
<td>+52 (55) 85 03 99 13</td>
</tr>
<tr>
<td></td>
<td>S. de R.L. de C.V.</td>
<td>+52 (55) 85 03 99 16</td>
</tr>
<tr>
<td></td>
<td>German Centre Oficina 4-2-2</td>
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</tr>
<tr>
<td></td>
<td>Av. Santa Fé 170</td>
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<tr>
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<td></td>
</tr>
<tr>
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<td>01210 Mexico D.F.</td>
<td></td>
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<tr>
<td>Mexico</td>
<td>Rohde &amp; Schwarz de Mexico</td>
<td>+52 (33) 36 78 91 70</td>
</tr>
<tr>
<td></td>
<td>Av. Prol. Americas No. 1600, 2° Piso</td>
<td>+52 (33) 36 78 92 00</td>
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<tr>
<td></td>
<td>Col. Country Club</td>
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<tr>
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<td>siehe Romania</td>
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<tr>
<td>Nepal</td>
<td>ICTC Pvt. Ltd.</td>
<td>+977 (1) 443 48 95</td>
</tr>
<tr>
<td></td>
<td>Hattisar, Post Box No. 660</td>
<td>+977 (1) 443 49 37</td>
</tr>
<tr>
<td></td>
<td>Kathmandu</td>
<td></td>
</tr>
</tbody>
</table>
# R&S FS300 List of Rohde & Schwarz Offices

<table>
<thead>
<tr>
<th>Country</th>
<th>Address</th>
<th>Phone Numbers</th>
<th>Email Addresses</th>
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<tbody>
<tr>
<td>Netherlands</td>
<td>ROHDE &amp; SCHWARZ NEDERLAND B.V.</td>
<td>+31 (30) 600 17 00</td>
<td><a href="mailto:info@rsn.rohde-schwarz.com">info@rsn.rohde-schwarz.com</a></td>
</tr>
<tr>
<td></td>
<td>Perkinsbaan 1</td>
<td>+31 (30) 600 17 99</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3439 ND Nieuwegein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>Nichecom</td>
<td>+64 (4) 232 32 33</td>
<td><a href="mailto:rob@nichecom.co.nz">rob@nichecom.co.nz</a></td>
</tr>
<tr>
<td></td>
<td>1 Lincoln Ave.</td>
<td>+64 (4) 232 32 30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tawa, Wellington</td>
<td></td>
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<tr>
<td>Nicaragua</td>
<td>see Mexico</td>
<td></td>
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<tr>
<td>Nigeria</td>
<td>Ferrostaal Abuja</td>
<td>+234 (9) 413 52 51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plot 3323, Barada Close</td>
<td>+234 (9) 413 52 50</td>
<td><a href="mailto:fsabuja@rosecom.net">fsabuja@rosecom.net</a></td>
</tr>
<tr>
<td></td>
<td>P.O. Box 8513, Wuse</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td>Norway</td>
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<td>+47 (23) 38 66 00</td>
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<tr>
<td></td>
<td>Enebakkveien 302 B</td>
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<tr>
<td></td>
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<td></td>
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<tr>
<td>Oman</td>
<td>Mustafa Sultan Science &amp; Industry Co.LLC.</td>
<td>+968 63 60 00</td>
<td><a href="mailto:m-aziz@mustafasultan.com">m-aziz@mustafasultan.com</a></td>
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<tr>
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<td>Test &amp; Measurement Products</td>
<td>+968 60 70 66</td>
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<td>+92 (51) 227 22 00</td>
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<td>23, West Jinnah Avenue</td>
<td>+92 (51) 227 54 98</td>
<td><a href="mailto:reza.bokhary@siemens.com.pk">reza.bokhary@siemens.com.pk</a></td>
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<td>Philippines</td>
<td>Rohde &amp; Schwarz (Philippines) Ltd.</td>
<td>+63 (2) 755 88 70</td>
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<td>Przedstawicielstwo w Polsce</td>
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<td>ROHDE &amp; SCHWARZ</td>
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<td>Saudi Arabia</td>
<td>Rohde &amp; Schwarz Liaison Office Riyadh</td>
<td>+966 (1) 465 64 28 Ext. 303</td>
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<tr>
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<td>c/o Haji Abdullah Alireza Co. Ltd.</td>
<td>+966 (1) 465 628 Ext. 229</td>
<td><a href="mailto:chris.porzy@rsd.rohde-schwarz.com">chris.porzy@rsd.rohde-schwarz.com</a></td>
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<tr>
<td>Serbia-Montenegro</td>
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<td>Tose Jovanovica 7, 11030 Beograd</td>
<td>+381 (11) 305 50 25, +381 (11) 305 50 24</td>
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<tr>
<td>Singapore</td>
<td>Rohde &amp; Schwarz</td>
<td>Regional Headquarters Singapore Pte. Ltd., 1 Kaki Bukit View</td>
<td>+65 (6) 846 1872, +65 (6) 846 1252</td>
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<tr>
<td>Slovak Republic</td>
<td>Specialne systemy a software, a.s.</td>
<td>Svrcia ul., 841 04 Bratislava</td>
<td>+421 (2) 65 42 24 88, +421 (2) 65 42 07 68</td>
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<td>Slovenia</td>
<td>ROHDE &amp; SCHWARZ</td>
<td>Tbilisijska 89, 1000 Ljubljana</td>
<td>+386 (1) 423 46 51, +386 (1) 423 46 11</td>
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<tr>
<td>South Africa</td>
<td>Protea Data Systems (Pty.) Ltd.</td>
<td>Communications and Measurement Division, Private Bag X19, Bramley Road</td>
<td>+27 (11) 719 57 00, +27 (11) 786 58 91</td>
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<tr>
<td>South Africa</td>
<td>Protea Data Systems (Pty.) Ltd.</td>
<td>Cape Town Branch, Unit G9, Centurion Business Park</td>
<td>+27 (21) 555 36 32, +27 (21) 555 42 67</td>
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<tr>
<td>Spain</td>
<td>ROHDE &amp; SCHWARZ ESPANA S.A.</td>
<td>Salcedo, 11, 28034 Madrid</td>
<td>+34 (91) 334 10 70, +34 (91) 329 05 06</td>
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<tr>
<td>Sri Lanka</td>
<td>Dynatel Communications (PTE) Ltd.</td>
<td>451/A Kandy Road, Kelaniya</td>
<td>+94 (1) 90 80 01, +94 (1) 91 04 69</td>
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<td>Sudan</td>
<td>SolarMan Co. Ltd.</td>
<td>P.O.Box 11 545, North of Fraouq Cemetery Bldg. 16 Karthoum</td>
<td>+249 (11) 47 31 08, +249 (11) 47 31 38</td>
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<tr>
<td>Sweden</td>
<td>ROHDE &amp; SCHWARZ SVERIGE AB</td>
<td>Marketing Div., Flygfältsgatan 15, 128 30 Skarpnäck</td>
<td>+46 (8) 605 19 00, +46 (8) 605 19 80</td>
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<td>Switzerland</td>
<td>Roschi Rohde &amp; Schwarz AG</td>
<td>Mühlestr. 7, 3063 Ittigen</td>
<td>+41 (31) 922 15 22, +41 (31) 921 81 01</td>
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<tr>
<td>Syria</td>
<td>Electro Scientific Office</td>
<td>Baghdad Street, Dawara Clinical Lab. Bldg, P.O.Box 8162, Damascus</td>
<td>+963 (11) 231 59 74, +963 (11) 231 88 75</td>
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<tr>
<td>Taiwan</td>
<td>Rohde &amp; Schwarz Taiwan (Pvt.) Ltd.</td>
<td>Floor 14, No. 13, Sec. 2, Pei-Tou Road, Taipei 112</td>
<td>+886 (2) 28 93 10 88, +886 (2) 28 91 72 60</td>
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<tr>
<td>Tanzania</td>
<td>SSTL Group</td>
<td>P.O. Box 7512, Dar es Salaam</td>
<td>+255 (22) 276 00 37, +255 (22) 276 02 93</td>
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Thailand
Schmidt Electronics (Thailand) Ltd.
63 Government Housing Bank Bldg.
Tower II, 19th floor, Rama 9 Rd.
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kamthoninthuyot@schmidtthailand.com

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siehe Mexico

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Residence Alain Savary (C64)
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+216 (71) 77 05 53

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Liaison Office Istanbul
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+90 (216) 385 19 18
rsturk@superonline.com

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252042 Kiev
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+38 (044) 268 83 64
rsbkiev@public.ua.net

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ROHDE & SCHWARZ International GmbH
Liaison Office Abu Dhabi
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+971 (4) 3944 794
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United Arab Emirates
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Dubai
+971 (4) 883 71 35
+971 (4) 883 71 36

United Arab Emirates
ROHDE & SCHWARZ Emirates L.L.C.
Ahmed Al Nasri Building, Mezzanine Floor,
P.O.Box 31156
Off old Airport Road
Behind new GEMACO Furniture
Abu Dhabi
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+971 (2) 631 30 40
rsuae@emirates.net.ae

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ROHDE & SCHWARZ UK Ltd.
Ancells Business Park
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Hampshire
GU 51 2UZ England
+44 (1252) 81 88 88 (sales)
+44 (1252) 81 88 18 (service)
+44 (1252) 81 14 47
sales@rsuk.rohde-schwarz.com

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AEROMARINE S.A.
Cerro Largo 1497
11200 Montevideo
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1 Introduction

Chapter 1 describes the uses of the R&S FS300 and also provides information on the storage and transportation procedures that should be adopted for the instrument. Warranty conditions are also explained.

Further information

Chapter 2 contains an overview of the R&S FS300’s control elements, indicators, etc.

Chapter 3 describes how to put the R&S FS300 into operation.

1.1 Applications for the R&S FS300

Uses

RF signals are used by telecommunication systems to transmit information. The transmitted power must remain within strictly specified frequency bands, otherwise interference with other services on adjacent channels would occur.

To ensure that the stringent requirements laid down for RF communication systems are met, it is essential to have measuring equipment that can precisely measure and analyze the modulated and unmodulated signals involved.

Performance features

The Spectrum Analyzer R&S FS300 has all the performance features required to perform precise level and frequency measurements.

The key features are:

- High-Quality RF characteristics
- Resolution bandwidth from 200 Hz to 1 MHz
- Frequency counter with 1 Hz resolution
- Maximum input level +33 dBm
- Ergonomic user interface

Operation from keypad

All functions and measurement parameters can be set via menus using a keypad and a rotary knob.

The current trace, along with the key parameters and status indicators needed to evaluate the results, can be read at a glance from the TFT colour screen.

Remote control via PC

The R&S FS300 is equipped as standard with a USB interface so that it can communicate with a PC. All functions and parameters can be set.
1.2 Supplied Accessories

Content
- 1 power cord Europe
- 1 manual German/English
- 1 CD (Content: operating manual German/English, data sheet German/English, PC software R&S FS300-K1, USB cable Acrobat Reader™)

1.3 Warranty

Rohde & Schwarz guarantees that the R&S FS300 will operate free of faults for a period of 12 months from delivery. The warranty does not cover faults caused by incorrect handling, by any modifications not made by Rohde & Schwarz or arising from any use other than for the intended purpose.

Returning a defective R&S FS300
Please observe the packaging instructions (0-16). You will find the addresses of your nearest R&S representative and of the support center at the front of the manual.

Indicating claims under the warranty
We would also ask you to state clearly if you are making a claim for repairs under warranty, preferably by including your delivery note. Repair requests that do not explicitly refer to the warranty will, in the first instance, incur charges.
If your warranty has expired, we will, of course, repair your R&S FS300 in accordance with our general installation and service conditions.
2 Control Elements

2.1 Front View

1 ON/STANDBY switch
2 ON/STANDBY indicator
3 SYS key
4 ESC/CANCEL key
5 ENTER key
6 Cursor keys ↓ / ↑
7 Cursor keys ← / →
8 RF IN, RF input connector
9 Unit keys
10 Rotary knob
11 Numerical keys
12 Function keys
13 Screen
2.2 Rear View

14 Input connector for external trigger or external gate signal
15 Connector for external USB host
16 Output connector for USB device (e.g. printer)
17 Power supply connector
18 AC line fuses
19 AC line switch
20 Connector for external monitor
21 Connector for external keyboard
22 Input for external reference (10 MHz)
23 Output of internal/external reference (10 MHz)
3 Putting the R&S FS300 into Operation

This chapter

Chapter 3 describes how to put the R&S FS300 into operation.

Further information

Chapter 2 contains an overview of the R&S FS300’s control elements, indicators, etc.

Chapter 4, “Getting started”, takes you step-by-step through a number of simple measurements.

Chapter 8 is an in-depth description of the instrument’s interfaces.

Caution

Before putting the R&S FS300 into operation, make the following checks:

- Ensure that the ventilation holes are free of obstructions.
- Ensure that there are no unsuitable signal voltages connected to the input.
- The R&S FS300’s outputs may not be overloaded and correct polarity must be ensured.

The instrument may be damaged if the above checks are not performed.

3.1 Unpacking the R&S FS300

Recommended procedure

When you unpack the R&S FS300, proceed as follows:

1. Remove the R&S FS300 from its packaging and check that the delivery is complete using the accessory list (1-34).
2. Carefully check the R&S FS300 for any damage.
3. If there is damage, immediately contact the carrier who delivered the instrument. Under these circumstances, it is essential to keep the box in which the R&S FS300 was transported and the packaging material (0-16).

3.2 Setting up the Instrument

Caution

There is a risk of injury from sharp edges and becoming wedged between the setting lever and the handle.

Setup instructions

The R&S FS300 must be assembled on a firm, level surface only. The instrument has a carrying handle which is also used for various setup options. This handle can be moved into any position, depending on the particular field of application.
Setting up the Instrument R&S FS300

Setting the handle

1. Place the thumb and two fingers around the side-mounted setting lever and loosen it with a turning action.

2. Slide the handle lengthwise while twisting it radially in steps of about 12°.

3. Close the setting lever by pressing on the outer surface.
   **Caution:** There is a risk of injury from sharp edges and becoming wedged between the setting lever and the handle.

4. Remove the protective film from the screen glass if necessary.
   **Caution:** Use no pointed or sharp objects.
3.3 Connecting the R&S FS300 to the AC Line

Caution

The R&S FS300 meets the requirements for Safety Class I to DIN EN 61010-1/IEC 61010-1, e.g. all metal parts that can be touched or accessed without removing the enclosure are connected to the protective ground of the power supply network.

The connection to the AC line is made via a power cord and a connector with a protective ground contact.

Automatic AC line voltage detection

When the R&S FS300 is connected to the AC line, it automatically sets itself to the correct voltage (range: AC voltage 100 V to 240 V, AC frequency 50 Hz to 60 Hz). There is no need to set the voltage manually or change the fuse.

Connecting the AC line

1. Use the supplied power cord to connect the R&S FS300 to the AC line.
   The power supply connector [17] is at the rear of the instrument.

2. Connect the power cord to the AC line.

3.4 Switching On the R&S FS300

Hazard

The AC line is still connected to the R&S FS300 when the instrument is in the standby mode.

AC line switch on the rear panel

The R&S FS300 is connected to the AC line via power supply connector [17]. AC line switch [19] which isolates the R&S FS300 from the AC line is located next to the power supply connector.

ON/STANDBY switch on the front panel

ON operating state

After switching on the R&S FS300 by means of the AC line switch [19] at the rear panel, it is in standby mode and the yellow LED [2] comes on. If you press the ON/STANDBY switch [1], the instrument is switched on and the green LED [2] comes on.

STANDBY operating state

To switch the R&S FS300 from the operating mode to standby mode, press the ON/STANDBY switch [1] for approx. 2 seconds. After switching off the ON/STANDBY switch [1] the yellow LED [2] comes on.

Switching on the R&S FS300

1. Press the AC line switch [19] on the rear panel in the I position.

2. Press the ON/STANDBY switch [1] on the front panel.
   The green ON LED [2] should come on.
### 3.5 Function Test

**Caution**

When performing service procedures, follow the requirements of VDE 0701. Only properly qualified technicians are allowed to repair the R&S FS300. The instrument does not contain any parts the operator can repair.

**Function test**

After the R&S FS300 has been switched on (page 3-39), the green LED ON [2] on the instrument’s front panel comes on. During booting, the “R&S SmartInstruments” symbol appears on a blue screen background [13]. Booting the R&S FS300 takes approx. 1.5 minute and is completed when the measurement mask (page 5-47) and the trace appear.

**In error case**

If the measurement mask (page 5-47) does not appear and the red or the red or green LED flash alternately, switch the R&S FS300 off and on. In case the error continues, return the instrument to our service center for checking.

If the instrument shows an error message after booting, then follow the instructions in the chapter “Error messages” (page 6-234).

**Note**

If the measurement trace does not appear on the screen shortly after booting, the sweep time may have been too long. In this case, reset the R&S FS300 by means of PRESET (page 6-146). If the trace still fails to appear, an error occurred and our service center must check the instrument.

### 3.6 EMC

**EMC requirements**

The R&S FS300 meets the EMC Directive 89/336/EEC (applied standards EN 55011 Class B and EN 61326).

To prevent EMI, the R&S FS300 may only be operated with its enclosure closed. Only appropriately shielded signal and control cables may be used. External units, such as keyboard, printer or monitor, that are to be connected to the R&S FS300 must comply with EMC directives.
3.7 Connecting an External Keyboard

**Caution**
Only connect the keyboard when the R&S FS300 is off or in the STANDBY mode, otherwise malfunctions may occur at a later date.

**Use**
You can connect an external PC keyboard via the 6-pin PS/2 KEYBOARD connector [21] on the R&S FS300’s rear panel. The keyboard makes it easier to enter file names. The keyboard allows data entry as well as operation of the R&S FS300.

The keyboard is detected automatically when it is connected.

Key assignment for operating the R&S FS300

- [F10] ← or [F11]
- [F1] ... [F7]
- [A] ... [D]
- [Esc]
- [←], [→]
- [0] ... [9], [,], [-]
- [F9]
- [Enter]
- [↑], [↓]
4 Getting Started

This chapter

Chapter 4 uses a number of simple measurements to illustrate how to operate the R&S FS300.

For the following example, the initial setting for instrument is the default setting (factory). This is set by pressing the PRESET key in the menu (6-146). The full default setup is described in chapter 6.

Further information

Chapter 5 contains an in-depth explanation of the basic operating steps, for example selecting menus and setting parameters. The layout of the screen and the information displayed on the screen are also described.

Chapter 6 describes all the R&S FS300’s menus and the associated functions in detail.

4.1 Level and Frequency Measurements

4.1.1 Measurement Task

Caution

The input stage of the R&S FS300 can be destroyed by overloads or DC components. If there is a possibility that the limits specified in the data sheet may be violated, the input must be protected with an attenuator and/or a DC block.

Measurement problem

Determining the level and frequency of a signal is one of the most common measurements a spectrum analyzer is used to make. Often, when making these measurements on an unknown signal, the PRESET settings (factory) are chosen as a suitable initial setup (6-146).

Solution

The center frequency (CENTER), the SPAN and the MARKER functions play a key role in level and frequency measurements.
4.1.2 Measurement Procedure

Introduction
In this example, a signal with a frequency of 200 MHz and a level of -30 dBm is applied to the RF input [8]. The center frequency and the span are set manually.

Measurement steps
Perform the following steps:

1. Reset the R&S FS300.
   - Press the key.
   - Select in the bottom menu bar using the cursor keys.
   - Press the function key.

2. Apply the signal.

3. Set the center frequency (CENTER) to 200 MHz.
   - Select in the bottom menu bar using the cursor keys.
   - Press the function key.
   - Enter using the numerical keys. Terminate the entry by pressing the unit key MHz.

4. Reduce the SPAN to 1 MHz.
   - Stay in the menu.
   - Press the function key.
   - Enter from the numerical keys. Terminate the entry by pressing the unit key MHz.

5. Measure the level and frequency with the marker.
   - Select in the bottom menu bar using the cursor keys.
   - Press the function key.
   - Press the function key in the submenu that appears. The marker jumps to the signal peak. Turn the rotary knob to change the position of the marker.

6. Frequency measurements with the built-in frequency counter.
   - Press the function key in the submenu. You can change the resolution of the frequency counter in the same submenu with the function key.
5 Manual Operating Concept

This chapter contains an overview of the R&S FS300’s basic manual operating concept. This includes a description of the keypad, the screen layout, menu operation and how to set parameters. There is an overview of the menus and functions at the end of this chapter.

Further information
Chapter 4 contains a brief introduction that takes you step-by-step through some simple measurements.
Chapter 6 contains an in-depth description of the menu functions.
Chapter 7 contains note for remote control the R&S FS300 via a USB interface.

5.1 Making Entries from the Keypad

Introduction
The R&S FS300 is operated using menus in conjunction with a keypad and a rotary knob. The keypad comprises the following sections:

- Unit keys [9]
- Cursor keys [6, 7]
- Function keys [12]
- Action keys [4, 5]
- SYS key [3]

5.1.1 Numerical Keys

Function
The numerical keys are used to enter numerical parameters.

- Inserts one of the digits “0” to “9” at the cursor position.
- Inserts a decimal point “.” at the cursor position.
- Inserts a minus sign “-” at the cursor position.

5.1.2 Unit Keys

Function
The unit keys are used to assign the appropriate unit to the number that has been entered, simultaneously terminating the entry.

- Assigns GHz when a frequency setting is being made
- Assigns s when a time setting is being made
- Assigns MHz when a frequency setting is being made
- Assigns ms when a time setting is being made
- Assigns kHz when a frequency setting is being made
- Assigns µs when a time setting is being made
- Assigns Hz when a frequency setting is being made

Note
In the case of all other entries, the unit keys assume the same function as the Enter key. (7 5-46).
5.1.3 Rotary Knob

**Function**
As well as the numerical keys and the cursor keys, the rotary knob is also used to set parameters.

The rotary knob has several functions:

- **Incrementing** (turn clockwise) or **decrementing** (turn counterclockwise) numerical instrument parameters using a specified step size.
- **Positioning** markers, limits, etc on the screen.

5.1.4 Cursor Keys

**Function**
As well as the numerical keys and the rotary knob, the cursor keys are also used for entering parameters and to navigate through the menus.

The cursor keys have the following functions:

- **Navigating** through menus and selection fields
- The 〈 or 〉 cursor keys move the cursor to the position you want within the numerical editing line.
- The ▼ or ▲ cursor keys increment or decrement numerical parameter entries.

5.1.5 Function Keys

**Function**
In the function area, various instrument functions are displayed depending on which menu has been selected.

The displayed instrument functions are assigned to the seven function keys down the right side of the screen. This means that each function key can have a variety of functions (Ê 5-49).

When a function key is pressed, various responses can be elicited:

- Immediate activation of a function or toggling between settings
- Entry of a value or selection of a setting/function
- Confirmation of a new setting and opening of a new menu item
- Branching to a submenu
5.1.6 Action Keys

Function

The action keys are for terminating menu-guided settings.

- This key is for closing the entry field or selection field after data has been entered. The new value is set on the R&S FS300.

  Note: Pressing a unit key will also terminate the entry of setting data.

- This key is for closing the entry field or selection field, but the data that has been entered is not saved - in other words the old value is retained.

5.1.7 SYS Key

Function

- When you press the SYS key [3], the measuring menu is blanked out and replaced by the SYS menu. Other functions are assigned to the function keys [12] and the measurement diagram is replaced by the system parameters (6-144).

- By repeatedly pressing the SYS key [3], you can quit the SYS menu and accept the new settings.
5.2 Screen Display

Introduction

The screen [13] provides on-going information about events and the parameters associated with the selected measurement functions. The display mode for the measurement results, the lettering of the function keys and the type of menu all depend on the current settings.

Screen layout

The screen is divided into three areas:

I Diagram area
II Menu area
III Function area

![Diagram of screen layout]
5.2.1 Diagram Area

Displays in the diagram area

- Measurement diagrams and the associated scales (h) and traces (e)
- Measured value displays, e.g. display line (d) and markers (c)
- Parameter field (b) and status displays (a)
- Selection fields and entry fields that come up on the screen (g)
- Error messages that come up on the screen (f)

Measurement diagram

A 10 x 8 grid is superimposed on the diagram area to make it easier to analyze traces.

Parameter field and status display

The following are displayed in the parameter field:

- **Ref:** upper diagram limit (reference level)
- **RBW:** current resolution bandwidth
- **M1:** marker 1 plus marker position and level
- **M2:** marker 2 plus marker position and level

The status display provides the following information:

- **Offs** - level offset is on
- **MAX** - current trace display mode, e.g. max hold

5.2.2 Menu Area

Menu display

Menus for setting the measurement parameters and the measurement functions are displayed in the menu area. The selected menu is highlighted, e.g. FREQ/SPAN menu.

<table>
<thead>
<tr>
<th>FREQ/SPAN</th>
<th>AMP</th>
<th>MKR</th>
<th>BW/TRACE</th>
<th>MEAS</th>
</tr>
</thead>
</table>

[Diagram of screen display with labeled areas (a) to (h).]
5.2.3 Function Area

When a menu is selected, the associated instrument functions are displayed in the function area.

The displayed instrument functions are assigned to the seven function keys down the right-hand side of the screen. If a key in the function area does not have any lettering, the key has not been assigned a function in the menu in question. If a key has lettering, but not in full brightness, the key has temporarily (current setting) not been assigned a function.

- Activated function key
- De-activated function key
- No function assigned
5.3 Calling and Changing Menus

Introduction

Operating the R&S FS300 is menu-guided. All the menus used to set the measurement parameters and measurement functions are displayed in the menu area. The instrument functions associated with any menu you select are displayed in the function area.

Pressing a function key has one of the following effects:

- Direct execution of an instrument function
- Opening of entry or selection windows
- Opening of submenus

The ← or → cursor keys [6] are used for menu navigation.

1. Select a menu, e.g. MARKER, with the ← or → [6] cursor keys.

The menu name is highlighted and the appropriate function is assigned to the function keys [12].

Note

A double arrow ⇒ pointing to a function key, e.g. MARKER 1, tells you that pressing this key will call a submenu.
2. Press the function key in the menu.
   The MARKER 1 submenu opens and the new functions are assigned to the function keys [12].

3. Press the function key in the submenu.
   The submenu is closed and the previous functions remain assigned to the function keys [12].
5.4 Setting Parameters

Parameters can be set in a number of ways:
- Direct selection of an instrument function (function key)
- Selecting settings from selection fields
- Entering numerical parameters in entry fields

The numerical keys [11], the unit keys [9], the rotary knob [10], the cursor keys [6, 7] and the action keys [4, 5] can all be used to select and enter instrument parameters.

5.4.1 Direct Selection of Instrument Functions

Introduction

When you select a menu, various instrument functions are displayed in the function area. Some instrument functions can be set directly by pressing a function key.

The function key you select is highlighted.

e.g.:

Displaying marker 1 (6-92)

1. Press the function key in the submenu.

Marker 1 is turned on and placed on the trace maximum. The M1 marker values are displayed in the parameter field.

2. Press the function key in the submenu.

Marker 1 disappears from the diagram area and the M1 marker values are blanked out.
5.4.2 Selecting Settings

Introduction

When you select a menu, a number of instrument functions are displayed in the function area. If certain function keys are then pressed, a selection field is displayed in the diagram area. You can then choose and activate any of the settings offered for selection.

The function key you select is highlighted.

1. Press the **function key** in the **menu**.

   A selection field containing the available settings is displayed. The default setting is “80 dB”.

2. Select a level display range with **rotary knob** [10].

3. Press the **ENTER key** [5] to close the selection field.

   The new setting is saved.

   If you want to keep the old setting, close the entry field with the **ESC/CANCEL key** [4].

**Note**

If there are more than five options, a scroll bar is displayed on the right next to the selection field. At any one time, only five options are displayed on the screen.
5.4.3 Entering Numerical Parameters

Introduction
When you select a menu, a number of instrument functions will be displayed in the function area. If you press certain function keys, an entry field will be displayed in the diagram area. The function key you select is highlighted.

There are two ways of entering numerical parameters:

- **Entry** of a number with the numerical keys
- **Entry** of a number with the cursor keys and rotary knob

The entry with the cursor keys and rotary knob is useful if you only have a rough idea of what the measurement parameters should be. As the screen is continuously updated as the value is varied, a search is possible.

5.4.3.1 Entry with the Numerical Keys

**e.g.: Setting the center frequency (6-71)**

1. Press the CENTER function key in the FREQ/SPAN menu. An entry field containing the current setting is displayed.

   ![Diagram showing entry field]

2. Overwrite the old value, e.g. 1.5 GHz, with the numerical keys [11].

   ![Number keys and entry field]

   **Note:** If a numerical key is pressed after the entry field is brought up on the screen, the old value will be erased. However, a complete new value must now be entered using the numerical keys.
Terminating entries

3a. Press a unit key [9], e.g. GHz, to terminate the entry.

The R&S FS300 sets the value that has been set numerically using the new unit. The entry window is closed.

3b. Press the ENTER key [5] to terminate the entry.

The R&S FS300 sets the value that has been set numerically, but with the old unit. The entry window is closed.

Note: If a parameter is unitless or always has the same unit, you can terminate the entry with the ENTER key or one of the unit keys.

3c. Press the ESC/CANCEL key [4] to abort the entry.

The old value is retained. The entry window is closed.

Invalid parameter entry

If an invalid parameter is entered, the new value is rejected by the R&S FS300 and an error message is issued:

- Acknowledge the error message with the ENTER key [5] and repeat the entry with the correct value.

Note

When numbers are displayed, only the digit sequences 1 to 999 appear before the decimal point. In other words, if the digit sequence <5000> and the unit <kHz> are entered, <5 MHz> appears in the display. Trailing zeros will be eliminated in the display area.
5.4.3.2 Entry using the Cursor Keys and the Rotary Knob

1. Press the \textbf{SPAN} function key in the \textbf{FREQ/SPAN} menu. An entry field containing the current setting is displayed.

2. Using the cursor keys \text{^\Leftarrow} and \text{\Rightarrow} \[6\], position the cursor on a decimal place in the entry field.

3a. Press the \text{^\Uparrow} or \text{^\Downarrow} cursor key \[7\] until you obtain the value you want. Pressing the \text{^\Uparrow} cursor key once increments the value by one; pressing the \text{^\Downarrow} cursor key once decrements the value by one.

3b. Turn the rotary knob \[10\] until you obtain the value you want. Turning clockwise increases the value; turning counter-clockwise reduces the value.

\textbf{Note:} In both cases, there are carries associated with incrementation or decrementation. In other words, if a 9 digit is incremented or a 0 digit decremented, a carry is added to or subtracted from next highest digit.

\textbf{Note} When you enter the center frequency, you can specify the step width of the rotary knob. (\text{\ref{6-73}}). In this case, the value is incremented or decremented in accordance with the specified step width, with the cursor always moving to the highest value, irrespective of its earlier position.
**Terminating entries**

4a. Press a **unit key** [9], e.g. MHz, to terminate the entry.

![MHz](MHz.png)  

The R&S FS300 sets the value that has been entered using the **new unit**. The entry window is closed.

4b. Press the **ENTER key** [5] to terminate the entry.

![ENTER](ENTER.png)  

The R&S FS300 sets the value that has been set numerically but with the **old unit**. The entry window is closed.

**Note:** If a parameter is unitless or always has the same unit, you can terminate the entry with the ENTER key or one of the unit keys.

4c. Press the **ESC/CANCEL key** [4] to abort the entry.

![ESC CANCEL](ESC CANCEL.png)  

The **old value** is retained. The entry window is closed.

**Invalid parameter entry**

If the limit value is reached, the numeric value in the entry window remains the same and is neither increased nor decreased. No error message is issued.

---

**Note**

When numbers are displayed, only the digit sequences 1 to 999 appear before the decimal point. In other words, if the digit sequence <5000> and the unit <kHz> are entered, <5 MHz> appears in the display. Trailing zeros will be eliminated in the display area.
5.5 Overview of all Menus and Functions

5.5.1 Spectrum Analyzer

5.5.1.1 FREQ/SPAN Menu

Function key assignment

- Entering the center frequency
- Entering the span
- Entering the start frequency
- Entering the stop frequency

Open submenu:
- Entering the step width of the center frequency
- Quitting the submenu
- Setting the step size manually
- Setting the step size automatically
- Setting the step size to the center frequency
- Setting the step size to the marker frequency

Open submenu:
- Display modes for the frequency axis
- Displaying the whole frequency range
- Switching over to the ZERO SPAN
- Restoring the previous setting
- Reducing the span
- Increasing the span
- Expanding the diagram area to fill the whole screen

Open submenu:
- Signal tracking
- Activating signal tracking
- De-activating signal tracking
5.5.1.2 AMPT Menu

Function key assignment

- **REF LEVEL**: Entering the reference level (☞ 6-82)
- **REF LEVEL OFFSET**: Entering a level offset (☞ 6-83)
- **RANGE**: Selecting the level display range (☞ 6-84)
- **UNIT**: Selecting a unit for the level display (☞ 6-85)
- **RF ATEN MANUAL**: Setting the RF input attenuation manually (☞ 6-87)
- **RF ATEN AUTO**: Setting the RF input attenuation automatically (☞ 6-88)
5.5.1.3 MKR Menu

Function key assignment

### Open submenu:
Activate marker 1

- Quitting the submenu
- Place marker 1 on the trace maximum
  - Place marker 1 on the next trace maximum to the left
  - Place marker 1 on the next trace maximum to the right
- Measure the signal frequency: Start measurement
- Measure signal frequency: Set resolution
- De-activate marker 1

### Open submenu:
Activate marker 2

- Quitting the submenu
- Place marker 2 on the trace maximum
  - Place marker 2 on the next trace maximum to the left
  - Place marker 2 on the next trace maximum to the right
- Set marker 2 as a normal marker (NORM)
- Set marker 2 as a delta marker (DELTA)
- De-activate marker 2

### Open submenu:
Accepting marker values as settings

- Quitting the submenu
- Set the center frequency to the marker frequency
- Set the marker level as a reference level
- Set the step size for entering the center frequency to the marker frequency
Open submenu:
Marker measurement functions

- Measuring noise power density (§ 6-103)
- Measuring signal bandwidth (§ 6-104)

Open submenu:
Search criterion of functions NEXT PEAK LEFT/RIGHT

- Entering the peak excursion (§ 6-108)

Open submenu:
Reference points for measuring level differences

- Activating the entry of arbitrary reference points (§ 6-111)
- Using M1 marker values as a reference point (§ 6-111)
- Entering the reference-point level (§ 6-111)
- Entering the reference-point frequency (§ 6-111)
- Entering the reference-point time (§ 6-111)
5.5.1.4 BW/SWEEP Menu

Function key assignment

- **RES BW**
  - Setting the resolution bandwidth manually (6-115)
  - Activating automatic resolution bandwidth setting (6-115)
- **VIDEO BW**
  - Setting the video bandwidth manually (6-116)
  - Activating automatic video bandwidth setting (6-116)
- **COUPL RATIO**
  - Open submenu:
    - Setting the RBW/VBW coupling ratio
      - Setting the RBW/VBW coupling ratio manually (6-118)
      - Activating the default setting for the coupling ratio (6-118)
  - Quitting the submenu
- **SLEEP**
  - Open submenu:
    - Setting the sweep time
      - Starting a continuous frequency sweep (6-120)
      - Performing an n-times sweep (6-120)
      - Setting the number of sweeps (6-120)
      - Repeating n-times sweeps (6-121)
      - Setting the sweep time manually (6-121)
      - Activating automatic sweep-time setting (6-121)
5.5.1.5 TRACE Menu

Function key assignment

**Open submenu:**
Selecting the active trace

- Quitting the submenu
- Turning on and activating Trace 1
- Turning on and activating Trace 2

Trace display mode: Overwrite mode
Trace display mode: Min./Max. hold
Trace display mode: Averaging
Freezing the trace
Blanking out the trace

**Open submenu:**
Trace difference

- Quitting the submenu
- Turning on the trace-difference mode
- Repositioning Trace 1 (result)
- Turning off the trace-difference mode
5.5.1.6 TRIG Menu

Function key assignment

- **FREE RUN**
  - Free-running measurements
  
- **EXTERNAL**
  - Triggering by an external TTL signal
  
- **VIDEO**
  - Triggering by the display level

- **LINE**
  - Triggering by the AC-line frequency

- **TRIG OFFSET**
  - Entering a trigger offset

**Open submenu:**

Quitting the submenu

- Triggering on positive-going edge
  
- Triggering on negative-going edge

(6-133)
5.5.1.7 MEAS Menu

Function key assignment

Open submenu:
Measure the power in the time domain (ZERO SPAN)

- Quitting the submenu
- Output the peak value within the section (6-140)
- Output the mean value within the section (6-140)
- Insert a vertical line to limit the lower (left) part of a section (6-140)
- Insert a vertical line to limit the upper (right) part of a section (6-140)
- Switch off the power measurement (6-140)
- Measure the third-order intercept point (6-143)
5.5.2  SYSTEM Functions

5.5.2.1  PRESET Menu

Function key assignment

- Calls an instrument default setting (§ 6-147)
- Selects an instrument default setting (§ 6-147)

5.5.2.2  STATUS Menu

Function key assignment

- Displaying the current instrument setting (§ 6-148)

5.5.2.3  FILE Menu

Function key assignment

- Saves a user-defined setting (§ 6-150)
- Loads a user-defined setting (§ 6-150)
- Prints out a screenshot (§ 6-150)

5.5.2.4  CONFIG Menu

Function key assignment

- Sets the date and time (§ 6-157)
- Selects an internal or external reference source (§ 6-159)
- Configures the instrument interfaces (§ 6-160)
- Sets the screen saver mode (§ 6-162)
- Selects an internal or external monitor (§ 6-164)

5.5.2.5  SERVICE Menu

Function key assignment

- Performs a selftest (§ 6-165)
5.5.2.6 INFO Menu

Function key assignment

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARDWARE INFO</td>
<td>Displays module data</td>
<td>6-167</td>
</tr>
<tr>
<td>STATISTICS</td>
<td>Displays instrument statistics</td>
<td>6-167</td>
</tr>
<tr>
<td>SYSTEM MESSAGES</td>
<td>Displays system messages</td>
<td>6-168</td>
</tr>
</tbody>
</table>
6 Using the R&S FS300

This chapter

All the spectrum analyzer functions and their uses are fully described in chapter 6. The order in which the menus are described follows that of the procedures for configuring and starting measurements:

- R&S FS300 default settings
- Setting measurement parameters
- Selecting and configuring measurement functions

Further information

The operating concept is explained in chapter 5, which also contains an overview of the menus and functions.

The index at the end of this manual will also help you find the information you want.

6.1 R&S FS300 Factory Settings

Switching on for the first time

When you switch on the R&S FS300 (3-39), the settings you were using when the instrument was last switched off are restored.

When you switch on for the first time, the factory default settings are activated:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency axis</td>
<td></td>
</tr>
<tr>
<td>Center frequency (CENTER)</td>
<td>1.5 GHz</td>
</tr>
<tr>
<td>Frequency span (SPAN)</td>
<td>3 GHz</td>
</tr>
<tr>
<td>Step size for center frequency</td>
<td>150 MHz</td>
</tr>
<tr>
<td>Level axis</td>
<td></td>
</tr>
<tr>
<td>Reference level (REF LEVEL)</td>
<td>-20 dBm</td>
</tr>
<tr>
<td>Level offset (REF LEVEL OFFSET)</td>
<td>0 dB</td>
</tr>
<tr>
<td>Level range (RANGE)</td>
<td>80 dB</td>
</tr>
<tr>
<td>Level unit (UNIT)</td>
<td>dBm</td>
</tr>
<tr>
<td>RF input</td>
<td></td>
</tr>
<tr>
<td>Input attenuation (RF ATTEN)</td>
<td>AUTO (NORMAL)</td>
</tr>
<tr>
<td>Bandwidth</td>
<td></td>
</tr>
<tr>
<td>Sweep time (SWEEP TIME)</td>
<td>AUTO</td>
</tr>
<tr>
<td>Resolution bandwidth (RES BW)</td>
<td>AUTO (1 MHz)</td>
</tr>
<tr>
<td>Video bandwidth (VIDEO BW)</td>
<td>AUTO (1 MHz)</td>
</tr>
<tr>
<td>Frequency sweep</td>
<td></td>
</tr>
<tr>
<td>Sweep</td>
<td>CONT SWEEP</td>
</tr>
<tr>
<td>Trace</td>
<td>CLEAR/WRITE</td>
</tr>
<tr>
<td>Trigger</td>
<td>FREE RUN</td>
</tr>
<tr>
<td>Markers</td>
<td>Marker 1 and marker 2</td>
</tr>
</tbody>
</table>

Note

The factory default setting is stored in non-volatile memory in the R&S FS300 and can be reloaded at any time (6-146).
### 6.2 Spectrum Analyzer

**Introduction**

The R&S FS300 measures signal spectra over the selected frequency range using the selected resolution bandwidth and sweep. The time characteristic of the amplitude at the set frequency is displayed in zero span.

**User interface**

When the R&S FS300 is switched on and the selftest passed, the spectrum analyzer’s user interface is activated. The following is displayed on the screen [13]:

![Diagram of Spectrum Analyzer](image)

**Menus for configuring and starting measurements**

The menus used to set the spectrum analyzer are displayed in the menu area. The order of the menus mirrors that of the procedure for configuring and starting measurements:

- **SELECT**
  - Selecting the frequency span (setting the x axis in the diagram area) (☞ 6-70)
  - Setting the level axis and the RF input (setting the y axis in the diagram area) (☞ 6-81)
  - Signal analysis with marker functions (☞ 6-90)
  - Setting the bandwidths and the sweep time (☞ 6-114)
  - Displaying the trace (☞ 6-122)
  - Triggering the measurement (☞ 6-132)
  - Measurement functions (☞ 6-138)
6.2.1 Selecting the Frequency Span (FREQ/SPAN Menu)

Use the FREQ/SPAN menu to specify the frequency range.

- Select the **FREQ/SPAN** menu using the ↓ or → cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys.

**Function key assignment**

**1st variant:** Setting the frequency range
Enter the center frequency (CENTER) and the SPAN (6-71)

**2nd variant:** Setting the frequency range
Enter the START and STOP frequencies (6-72)

**Open submenu:**
Entering the step width of the center frequency (6-73)

**Open submenu:**
Frequency axis display modes (6-75)

**Open submenu:**
Signal tracking (6-79)
6.2.1.1 Entering the Center Frequency and the Span

Use

If you know the frequency of the signal you want to measure, you can set the x axis of the diagram area accordingly. Enter the signal frequency as the center frequency (CENTER) and specify a SPAN.

Entering the center frequency

1. Press the CENTER function key in the menu.
   An entry field containing the current setting is displayed:

2. Enter the new value (5-54).
   The entry range for the center frequency is:
   \[ 500 \text{ Hz} \leq \text{Center} \leq 2,9999995 \text{ GHz} \]

Setting the span

3. Press the SPAN function key in the menu.
   An entry field containing the current setting is displayed:

4. Enter the new value (5-54).
   The span entry range is:
   \[ 1 \text{ kHz} \leq \text{Span} \leq 3 \text{ GHz} \]
   The new setting is saved and displayed in the diagram area. The grid lines associated with the frequency axis represent 1/10 of the current span.

Note

The effect of pressing the CENTER or SPAN function key is to switch the frequency axis lettering in the diagram area to the display showing the current center frequency and the span.
6.2.1.2 Entering the Start Frequency and the Stop Frequency

Use

If you want to analyze a specific frequency range, you can enter a start frequency and a stop frequency. The frequency range is shown along the x axis of the diagram area.

**Entering a start frequency**

1. Press the `START` function key in the **Freq** menu.
   An entry field containing the current setting is displayed:
   ![Start Frequency Entry Field]

2. Enter the new value (\( \geq 5\text{-}54 \)).
   The entry range for the start frequency is:
   \[ 0 \leq \text{Start} \leq 2,999999 \text{ GHz} \]

**Entering a stop frequency**

3. Press the `STOP` function key in the **Freq** menu.
   An entry field containing the current setting is displayed:
   ![Stop Frequency Entry Field]

4. Enter the new value (\( \geq 5\text{-}54 \)).
   The entry range for the stop frequency is:
   \[ 1 \text{ kHz} \leq \text{Stop} \leq 3 \text{ GHz} \]

   The new setting is saved and displayed in the diagram area. The grid lines associated with the frequency axis represent 1/10 of the current span.

**Note**

The effect of pressing the `START` or the `STOP` function key is to switch the lettering of the frequency axis in the diagram area to the display showing the current start and stop frequencies.
6.2.1.3 Entering the Step Width of the Center Frequency

What the settings are for

Using the CF STEP SIZE submenu, you can set any step size of the rotary knob you want or have the R&S FS300 set a step size that is a function of the measurement parameters.

Selecting the CF STEP SIZE submenu

- Press the_CF_STEP_SIZE_function key in the menu.

The submenu opens and the appropriate functions are assigned to the function keys.

<table>
<thead>
<tr>
<th>CF STEP SIZE</th>
<th>MANUAL</th>
<th>AUTO</th>
<th>CENTER</th>
<th>MARKER</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF</td>
<td>dBm</td>
<td>kHz</td>
<td>MHz</td>
<td>RF</td>
</tr>
<tr>
<td>CENTER</td>
<td>1.5 Hz</td>
<td>Scan</td>
<td>3.0 Hz</td>
<td></td>
</tr>
</tbody>
</table>

Function key assignment

- Quitting the submenu
- Setting the step size manually
- Setting the step size automatically
- Setting the step size to the center frequency
- Setting the step size to the marker frequency

Note

The MANUAL and AUTO function keys are selection keys. In other words, only one setting can be activated at any one time. The function key in question is highlighted. The AUTO function is the default setting.

The MARKER function key is available only when marker 1 is turned on.
6.2.1.3.1 Setting the Step Size

Setting the step size manually

If you want to examine the frequency spectrum at certain intervals, you can enter the value of your choice for the step size of the rotary knob.

1. Press the \textbf{function key} in the \textbf{submenu}.
   An entry field containing the current setting is displayed:

2. Enter the new value (\textasciitilde 5-54).
   The entry range for the step size is:
   \[ 1 \text{ Hz} \leq \text{Step Size} \leq 2,999999 \text{ GHz} \]

Setting the step size automatically

If you want to change the center frequency using steps that are small compared with the span, select the automatic setting mode.

- Press the \textbf{function key} in the \textbf{submenu}.
  The step size is set to a tenth of the current span.

Setting the step size to the center frequency

If you make the step size equal to the center frequency (or an integer multiple of the center frequency), it is easy to find harmonics which are multiples of the center frequency.

- Press the \textbf{function key} in the \textbf{submenu}.
  The step size is made equal to the current center frequency.

Setting the step size to the marker frequency

If you make the step size equal the marker frequency, you can search through the frequency spectrum and quickly jump back to the frequency at which you started.

- Press the \textbf{function key} in the \textbf{submenu}.
  The step size is made equal to the current marker frequency (\textasciitilde 6-90).
6.2.1.4 Frequency-Axis Display Modes

What the settings are for

The frequency axis (x axis) can be displayed in a number of ways. Using the SPAN SETTINGS submenu, you can display the whole frequency range, zoom in on subranges of the frequency axis or project the diagram area onto the whole of the screen, if and when you require.

If you switch over to the time domain (ZERO SPAN), you can display the amplitude of the carrier signal as functions of time.

Selecting the SPAN SETTINGS submenu

- Press the function key in the menu.

The submenu opens and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Quitting the submenu
- Displaying the whole frequency range
- Switching over to the ZERO SPAN
- Restoring the previous setting
- Zoom function: Reducing the span
- Zoom function: Increasing the span
- Zoom function: Filling the whole screen with the diagram area
6.2.1.4.1 Displaying the Whole Frequency Range

Use

If you do not know the frequency of the signal to be investigated, you can display the R&S FS300's whole frequency range along the x axis of the diagram area. You can then systematically reduce the span to the appropriate size (6-71).

The whole frequency range display can also be used to swap backwards and forwards between an overview measurement (FULL SPAN) and a detailed measurement (LAST SPAN, e.g. center frequency and span set manually).

Displaying the whole frequency range

1. Press the function key in the menu.

The old setting is saved and the R&S FS300's whole frequency range is displayed in the diagram area.

Displaying the last span

2. Press the function key in the menu.

The last span setting is displayed in the diagram area, e.g. 1 GHz:

Note

The last span is restored if and only if the span is > 0, in other words, the time domain (ZERO SPAN) will not be selected automatically.
6.2.1.4.2 Switching over to the ZERO SPAN

Use

The amplitude of a particular signal component in the frequency spectrum can be displayed as a function of time. To activate this mode, enter the frequency of the signal component as the center frequency. You can then define the x axis to be the time axis.

Specifying the signal component

1. Press the function key in the menu.

An entry field containing the current setting is displayed:

2. Enter the frequency of the signal component you want to display in the time domain (6-71).

Switching over to the ZERO SPAN

3. Press the function key in the submenu.

The x axis becomes the time axis and the signal amplitude at the current center frequency is displayed as a function of time (current sweep time). The grid line spacing represents 1/10 of the current sweep time (6-119).

Switching over to the frequency domain

4. Press the function key in the submenu.

The last span is displayed in the diagram area.
6.2.1.4.3 ZOOM Functions

Use

If you want to increase or decrease the size of the screen window to analyze traces, you can zoom onto sections of the span or fill the whole screen with the current screen window.

Reducing the span

- Press the ZOOM IN function key in the SPAN SETTINGS submenu.

  The span is reduced by a factor of two. The center frequency remains the same.

Increasing the span

- Press the ZOOM OUT function key in the SPAN SETTINGS submenu.

  The span is increased by a factor of two. The center frequency remains the same. The center frequency will be adapted if the new display frequency range exceeds the maximum permissible start or stop frequency.

Whole screen

1. Press the FULL SCREEN function key in the SPAN SETTINGS submenu.

   The menu area, the function area and the parameter field are blanked out on the screen [13]. The diagram area then fills the whole screen. The scale lettering and all key parameters are displayed within the diagram area.

2. Press any key to return to the normal display mode.
6.2.1.5 Signal Tracking

What the settings are for

When signal tracking is selected, the center frequency of the R&S FS300 is continually set to the frequency of the signal with most power. This means that a signal whose frequency is changing slowly in comparison with the sweep time can be kept in the center of the screen. The capture range of the function is ± span/5 referring to the center frequency. The spectrum analyzer’s center frequency is adjusted after each sweep.

Selecting the SIGNAL TRACK submenu

- Press the function key in the menu.

The submenu opens and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Quitting the submenu
- Activating signal tracking (6-80)
- De-activating signal tracking (6-80)
6.2.1.5.1 Activating Signal Tracking

Use
If the frequency of the signal being analyzed is continually varying, you can use this function to obtain a display that appears to be stationary. The power of signals of this kind can then be measured over long periods.

Activating signal tracking

- Press the function key in the submenu.

The center frequency is constantly adjusted so that the signal peak is always in the middle of the screen. The latest center frequency to be set is displayed. The peak will continue to be tracked provided it remains within the span referring to the center frequency.

De-activating signal tracking

- Press the function key in the submenu.

The center frequency ceases to be tracked and remains at its last value.
6.2.2 Setting the Level Axis and the RF Input (AMPT Menu)

From the AMPT menu, you can define the y axis of the measurement diagram as the level axis. You can also specify the attenuation of the RF input.

- Select the **AMPT** menu with the left or right cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

### Function key assignment

- **Entering the reference level** (⇒ 6-82)
- **Entering a level offset** (⇒ 6-83)
- **Selecting the level display range** (⇒ 6-84)
- **Selecting the level display unit** (⇒ 6-85)
- **Setting the RF input attenuation manually** (⇒ 6-87)
- **Setting the RF input attenuation automatically** (⇒ 6-88)

**Note**

The **RF ATTN MANUAL** and **RF ATTN AUTO** function keys are selection keys. In other words, only one setting can be activated at any one time. The function key in question is highlighted.

The **RF ATTN AUTO** function is the default setting.
6.2.2.1 Entering the Reference Level

Use

The upper diagram limit is specified with the reference level.

Note

The currently activated unit is used as the unit for reference level entries (6-85). The default setting is “dBm”.

Entering the reference level

1. Press the function key in the menu.

An entry field containing the current setting is displayed. The default setting is -20 dBm.

2. Enter a new value in 0.1 dB steps (5-54).

The entry range for the reference level is:

\[-110 \text{ [dBm]} \leq \text{Reference} \leq +36 \text{ [dBm]}\]

The new setting is saved and displayed in the diagram area. The reference level defines the upper limit of the diagram.
6.2.2.2 Entering a Level Offset

Use
If you have connected external attenuators or amplifiers between the DUT and the RF input, you can enter a level offset to adjust the level display. The level offset is added to the reference level.

REF LEVEL + REF LEVEL OFFSET

1. Press the function key in the menu.
An entry field containing the current setting is displayed. The default setting is 0 dB.

2. Enter a new value in 0.1 dB steps (5-54).
The entry range for the level offset is:

-100 [dB] ≤ Ref Lvl Offset ≤ +50 [dB]

The new setting is saved and displayed in the diagram area. The text “Offs” is also displayed in the top left of the diagram.

The level offset is always entered in dB no matter what unit is used for the reference level. If the units mV or mW are used, the offset is automatically converted so that the reference level is displayed correctly:

\[ \text{REF LEVEL}_{\text{Display}} = \text{REF LEVEL} + \text{REF LEVEL OFFSET} \]

\[ \text{e.g.} \quad -20 \text{ dBm} + 40 \text{ dB} = 20 \text{ dBm} \]
6.2.2.3 Selecting the Level Display Range

Use the level display range to define the “visible” level range and set the measurement diagram scale.

Levels can be displayed using either logarithmic or linear scales. The lettering of the grid lines is automatically adapted.

- 8 dB
  1 dB/div.
- 16 dB
  2 dB/div.
- 40 dB
  5 dB/div.
- 80 dB
  10 dB/div.
- LINEAR
  12.5 %/div., linear scale, 100 % corresponds to the reference level, 0 % to 0 V or 0 W

Entering the level display range

1. Press the RANGE function key in the menu. A selection field containing the available settings is displayed. The default setting is 80 dB.

2. Select a level display range with rotary knob [10].

The new setting is saved and displayed in inverse video in the diagram area. The level display range is referred to the reference level. This determines how the grid lines are lettered, for example, for REF LEVEL = -20 dBm and RANGE = 80 dB, the first grid line is at -20 dBm and the second at -30 dBm, and so on.
Note

The level display range uses the currently activated unit (6-85).

6.2.2.4 Selecting the Level Display Unit

Use

To make it easier to analyze results, you can display levels in dBm, dBmV, dBµV, mV and mW.

Selecting the unit for the level display

1. Press the UNIT function key in the menu.

   A selection field containing the available settings is displayed. The default setting is dBm.

2. Select a unit for the level display with rotary knob [10].


   The new setting is saved and displayed in the diagram area.

How RANGE and UNIT are related

Log display/RANGE in dBx (The letter x is a wildcard character for the letters m, mV or µV.)

If a dB display has been selected for RANGE (6-84) and a dBx display for UNIT, the vertical-scale unit is dB. The values indicated by the level markers and the relevant level entries are in dBx.
**Log display/RANGE in xV or xW** (The letter x is a wildcard character for the letters m, mV or µV.)

If a mV or mW has been selected for UNIT, only the reference level is displayed in the selected unit. There is no grid lettering. The values shown by the level markers and the relevant level entries are in the selected unit.

**Linear display/RANGE in xV or xW** (The letter x is a wildcard character for the letters m, mV or µV.)

If the linear scale is selected for RANGE, the scale lettering indicates percent, e.g. 0 %, 25 %, 50 %, 75 % and 100 %. The values indicated by the level markers and the relevant level entries are in the selected unit.
6.2.2.5 Setting the RF Input Attenuation Manually

Use

In the default setting, the input attenuation is coupled to the reference level. In most cases, this is the setting that will be used because it prevents the input stages from being overdriven and so, consequently, any incorrect measurements.

In exceptional cases, it may be necessary to adjust the input attenuation manually with input attenuations from 0 to 70 dB.

Setting the input attenuation manually

1. Press the function key in the menu.

   A selection field containing the available settings is displayed. The default setting is 16 dB.

2. Select an input attenuation for the RF input with rotary knob [10].


   The new setting is saved and the RF input is re-configured.

Invalid parameter entry

If the reference level you have specified cannot be set for the input attenuation that has been entered, (6-82), it is automatically adjusted.
6.2.2.6 Setting the RF Input Attenuation Automatically

Use

The input attenuation should be set automatically to prevent the R&S FS300’s input mixer from being overloaded. There are three RF input modes you can choose from (coupling between reference level and input attenuation) to optimize measurements:

- **NORMAL**
  Normal setting for measurements.

- **LOW NOISE**
  Settings for measurements with low displayed average noise level of the analyzer.

- **LOW DISTORTION**
  Setting for measurements with low inherent distortion of the analyzer.
Activating the automatic input attenuation setting mode

1. Press the **function key** in the **RMT** menu.
   A selection field containing the available settings is displayed. The default setting is NORMAL.

2. Using the **rotary knob** [10] select a criterion for autosetting the input attenuation.

3. Press the **ENTER key** [5] to close the selection field.
   The new setting is saved and the RF input is configured automatically according to the setting.
6.2.3 Signal Analysis using Marker Functions (MRK Menu)

**What the settings are for**

Using the MRK menu, you can position markers on any point on the trace to read off any levels or level differences of interest. The measured values indicated by the markers (marker values) are displayed in the parameter field (5-48).

A scrollable display line can also be shown on-screen.

**Selecting the MKR menu**

- Select the **MRK** menu with the ← or → cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

**Function key assignment**

- **Open submenu:**
  - Activate marker 1
  - (6-91)
  - Activate marker 2
  - (6-95)
  - Accepting marker values as settings
  - (6-98)
  - Marker measurement functions
  - (6-102)
  - Show display line
  - (6-106)
  - Search criterion of functions NEXT PEAK LEFT/RIGHT
  - (6-107)
  - Reference points for level-difference measurements
  - (6-110)

**Note**

- The function keys are selection keys.

- The function key is available only when marker 1 is turned on.

- The function keys are available only when marker 1 is turned on.
6.2.3.1 Activating Marker 1

**What the settings are for**

From the MARKER 1 submenu, you can activate a marker and position it on the trace. All the current level and frequency values (marker values) are displayed.

The frequency indicated by the marker can be measured more accurately with the FREQ COUNT function.

**Selecting the MARKER 1 submenu**

- Press the function key in the menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

**Function key assignment**

- **MARKER 1**
  - **RETURN**
  - **PERK**
  - **NEXT PERK LEFT**
  - **NEXT PERK RIGHT**
  - **SIGNAL COUNT**
  - **COUNT RESOL**
  - **MARKER OFF**

- **Quit**
  - **MARKER 1**, **PERK**
  - **NEXT PERK LEFT**
  - **NEXT PERK RIGHT**
  - **SIGNAL COUNT**
  - **COUNT RESOL**
  - **MARKER OFF**

- **Activate marker 1 and place it on the trace maximum**
  - **6-92**

- **Place marker 1 on the next peak to the left**
  - **6-92**

- **Place marker 1 on the next peak to the right**
  - **6-92**

- **Measure the signal frequency: Start the measurement**
  - **6-94**

- **Measure the signal frequency: Set the resolution**
  - **6-94**

- **De-activate marker 1**
  - **6-92**

**Note**

The **SIGNAL COUNT** and **COUNT RESOL** function keys are available only when marker 1 has been activated.
6.2.3.1.1 Reading off Measured Values with Marker 1

Use

You can position marker 1 on the trace to read off specific levels and frequencies (marker values).

Activating marker 1 and placing it on the trace maximum

1. Press the function key in the submenu.

Marker 1 is activated and placed on the current trace maximum. M1 marker values are displayed in the parameter field.

Placing marker 1 on the next trace maximum

2. Press the or function key in the submenu.

Marker 1 is positioned on the next trace maximum to the right (or left). The new M1 marker values are displayed in the parameter field.

Note

The search criterion of functions NEXT PEAK LEFT/RIGHT can be changed by using the funktion key (6-108).
3. Change the marker position with **rotary knob** [10].

The current M1 marker values are displayed in the parameter field.

---

**Scrolling marker 1**

- Change the marker position with the **rotary knob** [10].

The current M1 marker values are displayed in the parameter field.

---

**De-activating marker 1**

- Press the function key in the **MARKER** submenu.

Marker 1 (and marker 2, if activated) disappears from the diagram area and the M1 (M2) marker values are blanked out.

---

**Note**

The **NEXT PEEK RIGHT** and **NEXT PEEK LEFT** function keys can also be used to activate marker 1.
6.2.3.1.2 Frequency Measurements using the Frequency Counter

Use
The normal marker indicates the frequency represented by the pixel on which it is placed. The measurement uncertainty is relatively large because the number of pixels is limited to 250.

When a measurement is made with the frequency counter, the sweep is stopped at the frequency indicated by marker 1, the frequency is counted using the required resolution (1 KHz, 100 Hz, 10 Hz, 1 Hz) and then the sweep is restarted. There must be a periodic signal at the marker position if the measurement is to be successful.

Setting the resolution

1. Position marker 1 on the trace (6-91).
   The current M1 marker values are displayed in the parameter field.

2. Press the function key in the submenu.
   A selection field containing the available settings is displayed. The default setting is 100 Hz.

3. Select a resolution for the internal frequency counter with rotary knob [10], e.g. 1 Hz.
   The new setting is saved.

Measuring the signal frequency

4. Press the function key in the submenu.
   The frequency is counted with the internal counter. The result is displayed in the parameter field instead of the marker frequency (M1).

De-activating the measurement

• Press the function key in the submenu.
   The internal counter is turned off. The current M1 marker values are again displayed in the parameter field.

Note
The absolute accuracy of the frequency measurement depends on the frequency stability of the reference-oscillator. When the internal reference is used, the accuracy is given according to the values specified in the data sheet (0-11).
6.2.3.2 Activating Marker 2

From the MARKER 2 submenu, you can activate a second marker and position it on the trace.

Marker 2 can be used either as a normal marker (NORM) or as a delta marker (DELTA). The delta marker function expands the R&S FS300’s analysis capability and can be used as a basis for a variety of measurement techniques (6-138).

Note

Marker 2 can only be activated if marker 1 has been activated.

Selecting the MARKER 2 submenu

- Press the function key in the menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Quitting the submenu
  - Activate marker 2 and position it on the trace maximum (6-96)
  - Place marker 2 on the next peak to the left (6-96)
  - Place marker 2 on the next peak to the right (6-96)
  - Set marker 2 as a normal marker (NORM) (6-97)
  - Set marker 2 as a delta marker (DELTA) (6-97)
  - De-activate marker 2 (6-96)

Note

The and function keys are selection keys. In other words, only one setting can be activated at any one time. The function key in question is highlighted. The MARKER NORM function is the default setting.
6.2.3.2.1 Reading off Measured Values with Marker 2

**Use**

To read off specific levels, you can activate marker 2 as a normal marker (in addition to marker 1) and position it on the trace. The current level and frequency can be displayed in this way (M2 marker values).

**Activating marker 2 as a normal marker (NORM)**

1. Press the **MARKER** function key in the **MARKER** submenu.
   Marker 2 is activated and placed on the trace maximum.

2. Press the **MARKER** function key in the **MARKER** submenu.
   Marker 2 is defined as a normal marker. The M2 absolute marker values are displayed in the parameter field.

3. Position marker 2 on the trace ( § 6-92).
   The current M2 marker values are displayed in the parameter field.

**De-activating marker 2**

- Press the **MARKER** function key in the **MARKER** submenu.
  Marker 2 disappears from the diagram area and the M2 marker values are blanked out.

**Note**

The **NEXT PEAK RIGHT** and **NEXT PEAK LEFT** function keys can also be used to activate marker 2.
6.2.3.2.2 Reading off Level Differences

Use

You can define marker 2 as a delta marker to read off level differences from the trace. The level difference between marker 2 and a reference point is displayed. Marker 1 (6-91) or reference values that have been set manually (6-110) can be used as reference points.

Activating marker 2

1. Press the PEAK function key in the MARKER 2 submenu.
2. Position marker 2 on the trace (6-95).

The current M2 marker values are displayed in the parameter field.

Defining marker 2 as a delta marker (DELTA)

3. Press the function key in the MARKER 2 submenu.

Marker 2 is defined as a delta marker. The relative delta marker values (M), which represent the level difference between marker 2 and a reference point, e.g. marker 1, are displayed in the parameter field.
6.2.3.3 Accepting Marker Values as Settings

What the settings are for

From the MKR> submenu, you can accept the marker values of the active marker as settings for level, frequency or frequency steps.

The step size used to enter the center frequency with the help of the rotary knob can also be the marker frequency.

**Note**

The function key is only available when the markers are activated.

Selecting the MKR> submenu

- Press the function key in the MKR menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

Function key assignment

**Quitting the submenu**

Set the center frequency (CENTER) to the marker frequency

Moving the trace in the diagram area (x axis) (6-99)

Set the reference level (REF LEVEL) to the marker level

Moving the trace in the diagram area (y axis) (6-99)

Set the step size for entering the center frequency to the marker frequency (6-101)

**Note**

In the time-domain mode (ZERO SPAN), the function key is not available.
6.2.3.3.1 Moving Trace Sections in the Measurement Diagram

**Use**

If you want to analyze a section of the trace more closely, you can change its location within the measurement diagram using the active marker. The marker frequency becomes the center frequency and the marker level becomes the upper diagram boundary.

You can then analyze the trace section using a smaller span (6-71).

**Positioning markers on the trace**

1. Activate the markers (6-91, 6-95).
2. Press the function key in the menu.
   The selected marker is activated. All further marker settings are for the active marker, e.g. marker 1.
3. Position the active marker on the trace (6-92, 6-96).

**Setting the center frequency to the marker frequency**

4. Press the function key in the menu.
   The marker frequency is made the current center frequency (6-71). The trace is shifted horizontally to bring marker 1 into the center of the measurement diagram.

   The span remains unchanged provided the limits of 9 kHz or 3 GHz are not reached. Otherwise the span is reduced symmetrically about the center frequency. The lower limit for the span is 1 kHz.
Note

In the time-domain mode (ZERO SPAN), the function key is not available.

Setting the reference level to the marker level

5. Press the function key in the submenu.

The current marker level is set as the reference level (6-82). The trace is shifted vertically until the marker level forms the upper limit of the measurement diagram. The minimum value that can be set is -110 dBm.
6.2.3.3.2 Setting the Step Size to the Marker Frequency

Use

If you set the step size to the marker frequency, you will find that you can quickly jump back to the start frequency when you are stepping through the frequency spectrum with the help of the rotary knob.

Positioning markers on the trace

1. Turn on the markers (6-91, 6-95).
2. Press the function key in the menu.
   The selected marker is activated. All further marker settings are for the active marker, e.g. marker 1.
3. Position the activated marker on the trace (6-92, 6-96).
4. Press the function key in the submenu.
   The step size is set to the current marker frequency.

Note

“Setting the step size to the marker frequency” has the same function as the setting “step size for entering the center frequency” (6-73).
6.2.3.4 Marker Measurement Functions

What the settings are for

From the MKR FCTN submenu, using the markers, you can select certain spectral components of the input signal to measure the noise power density and the signal bandwidth.

Note

The function key is available only when the markers are turned on.

Selecting the submenu MKR FCTN

- Press the function key in the menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Quitting the submenu
- Measuring the noise power density (χ 6-103)
- Measuring the signal bandwidth (χ 6-104)
6.2.3.4.1 Measuring the Noise Power Density

Use

The R&S FS300 allows you to measure the noise power density at the active marker position.

Measuring noise power density

1. Turn on the markers (6-91, 6-95).
2. Position the activated marker (6-92, 6-96) as desired.

3. Press the function key in the submenu.

The noise power density measurement is started at the frequency indicated by a marker. If marker 1 is the only marker that has been turned on, the measurement is made at its position. If marker 2 has also been turned on, the measurement is made at its position.

Two points in the frequency domain (one to the right and one to left of the marker) and two points in the time domain (one to the right and one to left of the marker) are used in the calculation to obtain a stable measurement result. The noise power density is displayed in the marker field of the appropriate marker.

The noise power density display mode depends on the activated unit:

- dBm/Hz, W/Hz for powers
- dBμV/√Hz, mV/√Hz for voltages

De-activating the measurement

- Press the function key in the submenu.

The noise power measurement is terminated. The marker used for the measurement reverts to being a normal marker. Marker values are again displayed in the parameter field.
6.2.3.4.2 Measuring the Filter or Signal Bandwidth

Use

If you want to measure the bandwidth of a certain signal spectrum shown in the measurement diagram, you can do this with the N dB DOWN function. Two lines one of which is n dB down on the active reference marker are displayed on the screen [13]. The difference between the measured frequencies is displayed on the screen as the bandwidth.

Selecting the signal spectrum

1. Position marker 1 on the trace maximum which is to form the reference for the bandwidth measurement ( injunction 6-91).

Measuring the signal bandwidth

2. Press the function key in the submenu. An entry field containing the current attenuation setting of N dB is displayed. The default setting is 3 dB.

3. Enter a new value ( injunction 5-54). The entry range for the attenuation N is:

\[ 0 \leq \text{down} \leq 100 \text{ dB} \]

4. Press the ENTER key [5] to close the entry field. The new setting is saved and the temporary markers T1 and T2 which are positioned to the right and left of marker 1 on the trace are activated. The levels at markers T1 and T2 are N dB less than the level at marker 1. The frequency difference between the markers T1 and T2 (N dB bandwidth) is displayed in the parameter field instead of the M2 marker values.
Terminating the measurement

- Press the function key in the submenu.

The signal or filter bandwidth measurement is terminated and the temporary markers T1 and T2 disappear from the screen. The M2 marker values are again displayed in the parameter field.
6.2.3.5 Activating a Display Line

Use

If you want to observe whether a signal exceeds or falls below a certain level you can activate a horizontal display line in the measurement diagram and adjust its position.

Activating the display line

1. Press the D-LINE function key in the menu.
   
   A selection field containing the available settings is displayed.

2. Select the SCROLL setting with rotary knob [10].

   The display line appears at the top edge of the diagram area (REF LEVEL). The lettering “SCROLL or press ENTER” is displayed and indicates that the display line can be moved “up” or “down”.

Moving the display line

4. Change the position of the display line with rotary knob [10].
   
   The current level is displayed on the left above the display line.

5. Press the ENTER key [5] to terminate the scroll mode.
   
   The text SCROLL disappears, and the display line is now in its new position.

De-activating the display line

1. Press the D-LINE function key in the menu.
   
   A selection field containing the available settings is displayed.

2. Select OFF with rotary knob [10].

   The display line disappears from the diagram area.
6.2.3.6 Setting the Search Criterion of Functions NEXT PEAK LEFT/RIGHT

What the settings are for

From the MARKER SETTINGS submenu, you can set the search criterion of functions NEXT PEAK LEFT/RIGHT. The PEAK EXCURSION softkey enables – for level measurements – the entry of a minimum level value by which a signal must fall so that it will be identified as a maximum by the NEXT PEAK LEFT and NEXT PEAK RIGHT search functions.

Selecting the MARKER SETTINGS submenu

Press the function key in the menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

Function key assignment

Quitting the submenu

Entering the peak excursion

(7 6-108)
6.2.3.6.1 Entering the Peak Excursion

Use

If NEXT PEAK LEFT or NEXT PEAK RIGHT is selected, these functions search for the next relative maximum left or right of the current marker position irrespective of the current signal amplitude. When the signal level decreases for a definite amount, the peak excursion, to either side of the maximum a relative maximum is given.

Entering the peak excursion

4. Press the function key in the submenu.

An entry field containing the current setting is displayed. The default setting is 6 dB.

```
Peak Excursion: 0 dB
```

5. Enter a new value in 0.1 dB steps (5-54).

The entry range for the reference-point level is:

\[ 0 \leq \text{Peak Excursion} \leq 80 \text{ dB} \]

The new setting is saved and it is the current search criterion when you use the functions NEXT PEAK LEFT/RIGHT (6-92).

Examples of level measurement with different settings of PEAK EXCURSION

The following example illustrates the effect of different settings of the PEAK EXCURSION.

![Diagram of level measurement with different settings of PEAK EXCURSION](image)

The following table lists the signals as indicated by numbers in the measuring diagram above, as well as the minimum of the amplitude decrease to both sides of the signal:

<table>
<thead>
<tr>
<th>Signal #</th>
<th>Min. amplitude decrease to both sides of the signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 dB</td>
</tr>
<tr>
<td>2</td>
<td>35 dB</td>
</tr>
<tr>
<td>3</td>
<td>48 dB</td>
</tr>
<tr>
<td>4</td>
<td>35 dB</td>
</tr>
<tr>
<td>5</td>
<td>10 dB</td>
</tr>
</tbody>
</table>
50 dB peak excursion

With this setting, NEXT PEAK LEFT and NEXT PEAK RIGHT will not find any signal, as the signal level does not decrease by more than 48 dB to either side of any signal.

Order of signals detected:
PEAK: signal 3
NEXT PEAK LEFT: signal 3 (no further signal detected)
NEXT PEAK RIGHT: signal 3 (no further signal detected)

30 dB peak excursion

With this setting, NEXT PEAK LEFT and NEXT PEAK RIGHT will also detect signals 2 and 4, as the signal level decreases at least by 35 dB to either side of this signal, which is now greater than the peak excursion.

Order of signals detected:
PEAK: signal 3
NEXT PEAK LEFT: signal 2
NEXT PEAK LEFT: signal 2 (no further signal detected)
NEXT PEAK RIGHT: signal 3
NEXT PEAK RIGHT: signal 4
NEXT PEAK RIGHT: signal 4 (no further signal detected)

6 dB peak excursion

With this setting, all signals will be detected with NEXT PEAK RIGHT or NEXT PEAK LEFT.

Order of signals detected:
PEAK: signal 3
NEXT PEAK LEFT: signal 2
NEXT PEAK LEFT: signal 1
NEXT PEAK LEFT: signal 1 (no further signal detected)
NEXT PEAK RIGHT: signal 2
NEXT PEAK RIGHT: signal 3
NEXT PEAK RIGHT: signal 4
NEXT PEAK RIGHT: signal 5
NEXT PEAK RIGHT: signal 5 (no further signal detected)
6.2.3.7 Setting Reference Points for Level-Difference Measurements

What the settings are for

From the REF FIXED submenu, you can define any reference point within the R&S FS300's measurement range. You can use this point as a fixed reference for level-difference measurements using the delta marker (Æ 6-97).

Note

The function keys are available only when the markers are turned on.

Selecting the REF FIXED submenu

• Press the function key in the menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Quitting the submenu
  - Activate reference point entry (Æ 6-111)
  - Activate the M1 marker values as a reference point (Æ 6-111)
  - Enter the reference point level (Æ 6-111)
  - Enter the reference point frequency (Æ 6-111)
  - Enter the reference point time (Æ 6-111)

Note

The and function keys are selection keys. In other words, only one setting can be activated at any one time. The function key in question is highlighted.

The function key is available only in the frequency domain (SPAN > 0). The function key is available only in the time domain (ZERO SPAN).
### 6.2.3.7.1 Manual Entry of Reference Points

#### Use

There are two methods you can use to find level differences from the trace. The first method is to define a reference point on the trace using marker 1 (¶ 6-91).

The second approach is entering arbitrary reference points inside and outside the measurement diagram.

When you enter arbitrary reference points the M1 marker values are frozen. Instead, the R reference values are displayed in the parameter field. The M2 marker values indicate the level difference referred to the reference point.

#### Activating entry of arbitrary reference points

1. Press the function key in the submenu.

   It is now not possible to move marker 1. The M1 marker values are frozen and are used as fixed reference values R.

#### Entering reference point levels

2. Press the function key in the submenu.

   An entry field containing the current setting (frozen marker level) is displayed.

3. Enter a new value in 0.1 dB steps (¶ 5-54).

   The entry range for the reference-point level is:
   
   $$ -200 \ [\text{dBm}] \leq \text{Ref point level} \leq +200 \ [\text{dBm}] $$

   The new setting is saved and displayed in the diagram area. The value is not displayed if it is outside the diagram area.
Entering a reference point frequency

4a) Frequency-domain display mode (SPAN > 0, \(6-70\)):

- Press the function key in the submenu.

An entry field containing the current setting (frozen marker frequency) is displayed.

- Enter a new value (\(5-54\)).

The entry range for the reference point frequency is:

\[
0 \leq \text{Ref point freq} \leq 3 \text{ GHz}
\]

The new setting is saved and displayed in the diagram area. The value is not displayed if it is outside the diagram area.

The level and the frequency at the reference point form the fixed reference point for level-difference measurements with the delta marker in the frequency domain (\(6-97\)).

Entering a reference point time

4b) Time-domain display mode (ZERO SPAN, \(6-77\)):

- Press the function key in the submenu.

An entry field containing the current setting (frozen marker time) is displayed.

- Enter a new value (\(5-54\)).

The entry range for the reference-point time is:

\[
0 \leq \text{Ref point time} \leq t_{\text{SWEEP}}
\]

where \(t_{\text{SWEEP}}\) - current SWEEP time (\(6-121\))

The new setting is saved and displayed in the diagram area. If the value is outside the diagram area, it is not displayed.

The reference point level and time form a fixed reference point for level difference measurements with the delta marker in the time domain (\(6-97\)).
**Activating M1 marker values as reference points**

- Press the function key in the submenu.

The reference values (R) disappear from the screen and the M1 marker values are again activated. Marker 1 is positioned on the last reference point frequency on the trace and can again be moved, e.g., in the frequency-domain display mode.
6.2.4 Setting the Bandwidths and the Sweep Time (BW/SWEEP Menu)

What the settings are for

You can set the resolution bandwidth (RBW), the video bandwidth (VBW) and the sweep time using the BW/SWEEP menu. The parameters determine the measurement procedure and can be coupled as a function of the SPAN or set independently.

Selecting the BW/SWEEP menu

- Select the **BW/SWEEP** menu with the  or  cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Setting the resolution bandwidth manually (6-115)
- Activating automatic resolution bandwidth setting (6-115)
- Setting the video bandwidth manually (6-116)
- Activating automatic video bandwidth setting (6-116)

Open submenu:
- Setting the RBW/VBW coupling ratio (6-117)
- Setting the sweep time (6-119)

**Note**

The function keys and the function keys are selection keys. In other words, only one setting can be activated at any one time. The function key in question is highlighted. The RES BW AUTO and VIDEO BW AUTO functions are the default settings. The function key is not available in the time-domain display mode (ZERO SPAN).
### 6.2.4.1 Setting the Resolution Bandwidth

**Use**

The span and the resolution bandwidth can be set independently. In the default setting, however, these two parameters are coupled to make operating the instrument easier. This setting is recommended for many applications because operating errors are prevented. To make certain measurements, it may be necessary to set the resolution bandwidth and the span independently. With the R&S FS300, you can manually set resolution bandwidths from 200 Hz to 1 MHz in a 1, 2, 3, 5, 10 sequence.

**Setting the resolution bandwidth manually**

1. Press the function key in the menu.
   
   A selection field containing the available settings is displayed. The default setting is 1 MHz.
   
   ![Resolution Bandwidth Selection Field]
   
   2. Select a resolution bandwidth with rotary knob [10].

   The new setting is saved and the resolution filter is configured.

**Activating automatic resolution bandwidth setting**

- Press the function key in the menu.

   The resolution bandwidth is set to \( \frac{1}{50} \) of the span. If the span is changed, the resolution bandwidth is adjusted automatically.

---

**Note**

The function key is not available in the time-domain display mode (ZERO SPAN).
6.2.4.2 Setting the Video Bandwidth

Use

You can set a variety of video bandwidths to smooth the trace. You can set video bandwidths from 10 Hz to 1 MHz in a 1, 2, 3, 5, 10 sequence on the R&S FS300.

Setting the video bandwidth manually

1. Press the function key in the menu.
   A selection field containing the available settings is displayed. The default setting is 1 MHz.

2. Select a video bandwidth with rotary knob [10].

   The new setting is saved and the selected video bandwidth is set.

Activating automatic video bandwidth setting

- Press the function key in the menu.
   The R&S FS300's video bandwidth is set to three times the resolution bandwidth. If the resolution bandwidth is changed, the video bandwidth is adjusted automatically.
   Within the permissible setting range, the video bandwidth is set to the value that is closest to three times the value of the resolution bandwidth.
   The coupling ratio can be changed (7 6-117).
6.2.4.3 RBW/VBW Coupling Ratio

What the settings are for

You can set the coupling ratio between the video bandwidth and the resolution bandwidth using the COUPLING RATIO submenu.

Selecting the COUPLING RATIO submenu

- Press the \[\text{COUPL RATIO}\] function key in the \[\text{B/W SHEEP}\] menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

Function key assignment

<table>
<thead>
<tr>
<th>Function key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{COUPL RATIO}]</td>
<td>Quitting the submenu</td>
</tr>
<tr>
<td>[\text{RBW/VBW MANUAL}]</td>
<td>Setting the coupling ratio manually (§ 6-118)</td>
</tr>
<tr>
<td>[\text{RBW/VBW AUTO}]</td>
<td>Activating the default setting for the coupling ratio (§ 6-118)</td>
</tr>
</tbody>
</table>

Note

The \[\text{RBW/VBW MANUAL}\] and \[\text{RBW/VBW AUTO}\] function keys are selection keys. In other words, only one setting can be activated at any one time. The function key in question is highlighted.

The RBW/VBW AUTO function is the default setting.
6.2.4.3.1 Changing the Coupling Ratio

Setting the coupling ratio manually

1. Press the function key in the submenu.
   An entry field containing the current setting is displayed. The default setting is 1.

![RBW/VBW 10000](image)

2. Enter a new value (5-54).
   The entry range for the coupling ratio is:

   \[0.001 \leq \text{RBW/VBW} \leq 1000\]

   The new setting is saved and the VBW/RBW coupling ratio is set. If the resolution bandwidth is changed, the video bandwidth is adjusted automatically.

Activating the default setting for the coupling ratio

- Press the function key in the submenu.
  The R&S FS300's video bandwidth is set to three times the resolution bandwidth.
6.2.4.4 Setting the Sweep

You can select the type of sweep and the sweep time from the SWEEP submenu.

- Press the **SLEEP** function key in the **SLEEP** menu.

The submenu opens and the appropriate functions are assigned to the function keys [12].

Function key assignment

- **QUIT**
  - Quitting the submenu
  - (§ 6-120)

- **CONT SLEEP**
  - Starting the continuous sweep
  - (§ 6-120)

- **SINGLE SLEEP**
  - Performing an n-times sweep
  - (§ 6-120)

- **NO OF SLEEP**
  - Setting the number of sweeps
  - (§ 6-120)

- **REPEAT SLEEP**
  - Repeating an n-times sweep
  - (§ 6-121)

- **SLEEP TIME MANUAL**
  - Setting the sweep time manually
  - (§ 6-121)

- **SLEEP TIME AUTO**
  - Activating automatic sweep time setting
  - (§ 6-121)

**Note**

The **CONT SLEEP**, **SINGLE SLEEP** and **SLEEP TIME AUTO** function keys are selection keys. In other words, only one setting is activated at any one time. The function key in question is highlighted.

The COUNT SWEEP and SWEEP TIME AUTO functions are the default settings.

The **RES BN AUTO** function key is not available in the time-domain display mode (ZERO SPAN).
6.2.4.4.1 Selecting the Frequency Sweep

Use

Frequency sweep is the process where the resolution filter covers a defined frequency range. Sweeps may be performed continuously (CONT SWEEP) or once (SINGLE SWEEP).

Starting a continuous sweep

- Press the function key in the submenu.

The sweep repeats continuously when the trigger event is detected (6-132).

Performing an n-times sweep

1. Press the function key in the submenu.

An n-times sweep is started when the trigger event is detected. The number of sweeps is specified with the NO. OF SWEEPS setting (below).

When you repeatedly press the function key, the previous trace is cleared and a new frequency sweep (n times) is started.

Setting the number of sweeps

2. Press the function key in the submenu.

An entry field containing the current setting is displayed. The default setting is 0 (endless sweeps).

3. Enter a new value (5-54).

The entry range for the number of sweeps is:

\[ 0 \leq \text{Cycle Count} \leq 32767 \]

The new setting is saved and when a single sweep has been started, the sweep is repeated n times.

Repeating an n-times sweep

4. Press the function key in the submenu.

An n-times sweep is started when the trigger event is detected. The trace is not cleared on completion of the sweep as would be the case with the single-sweep function.

This is most relevant in relation to the TRACE AVERAGE and HOLD functions if measured values that have already been recorded have to be taken into account for averaging and finding the minimum/maximum.
6.2.4.4.2 Setting the Sweep Time

Use

The sweep time is the time taken by the resolution filter set to a specific bandwidth (RBW) to sweep a particular frequency range or span. In the default setting, the sweep time is coupled to the span (SPAN), the resolution bandwidth (RBW) and the video filter (VBW).

Setting the sweep time manually

1. Press the **function key** in the **submenü**.
   
   An entry field containing the current setting is displayed. The default setting is 15.5 ms. The default setting is at SPAN = 1 GHz and
   
   - RBW = 300 kHz: 137.833 ms
   - RBW = 1 MHz: 24.825 ms

2. Enter a new value (5-54).
   
   The entry range for the sweep time is:

   \[ 0 \text{ ms} \leq \text{Sweep Time} \leq 10 \text{ ms} \]

3. Press the **ENTER key** [5] to close the entry field.
   The new setting is saved and the new sweep time activated.

Activating automatic sweep time setting

- Press the **function key** in the **submenü**.

   The sweep time is coupled to the span, the resolution bandwidth (RBW) and the video bandwidth (VBW). The sweep time is automatically adjusted if either the span, the RBW or the VBW are changed.

   The R&S FS300 always selects the shortest possible sweep time consistent with valid results. The maximum level error trade-off for a longer sweep time is < 0.1 dB. If you do not want the additional bandwidth and level error, set the sweep time manually to three times the suggested value (5 above).
6.2.5 Measured-Value Display (TRACE Menu)

What the settings are for

Using the TRACE menu, you can apply various display modes to the input-signal results. Two traces (Trace 1, Trace 2) are provided for this purpose.

- Select the TRACE menu with the ‣ or † cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Selecting the TRACE menu

• Select the menu with the 3 or 4 cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Function key assignments

Open submenu:
- Select the active trace (6-123)
- Trace display mode: Overwrite mode (6-126)
- Trace display mode: Min/Max Hold (6-126)
- Trace display mode: Averaging (6-126)
- Freezing the trace (6-126)
- Blanking out the trace (6-126)

Open submenu:
- Trace difference function (6-129)

Note

The function keys CLEAR/WRITE, HOLD, TRAC AVERAGE, VIEW, or BLANK are selection keys. In other words, only one setting can be active at any one time. The function key in question is highlighted.

The CLEAR/WRITE function is the default setting.

The MATH function key is only available when both traces are on (6-123).
6.2.5.1 Selecting the Active Trace

Via the SELECT TRACE submenu, you can activate a second trace and select the current trace (Trace 1, Trace 2) to which all the following settings will be applied.

Selecting the SELECT TRACE submenu

- Press the function key in the menu.

The submenu opens and the appropriate functions are assigned to the function keys [12].

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<tr>
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<tr>
<td>Quitting the submenu</td>
</tr>
<tr>
<td>Turn on and activate Trace 1 (6-124)</td>
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<td>Turn on and activate Trace 2 (6-124)</td>
</tr>
</tbody>
</table>

Note

The function keys and are selection keys. In other words, only one setting can be active at any one time. The function key in question is highlighted. The TRACE 1 function is the default setting.
6.2.5.1.1 Activating Traces

Use

The measured values for the input signal can be displayed using two different traces (Trace 1 and Trace 2). However, only one trace is active and can be used at any one time. The other trace is frozen and displayed. This means that the two traces can be compared.

Activating Trace 1

When you switch on the R&S FS300, Trace 1 is automatically turned on and activated. Trace 2 is turned off. All the settings are for Trace 1.

- In the submenu, press the function key if Trace 2 is turned on and active.

Trace 1 becomes the active trace. All the following settings are for this trace. The current display mode, e.g. MAX HOLD (MAX, 6-126), is displayed in the top left of the diagram area in the trace colour:

Turning on and activating Trace 2

When the R&S FS300 is turned on, Trace 2 is turned off. When the trace is called for the first time, the CLEAR/WRITE display mode is set.

- Press the function key in the submenu.

Trace 2 becomes the active trace. All subsequent settings are for this trace. In the top left of the diagram area, the current display mode is shown in the trace colour, e.g. CLEAR/WRITE (CLR, 6-126):
Turning off Trace 2

1. Press the **TRACE 2** function key in the **SELECT** submenu.
   Trace 2 is now active.

2. Press the **BLINK** function key in the **TRACE** menu.
   Trace 2 is blanked out.

3. Press the **TRACE 1** function key in the **SELECT** submenu.
   Trace 1 is activated and Trace 2 is turned off.

**Note**

The current values are displayed in the trace colour. This means that you can quickly tell which trace has been activated.
6.2.5.2 Displaying the Active Trace

Use

You can select the following settings for displaying the active trace:

- **CLEAR/WRITE**
  Overwrites the trace on every frequency sweep.

- **HOLD**
  Displays the minimum/maximum over several sweeps.
  This function is used to find the minimum/maximum value of a signal over several frequency sweeps ( CONT. SWEEP, 6-120). This is particularly useful in the case of modulated or pulse-like signals. On every sweep, more data is added to the signal spectrum until all the signal components are displayed using a type of “envelope curve”.

- **AVERAGE**
  Displays the average over several frequency sweeps.
  This function is used to display the signal average over several frequency sweeps. This function is most useful for sine signals which have been degraded by noise. Essentially, noise can be eliminated by averaging the samples over several frequency sweeps.

After a measurement has been performed, the trace can be frozen (VIEW) or blanked out (BLANK).

Displaying current measured values

When the R&S FS300 is switched on, Trace 1 is active and is displayed in the CLEAR/WRITE display mode.

- Press the **CLEAR/WRITE** function key in the **TRACE** menu.
  The overwrite mode is set. This means that the trace is overwritten on every frequency sweep.
Displaying signal minimum/maximum

1. Press the **Hold** function key in the **Trace** menu.

   A selection field containing the available settings is displayed. The default setting is Min Hold.

   ![Trace Hold Menu]

2. Select a settings for displaying the active trace with **rotary knob** [10].

3. Press the **ENTER key** [5] to close the selection field.

   The MIN/MAX function is activated. This means that, after every sweep, the R&S FS300 only transfers the new measured value to the measured value memory if it is smaller/greater than the previous value. The current display mode, e.g. MAX, is displayed in the top left of the diagram area.

Displaying average values

1. Press the **Trace Average** function key in the **Trace** menu.

   Averaging is activated. The average is taken over several frequency sweeps.

   An entry field for entering the number of frequency sweeps is displayed. The default setting is 0.

   ![Sweep Count Entry Field]

2. Enter a new value (7 5-54).

   The entry range for the number of frequency sweeps is:

   \[0 \leq \text{Sweep Count} \leq 100\]

   where:

   - **Sweep Count = 0** Continuous averaging
   - **Sweep Count = 1** No averaging
   - **Sweep Count > 1** Averaging over the specified number of frequency sweeps

   If the continuous sweep mode (7 CONT. SWEEP, 6-120) has been selected, continuous averaging is automatically activated when the specified number of sweeps has been performed.
3. Press ENTER key [5] to close the entry field. The new setting is saved. Averaging is started and the result is displayed. The current display mode AVG is shown in the top left of the diagram area.

Freezing traces
1. Press the function key in the menu. The current trace is frozen and displayed.

2. Press the CLEAR/DELETE, HOLD or function key in the menu when you want to update the trace.

Blanking traces
- Press the function key in the menu. The trace is blanked out of the measurement diagram.

If the trace has been frozen previously at some time, it can be returned to the display by pressing the function key. Otherwise, the trace is deleted.
6.2.5.3 Trace Difference Function

**Note**

The function key is available only if both traces are turned on (6-123).

**What the settings are for**

You can activate the difference function for two traces (Trace 1, Trace 2) from the MATH submenu and use this function to analyze the input signal.

**Selecting the MATH submenu**

- Press the function key in the Trace menu.

The submenu opens and the appropriate functions are assigned to the function keys [12].

**Function key assignment**

- **Quitting the submenu**
- **Activating the trace difference function** (6-130)
- **Repositioning Trace 1 (result)** (6-130)
- **Turning off the trace difference function** (6-130)
6.2.5.3.1 Activating the Trace Difference Function

Use

You can use the R&S FS300’s MATH function to directly determine differences between signals by forming the difference of two traces. The new reference for the difference trace is in the center of the measurement diagram (50%). The difference trace can be moved within the measurement diagram by changing the reference.

Turning on the difference function

1. Press the \texttt{[T1-T2-T1]} function key in the \texttt{MATH} submenu.

The new trace, Trace 1, is the difference of the old traces, e.g. \( T1 = T1 - T2 \). Each measured value represented by Trace 2 is subtracted from the corresponding measured value represented by Trace 1.
Repositioning Trace 1 (result)

2. Press the function key in the submenu.

A reference line is displayed in the middle of the current diagram area. The text “SCROLL or press ENTER” is displayed to tell you that the trace can be moved up or down.

3. Change the position of the reference line with rotary knob [10].

The current position in % is displayed on the left above the reference line.


The text “SCROLL” disappears and Trace 1 is now in its new position. The new setting is saved.

You can then display (6-126) and analyze (6-90) Trace 1 in any way you want.

Turning off the trace difference function

- Press the function key in the submenu.

The difference function for the two traces (T1=T1-T2) is turned off and the two traces are again displayed independently.

Note

While a math function is being performed on both traces, it is not possible to change the active trace.
6.2.6 Triggering Measurements (TRIG Menu)

What the settings are for

From the TRIG menu, you can select a variety of trigger sources. You can set the trigger edge and the measurement time for external trigger signals (TTL).

- Select the TRIG menu with the < or > cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Selecting the TRIG menu

• Select the menu with the 3 or 4 cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Function key assignment

Free-running measurement. No explicit triggering of the start of measurement (6-133)

Open submenu:

- Triggering by an external TTL signal (6-135)
- Triggering by the display level (6-133)
- Triggering related to the zero crossings of the AC line voltage (6-133)

Enter trigger offset (6-137)

Note

- The functions keys are selection keys.
- In other words, only one setting can be activated at any one time. The function key in question is highlighted.
- The FREE RUN function is the default setting.

The function key is available only in the time-domain display mode (ZERO SPAN).
6.2.6.1 Internal Trigger Sources

Use

Depending on the measurement, you can use a variety of criteria for triggering measurements in the frequency domain (SPAN > 0) or in the time domain (ZERO SPAN).

- Free-running triggering
- Triggering by the display level (only in the time domain, ZERO SPAN)
- Triggering by the AC line frequency

Free-running triggering

Suitable for measurements on stationary signals where a time reference is not necessary.

- Press the \textbf{FREE RUN} function key in the \textbf{TRIG} menu.

  There is no explicit triggering of the start of measurements. When one measurement has been completed, another is started immediately.

Triggering by display level (only available in time domain, ZERO SPAN)

If the video trigger is used, triggering on signals whose carrier amplitude is a function of time is possible. This means that measurements can be made on bursts which are often encountered in mobile radio applications.

1. Press the \textbf{VIDEO} function key in the \textbf{TRIG} menu.

   A horizontal trigger line is displayed in the diagram area. The associated trigger level is displayed above the trigger line on the left.

   An entry field for entering the trigger level is also displayed. The trigger level can be set to between 0 % and 100 % of the diagram height. The default setting is 50 % corresponding to e.g. -60.0 dBm.

   \begin{center}
   \includegraphics[width=0.5\textwidth]{trigger_line}
   \end{center}

2. Enter a new value (\textbullet 5-54).

   The entry range for the trigger level is:

   \[ 0 \% \leq \text{Trigger Video} \leq 100 \% \]

3. Press the \textbf{ENTER key} [5] to close the entry field.

   The trigger line is in its new position and the current trigger level indicates how large the input level must be to start the next measurement.
This makes it possible to perform synchronized measurements on video signals, for example, which can even be triggered using the frequency of the AC line.

- Press the `LINE` function key in the `TRIG` menu.

  The measurement is triggered by referencing the AC line.
6.2.6.2 External Trigger Sources

From the EXTERNAL submenu, you can activate an external TTL signal and specify the trigger edge for triggering measurements.

- Press the function key in the menu.

The submenu is opened and the appropriate functions are assigned to the function keys [12].

Note

The and function keys are selection keys. In other words, only one setting can be selected at any one time. The function key in question is highlighted. The RISING EDGE function is the default setting.
6.2.6.2.1 Setting the Trigger Edge for External TTL Signals

Use

For certain measurements, you can use an external TTL signal (squarewave signal) as a trigger. The trigger period is user-selectable. The R&S FS300 allows you to set triggering on a rising or on a falling edge of the squarewave.

1. Connect the external signal source to the R&S FS300's input connector [14].

Rising trigger edge

2. a) Press the function key in the submenu.

The measurement is started on every positive-going edge of the trigger signal.

Falling trigger edge

b) Press the function key in the submenu.

The measurement is started on every negative-going edge of the trigger signal.
6.2.6.3 Setting a Trigger Offset

Use
If the time difference between the signal to be measured and the trigger event is too great \( t > t_{\text{sweep}} \), you can enter a time (trigger offset) by which the trigger point will be advanced or delayed.

Entering a trigger offset

1. Press the \( \text{TRIG OFFSET} \) function key in the \( \text{TRIG} \) menu.
An entry field containing the current setting is displayed. The default setting is 0.000 ms.

2. Enter a new value \((\uparrow 5-54)\).
The entry range for the trigger offset is:

\[
0 \text{ s} \leq \text{Trigger Delay} \leq 100 \text{ ms} \quad \text{(SPAN > 0)}
\]

\[
-\text{Sweep Time} \leq \text{Trigger Delay} \leq 100 \text{ ms} \quad \text{(ZERO SPAN)}
\]

3. Press the \text{ENTER key} \([5]\) to close the entry field.
The new setting is saved and the trigger offset is added to the trigger point.
6.2.7 Measurement Functions (MEAS Menu)

From the MEAS menu, you can measure the power in the time domain (ZERO SPAN) as well as the third-order intercept point.

Selecting the MEAS menu
- Select the MEAS menu with the \( \text{cursor key [6]} \).

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Function key assignment

Open submenu:
- Measure the power in the time domain (ZERO SPAN)
- Measure the third-order intercept point

Note:
The function key is only available in the time domain (ZERO SPAN).
6.2.7.1 Measuring the Power in the Time Domain

What the settings are for

From the TIME DOMAIN PWR submenu, you can determine the trace section for which the power measurement is to be performed. You can measure either the mean power (MEAN) or the peak power (PEAK).

Selecting the TIME DOMAIN PWR submenu

- Press the function key in the menu.

The submenu opens and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Quitting the submenu

- Output the peak value within the section (6-140)

- Output the mean value within the section (6-140)

- Insert a vertical line to limit the lower (left) part of a section (6-140)

- Insert a vertical line to limit the upper (right) part of a section (6-140)

- Switch off the power measurement (6-140)
6.2.7.1.1 Measuring the Power

Use

By using the "Time Domain Power" measurement function, the R&S FS300 determines in the time domain (ZERO SPAN) the power of the signal by integrating the pixels within the selected section. This allows you to measure the power of TDMA signals, for example, during the transmission phase or during the mute phase. You can measure either the mean power (MEAN) or the peak power (PEAK).

If both the switch-on and the switch-off phase of a burst signal are displayed, you can limit the measurement range to the transmission phase or the mute phase by means of the vertical lines. Since both phases are measured separately, you can determine the S/N power ratio of a TDMA signal, for example.

Activating the time domain mode

1. Switch the R&S FS300 to the time domain mode (ZERO SPAN, 6-77).
2. Press the PEAK function key in the Time Domain menu.

The maximum power is measured within the limit lines T1 and T2 and displayed in the parameter field (PEAK:). In the default setting, these are the left (T1) and the right (T2) limit lines of the measurement diagram.

![Spectrum Analyzer Diagram]

3. Press the MEAN function key in the Time Domain menu.

The mean power is measured within the limit lines T1 and T2 and displayed in the parameter field (MEAN:). In the default setting, these are the left and the right limit lines of the measurement diagram.

![Spectrum Analyzer Diagram]
Changing the measurement range (limit lines)

1. Press the function key in the submenu.
   A limit line is inserted at the left side of the diagram. The “SCROLL or press ENTER” display shows you that the limit lines can be scrolled to the left or to the right.
2. Use the rotary knob [10] to change the position of the limit line.
   The current position T1 of the left limit line and the new measured parameter are displayed in the parameter field.

   The SCROLL inscription disappears and the limit line is repositioned.
4. Press the function key in the submenu.
   A limit line is inserted at the right end of the diagram.
5. Repeat steps 2 to 5 to position the right limit line.
   The current position T2 of the right limit line and the new measured parameter are displayed in the parameter field.

Deactivating the measurement

- Press the function key in the submenu.
  The "Time Domain Power" measurement function is deactivated.
### 6.2.7.2 Measuring the Third-Order Intercept Point

**Use**

If two signals with different frequencies are applied to a DUT with non-linear characteristic, intermodulation products occur at the output. Third-order mixture products are of particular importance since they are close to the useful signals.

The frequencies of the noise products $f_{s1}$ and $f_{s2}$ are located above and below the frequencies of the input signals $f_{n1}$ and $f_{n2}$:

\[
\begin{align*}
F_{s1} &= 2 \times f_{n1} - f_{n2} \\
F_{s2} &= 2 \times f_{n2} - f_{n1}
\end{align*}
\]

A third-order intercept point can be easily calculated with the input signals at the same level $P_n$ plus the measured value of an intermodulation product:

\[
IP3 = a_{d3}/2 + P_n
\]

When the TOI function is set and the markers are set to the input signals, the R&S FS300 automatically measures the intermodulation products and displays the value calculated for the intercept point.

**Setting the markers to the input signals**

1. Set markers 1 and 2 to the two input signals (6-91, 6-95).

**Activating the measurement**

2. Press the **TOI** function key in the **MERS** submenu.

The TOI measurement is activated and the function key is highlighted. The value calculated for the TOI is displayed in the parameter field.

**Deactivating the measurement**

- Press the **TOI** function key in the **MERS** submenu.

The TOI measurement is deactivated and the function key is no longer highlighted.
6.3 SYSTEM Functions (SYS Key)

Introduction
The R&S FS300 has system and service functions as well as measurement functions. All current settings can be called so that they can be viewed at a glance, and saved for use at a later date, a selftest can be run on the R&S FS300 and the system settings configured. Furthermore, the R&S FS300 switched over from remote control to local mode.

Switching over the user interface
When the R&S FS300 has been switched on and the selftest has run without detecting any faults, the spectrum analyzer's user interface is activated.

1. Press the SYS key [3].
   The measurement diagram and the parameter field are blanked out. The menus for the system and service functions are brought up on the screen in the menu area and the appropriate functions are assigned to the function keys [12]. Depending on the function key assignment, the associated parameters are listed as tables in the diagram area.

2. Press the SYS key [3].
   The new settings are saved and the spectrum analyzer's user interface is activated again.

Press the ESC/CANCEL key [4].

The old settings are retained and the spectrum analyzer's user interface is activated again.
Menus for system and service functions

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</table>
6.3.1 Instrument Default Setting (Menu PRESET)

From the PRESET menu, you can specify a user-defined instrument setting as the instrument default setting and directly call it.

1. Press the SYS key [3].
2. Select the menu PRESET with the ← or → cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Function key assignment

- Calls an instrument default setting
  
- Selects an instrument default setting
6.3.1.1 Selecting and Calling the Instrument Default Setting

Use

When you switch on the R&S FS300, those settings that were valid when the R&S FS300 was last switched off are restored.

The R&S FS300 also lets you save and call user-defined instrument settings. If you frequently use one of these settings and want to load it quickly, you can define this setting to be the PRESET (default setting) and call it directly at any time.

**Selecting user-defined settings**

1. Save the user-defined settings (6-150).
2. Select the menu **PRESET** with the ← or → cursor key [6].
   A table containing the available settings is displayed. The current setting is marked with the sign x.

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</tr>
<tr>
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</tr>
<tr>
<td>SMF 4       Factory</td>
</tr>
<tr>
<td>SMF 5       user saved: 01.03.2002 12:00</td>
</tr>
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<td>SMF 6       Factory</td>
</tr>
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</tr>
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</tr>
<tr>
<td>SMF10       Factory</td>
</tr>
</tbody>
</table>

3. Select a setting with the ↑ or ↓ cursor key [7].
   The selected option is highlighted.
   The PRESET memory location FACTORY contains the factory setting (6-68).

4. Press the function key **PRESET SETTINGS**.
   The setting is defined to be the instrument default setting and is marked with the sign x.

5. Press the **PRESET** function key in the **PRESET** menu.
   The current instrument default setting is loaded and the SYS menu is leaved. The spectrum analyzer’s user interface is activated again.

**Note**

If no user-defined settings have been defined, the PRESET function key is assigned the FACTORY PRESET, e.g. the factory default setting (6-68).
6.3.2 Displaying the Current Instrument Setting (STATUS Menu)

From the STATUS menu, you can display an overview of the principal current instrument settings.

1. Press the **SYS key** [3].
2. Select the **STATUS** menu with the ← or → cursor key [6].

The principal spectrum-analyzer parameters and the current settings are listed in a table.

### Explanation of parameters

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<td>RBW</td>
<td>Resolution bandwidth</td>
<td>6-115</td>
</tr>
<tr>
<td>VBW</td>
<td>Video bandwidth</td>
<td>6-116</td>
</tr>
<tr>
<td>SWEEPTIME</td>
<td>Sweep time</td>
<td>6-119</td>
</tr>
<tr>
<td>TRACE 1</td>
<td>Display mode for Trace 1</td>
<td>6-123</td>
</tr>
<tr>
<td>TRACE 2</td>
<td>Display mode for Trace 2</td>
<td>6-123</td>
</tr>
<tr>
<td>MARKER 1</td>
<td>Marker 1 display</td>
<td>6-91</td>
</tr>
<tr>
<td>MARKER 2</td>
<td>Marker 2 display</td>
<td>6-95</td>
</tr>
<tr>
<td>TRIGGER</td>
<td>Trigger source</td>
<td>6-132</td>
</tr>
</tbody>
</table>
6.3.3 User-Defined Settings (FILE Menu)

What the settings are for

You can save user-defined settings and load them when required from the FILE menu. You can also print out a screenshot.

Selecting the FILE menu

1. Press the **SYS** key [3].
2. Select the **FILE** menu with the ← or → cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Function key assignment

<table>
<thead>
<tr>
<th>Function Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAVE</strong></td>
<td>Saves a user-defined setting (☞ 6-150)</td>
</tr>
<tr>
<td><strong>RECALL</strong></td>
<td>Loads a user-defined setting (☞ 6-150)</td>
</tr>
<tr>
<td><strong>PRINT</strong></td>
<td>Prints out a screenshot (☞ 6-152)</td>
</tr>
</tbody>
</table>
6.3.3.1 Saving and Loading User-Defined Settings

Use

When you switch on the R&S FS300, those settings that were valid when the R&S FS300 was last switched off are restored.

The R&S FS300 also lets you save and load user-defined settings.

You can save 10 different settings (SAVE 1 to 10) and 5 traces (WAVE 1 to 5). When the R&S FS300 is delivered, the factory settings are loaded in the SAVE memory locations. The WAVE memory locations are empty.

Saving user-defined settings

1. Set up the R&S FS300 for the measurement you want to perform (Æ 6-68).

2. Press the function key in the menu.

A table containing the available settings is displayed (memory locations).

<table>
<thead>
<tr>
<th>SAVE 1</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAVE 2</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 3</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 4</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 5</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 6</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 7</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 8</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 9</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 10</td>
<td>Factory</td>
</tr>
<tr>
<td>WAVEFORM 1</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 2</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 3</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 4</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 5</td>
<td>empty</td>
</tr>
</tbody>
</table>

3. Select a setting with the ▲ or ▼ cursor key [7].

The selected option is highlighted.

4. Press the ENTER key [5].

An entry field for entering a file name is displayed. The default setting is “user saved” or “empty”.

5. Enter a new file name from the numerical keys [11] or from an external keyboard (Æ 3-41).

6. Press the ENTER key [5].

The current setting is saved and the text “Factory” is replaced by the file name, the date and time.
1. Press the **RECALL** function key in the **FLE** menu.

   A table containing the available settings is displayed (memory locations).

<table>
<thead>
<tr>
<th>SAVE 1</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAVE 2</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 3</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 4</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 5</td>
<td>user saved: 02.09.2002 08:50</td>
</tr>
<tr>
<td>SAVE 6</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 7</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 8</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 9</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 10</td>
<td>Factory</td>
</tr>
<tr>
<td>WAVEFORM 1</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 2</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 3</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 4</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 5</td>
<td>empty</td>
</tr>
</tbody>
</table>

2. Select a setting with the ▲ or ▼ cursor key [7].

   The FACTORY memory location contains the factory setting (6-68).

<table>
<thead>
<tr>
<th>SAVE 1</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAVE 2</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 3</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 4</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 5</td>
<td>user saved: 02.09.2002 08:50</td>
</tr>
<tr>
<td>SAVE 6</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 7</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 8</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 9</td>
<td>Factory</td>
</tr>
<tr>
<td>SAVE 10</td>
<td>Factory</td>
</tr>
<tr>
<td>WAVEFORM 1</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 2</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 3</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 4</td>
<td>empty</td>
</tr>
<tr>
<td>WAVEFORM 5</td>
<td>empty</td>
</tr>
</tbody>
</table>

3. Press the **ENTER** key [5].

   The following message is displayed.

   ![Recall file?](image)

4. Press the **ENTER** key [5].

   The setting you have selected is loaded and the SYS menu is leaved.

   The spectrum analyzer's user interface is activated again.

### Note

If you frequently use one of the saved settings and want to load it quickly, you can define this setting to be the PRESET (default setting) and call it directly at any time. (6-147).
6.3.3.2 Printing out a Screenshot

Use

The R&S FS300 prints out (printer) or saves (USB stick) a current screenshot when you press the SYS key and an overview of the principal current instrument settings. A printer with a USB device connector or a USB stick is required.

Selecting an output unit

1. Press the PRINT function key in the FILE menu.
   A table containing the available parameters is displayed.
2. Select the PRINTER parameter with the ↑ or ↓ cursor key [7].

<table>
<thead>
<tr>
<th>PRINT SCREEN</th>
<th>Press Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINTER</td>
<td>HP DeskJet mono</td>
</tr>
<tr>
<td>REC TO USB-STICK</td>
<td>Press Enter</td>
</tr>
</tbody>
</table>

3. Press the ENTER key [5].
   A selection field containing the available settings is displayed. The default setting is "HP DeskJet mono".

4. Select a setting with the rotary knob [10].
5. Press the ENTER key [5] to close the selection field.
   The setting is saved and the printer driver is loaded.
Printing out a screenshot

1. Connect a printer to the **USB device connector** [16].
2. Select a printer for the output unit (6-152).
3. Press the **PRINT** function key in the **FILE** menu.
   A table containing the available parameters is displayed.
4. Select the PRINT SCREEN parameter with the ▲ or ▼ cursor key [7].
5. Press the **ENTER** key [5].
   The following message is displayed.

   A current screenshot and an overview of the principal current instrument settings (6-148) is printed out, e.g.:

   ![Screen Capture](image)

   **UMT/FS300 Spectrum Analyzer**
   Rohde & Schwarz, Munich
   Mit 29 Jan 2003 12:36:15 CET
   Version 1.05
   from 29.01.2003
   
   CENTER 1500.000000 MHz
   START 3000.000000 MHz
   STOP 3000.000000 MHz
   SPAN 5000.000000 MHz
   REF LEVEL OFFSET 6.0 dB
   RF ATTEN 16 dB AUTO
   RBW 1 MHz AUTO
   VBW 1 MHz AUTO
   SWP 100000 Hz AUTO
   TRAC 1 BLANK
   TRAC 2 BLANK
   MARKER 1 OFF
   MARKER 2 OFF DELTA
   TRIGGER FREE RUN
1. Connect the USB stick to the **USB device connector** [16].

2. Select the USB stick for the output unit (6-152).

3. Press the **PRINT** function key in the **FILE** menu.
   
   A table containing the available parameters is displayed.

4. Select the **PRINT SCREEN** parameter with the **↑** or **↓** cursor key [7].

<table>
<thead>
<tr>
<th>PRINT SCREEN</th>
<th>Press Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINTER</td>
<td>HF Digital mono</td>
</tr>
<tr>
<td>ASCII TO USB-STICK</td>
<td>Press Enter</td>
</tr>
</tbody>
</table>

5. Press the **ENTER key** [5].
   
   An entry field for entering a file name is displayed. The default setting is “FS_Date_Time”.

   ![File Name]

   **Note:** If you wish you can enter a new file name from the **numerical keys** [11] or from an external keyboard (3-41).

6. Press the **ENTER key** [5].
   
   The current screenshot before you press the SYS button is saved as a bitmap (.bmp) in the USB stick.

**Note**

When the USB stick is not connected the following message is displayed:

![No Stick]

- Connect the USB stick to the **USB device connector** [16] and confirm the message by pressing the **ENTER key** [5].
1. Connect the USB stick to the **USB device connector** [16].

2. Press the **PRINT** function key in the **FILE** menu.
   
   A table containing the available parameters is displayed.

3. Select the **ASCII TO USB-STICK** parameter with the **↑** or **↓** cursor key [7].

4. Press the **ENTER** key [5].
   
   An entry field for entering a file name is displayed. The default setting is “FS_Date_Time”.

   ![File name](image)

   **Note:** If you wish you can enter a new file name from the **numerical keys** [11] or from an external keyboard ((SDL 3-41).

5. Press the **ENTER** key [5].
   
   The current screenshot before you press the SYS button is saved as an ASCII file (.asc) in the USB stick.

---

**Note**

When the USB stick is not connected the following message is displayed:

![Message](image)

- Connect the USB stick to the **USB device connector** [16] and confirm the message by pressing the **ENTER** key [5].
6.3.4 System Settings (CONFIG Menu)

You can configure the general system parameters for time/date, reference source, instrument interface and screen saver from the CONFIG menu.

1. Press the SYS key [3].
2. Select the CONFIG menu with the ← or → cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

### Function key assignment

- **DATE/TIME**: Sets the date and time (6-157)
- **REF**: Selects an internal or external reference source (6-159)
- **INTERFACE**: Configures the instrument interfaces (6-160)
- **SCREEN SAVER**: Sets the screen saver mode (6-162)
- **MONITOR**: Selects an internal or external monitor (6-164)
6.3.4.1 Setting the Date and Time of Day

When you save a setting, it is time-stamped using the time provided by the internal real-time clock ( 6-150).

When you set the internal real-time clock, you can choose between two date and time display format options and modify the parameters.

- dd.mm.yyyy 24 h clock
- mm/dd/yyyy 12 h clock

where:  
d  - day  
m  - month  
y  - year

Selecting the display format

1. Press the functions key in the CONFIG menu. A table containing the available parameters is displayed.

2. Select the FORMAT parameter with the or cursor key [7].

3. Press the ENTER key [5]. A selection field containing the available settings is displayed. The default setting is “dd.mm.yyyy”.

4. Select a setting with the rotary knob [10].
5. Press the ENTER key [5] to close the selection field. The setting is saved and the display format updated.
1. Press the **DATE/TIME function key** in the **CONFIG** menu. A table containing the available parameters is displayed.

2. Select the **DATE** parameter with the **↑** or **↓** cursor key [7].

3. Press the **ENTER key** [5]. An entry field containing the current setting is displayed.

4. Enter a new value ( גופי ביטוי).

5. Press the **ENTER key** [5]. The setting is saved and displayed.

Setting the date

1. Press the **DATE/TIME function key** in the **CONFIG** menu. A table listing the available parameters is displayed.

2. Select the **TIME** parameter with the **↑** or **↓** cursor key [7].

3. Press the **ENTER key** [5]. An entry field containing the current setting is displayed.

4. Enter a new value ( גופי ביטוי).

5. Press the **ENTER key** [5]. The setting is saved and displayed.

Setting the time
6.3.4.2 Selecting an Internal or External Reference Source

Use

The R&S FS300 acting as the frequency standard for all internal oscillators can use the internal reference source (internal) or an external reference source (external). A 10 MHz crystal oscillator is used as the internal reference source. When the default setting is activated (internal reference), a 10 MHz frequency is output at the REF OUT rear-panel connector [23] to synchronize other devices to the R&S FS300 reference frequency, for example.

When the “REFERENCE external” setting is activated, the REF IN connector [22] is used as the input for an external frequency standard. All the R&S FS300’s internal oscillators are synchronized to this external reference frequency (also 10 MHz).

Selecting the reference source

1. When required, connect the external reference source to the REF IN connector [22].

2. Press the REF function key in the CONFIG menu.

The current reference source setting is displayed.

3. Press the ENTER key [5].

A selection field containing the available settings is displayed. The default setting is “internal”.

4. Select a reference source with rotary knob [10].

5. Press the ENTER key [5].

The setting is saved and the R&S FS300 frequency standard is taken from a new source.

Note

If there is no reference signal when you switch over to an external reference, the message PLL UNLOCK is output after a short delay to indicate that there is no sync.
6.3.4.3 Configuring the Instrument Interfaces

Use

The R&S FS300 can be remote-controlled via the existing USB host interface [15]. The R&S FS300 automatically detects an existing connection to a PC and also automatically switches to remote control in the default setting (AUTO). Switchover between internal USB master (local control on the instrument) and external USB master (remote control via PC) is effected by means of a USB master switch.

The behaviour of the USB master switch can be controlled via the following settings:

- **AUTO**
  The AUTO setting is the standard configuration of the USB master switch and allows flexible switching between the local control mode on the R&S FS300 and remote control via PC. This setting allows the instrument to automatically find a connected PC and switch immediately to "remote control". Under Windows™, the R&S FS300 is recognized as a new USB device, and is thus available for software applications on the PC.

  When you press the SYS key [3], the R&S FS300 can be switched to "local mode" at any time. The PC and the R&S FS300 are thus physically disconnected. Reactivate the AUTO setting to switch the R&S FS300 again to "remote control".

- **INSTRUMENT**
  The INSTRUMENT setting is required if the R&S FS300 is to be controlled only via the front panel (local control), irrespective of a PC connection. This setting avoids automatic switchover to "remote control".

  When you switch the INSTRUMENT setting to AUTO, an existing PC is recognized, and the R&S FS300 automatically switches to "remote control".
**EXTERN**

If EXTERNAL is set, the USB master switch is in the “remote control” mode and the R&S FS300 can only be controlled via a PC.

When you press the SYS key [3], the R&S FS300 can be switched again to “local mode” at any time, for example for changing settings. Reactivate the EXTERNAL setting to switch the R&S FS300 again to “remote control”.

1. Press the **INTERFACE** function key in the **CONFIG** menu. The current USB master setting is displayed.

2. Press the **ENTER** key [5]. A selection field containing the available settings is displayed. The default setting is AUTO.

3. Select a setting with **rotary knob** [10].

4. Press the **ENTER** key [5] to close the selection field. The setting is saved.

**Note**

With remote control, the local control mode of the R&S FS300 is deactivated and can only be reactivated by pressing the SYS key [3] on the front panel. Switching between remote control and local control takes approx. 2 s.
6.3.4.4 Setting the Screen Saver Mode

Use

The R&S FS300 has a screen-saver function that turns off the screen after a certain time. There are a number of timing options for screen turn-off:

- **none**
  The screen is always on.

- **5 min**
  The screen is turned off after 5 minutes.

- **30 min**
  The screen is turned off after 30 minutes.

If the instrument is in remote-control mode and the results are being displayed on the controller (PC monitor) the screen can be switched off.

- **picture**
  The screen displays when the instrument is in remote-control mode.

- **black**
  The screen is switched off.

Activating the screen saver

1. Press the **function key** in the **menu**.
   A table listing the available parameters is displayed.

2. Select the **SCREEN SAVER** parameter with the **cursor key** [7].

3. Press the **ENTER key** [5].
   A selection field containing the available settings is displayed. The default setting is "none".

4. Select a setting with **rotary knob** [10].

5. Press the **ENTER key** [5].
   The setting is saved and the screen saver is activated or de-activated.
Activating the Screen saver in remote-control mode

1. Press the function key in the menu.
   A table listing the available parameters is displayed.

2. Select the parameter with the cursor key [7].

3. Press the ENTER key [5].
   A selection field containing the available settings is displayed. The default setting is “black”.

4. Select a setting with rotary knob [10].

5. Press the ENTER key [5].
   The setting is saved and the screen disconnection in the remote-control mode is activated or de-activated.

With the “black” setting, the screen is, of course, black, and only the green LED [2] indicates that the R&S FS300 is in remote-control mode.

With the “picture” setting, the following message is displayed on the screen with the R&S FS300 in remote-control mode:

Note
With remote control, the local control mode of the R&S FS300 is deactivated and can only be reactivated by pressing the SYS key [3] on the front panel. Switching between remote control and local control takes approx. 2 s.
6.3.4.5 Selecting an Internal or External Monitor

**Use**

Screen display is possible via the internal monitor or an external monitor.

- **intern**
  Screen display is via the built-in colour TFT display.

- **extern**
  Screen display is via the connected monitor.

**Selecting the monitor**

1. If required, connect a monitor to the MONITOR connector [20].

2. Press the **MONITOR** function key in the **config** menu.
   The current screen setting is displayed.

3. Press the **ENTER** key [5].
   A selection field containing the available settings is displayed. The default setting is “intern”.

4. Select a setting with **rotary knob** [10].

5. Press the **ENTER** key [5].
   The setting is saved.
   If the “external” setting is selected, the connected screen shows the active user interface. The internal monitor is switched off.
6.3.5 Service Functions (SERVICE Menu)

What the settings are for

You can call a number of auxiliary functions to be used for servicing or troubleshooting from the SERVICE menu. These functions are not required for normal measurements with the R&S FS300.

Selecting the SERVICE menu

1. Press the SYS key [3].
2. Select the SERVICE menu with the ← or → cursor key [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [12].

Function key assignment

<table>
<thead>
<tr>
<th>Function key</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELFTEST</td>
<td>Performs a selftest (6-165)</td>
</tr>
</tbody>
</table>

6.3.5.1 Performing Selftests

Use

The R&S FS300 can perform a module selftest. If there is a fault, the R&S FS300 itself is capable of localizing the defective module.

Starting selftests

1. Press the SELFTEST function key in the SERVICE menu.

   The text SELFTEST is displayed (below).

2. Press the ENTER key [5].

   The selftest starts. All modules are checked one after the other and the result, “passed” or “failed”, is output.
6.3.6 System Information (INFO Menu)

You can obtain information such as module data, instrument statistics and system messages from the INFO menu.

Selecting the INFO menu

1. Press the SYS key [3].
2. Select the INFO menu with the ▼ or ▶ cursor key [6].

The menu name is highlighted and the appropriate functions are assigned the function keys [12].

Function key assignment

- Displays module data (6-167)
- Displays instrument statistics (6-167)
- Displays system messages (6-168)
6.3.6.1 Displaying Module Data

Use

You can display the serial number of the modules installed in the R&S FS300.

Calling module data

- Press the **function key** in the **INFO menu**.

A table listing the current modules and the serial number is displayed.

![Module Data Table](image)

6.3.6.2 Displaying Instrument Statistics

Use

You can display the following R&S FS300 statistics:

- **MODEL** - model designation
- **SERIAL NUMBER** - serial number
- **FW VERSION** - firmware version
- **OPERATION TIME** - operating hours
- **POWER ON CYCLES** - on/off cycles

Direct selection

- Press the **function key** in the **INFO menu**.

A table listing the current data is displayed.

![Instrument Statistics Table](image)
6.3.6.3 Displaying System Messages

Use

You can display the most recent R&S FS300 system messages in their order of occurrence. Operating errors are neither saved nor displayed.

System messages help the service personnel to analyze the instrument and handle errors, and should therefore only be deleted by them.

Displaying system messages

1. Press the **function key** in the **INFO** menu.
   
   A table listing the current system messages is displayed.

2. Select a system message with the **5** or **6** cursor key [7].

3. Press the **ENTER key** [5].
   
   The current system message is clearly displayed with the date and time of their occurrence and the error code.

4. Press the **ENTER key** [5] for closing the display.
Deleting system messages (only for service)

1. Press the **function key** in the **menu**.
   The table of current system messages is displayed.

2. Select the first line with the **cursor key**.

3. Press the **ENTER key**.
   The field for the input of the password is displayed.

4. Enter the right password and confirm with the **ENTER key**.
   The error messages are deleted.

Invalid password

If the password is invalid, the following message is displayed:

- Confirm the error message with the **ENTER key**.
  The deleting of the error messages is breaked off.
7 Remote Control/PC Software FS300-K1

Note

The latest remote control commands and software drivers for the USB-interface of the R&S FS300 can be downloaded from the R&S Smart Instruments internet site:

www.smart-instruments.de

7.1 Applications of PC Software

Performance features

The PC Software R&S FS300-K1 allows convenient operation of the R&S FS300 by remote control via a PC. All the functions of the spectrum analyzer are supported. In addition, you can create test reports on your PC. Highlights of the software features are:

- Fast and simple transfer of measurements between the R&S FS300 and the PC
- Permanent analysis of ongoing sweeps to the PC with evaluation capabilities (Marker, Zoom, etc.)
- Practically unlimited memory capacity for storing traces and measurement information (comparison of current and previous information)
- Extended range of functions (Limit Lines, Log File)
- Export of trace values (700 points) in .txt format for import into Microsoft Excel™
- Export of displayed data (screenshots) in JPEG format
- Printing the working window by standard Windows™ printer

Remote control using the keyboard and the mouse

All functions and measuring parameters can be set with the keyboard and the mouse using menus, toolbars or short keys.

Large display on the PC monitor

The current trace as well as parameters and status fields required for measuring result analysis are displayed clearly arranged on the monitor.
7.2 Installation and Configuration

System requirements
The PC software runs on Windows™ 2000 and XP operating systems with USB interface.

7.2.1 Installing the PC Software

Note
To install the PC software, you must have administrator rights on your PC. (Windows™ help).

Introduction
The PC software is installed in two steps. Firstly the remote control program for the R&S FS300 is installed. The R&S FS300 must not be connected at this time. Secondly the drivers are installed; at this time the instrument has to be connected.

7.2.1.1 Installing the Program

Note
The <Back> button enables the user to go back one step during installation. Installation can be interrupted by pressing <Cancel>.

Installation steps
1. Place the CD ROM, which came with the product, in your installation drive. The autorun function automatically initiates installation. Alternatively you may also initiate the installation in the start menu of Windows™ Start|Run using the Setup.exe from the CD.

The installation is prepared and the installation wizard appears.
2. Click <Next> to continue the installation.

3. Click <Browse> to assign a new directory if you wish to install the program in another directory than proposed. Click <Next> to continue the installation.
4. Click <Next> to continue the installation. Installation begins and the data are transferred to the PC. Please wait a moment.

5. Click <Finish> to successfully complete the installation.

6. Click <Yes> to restart the computer.
All new settings are now effective and the following appears in the Windows™ Start\Programs\Rohde&Schwarz\Series300 start-up menu:

7. Install the device driver now (☞ next section).

7.2.1.2 Installing the Device Drivers

7.2.1.2.1 Installing Steps for Windows™ 2000

Connecting R&S FS300 to the PC

R&S FS300 is connected to the PC via the USB interface. The connection cable has two plug types. Plug A is connected to the computer (☞ computer manual) and plug B is connected to the R&S FS300 (☞ R&S FS300 manual, Ch. 2.2 Rear View).

The CD ROM must be in the installation drive in order to install the driver.

1. Switch on the R&S FS300 and the PC.
2. Connect the instrument to the PC with the USB cable. The PC (Windows™) recognizes the connected instrument and reports new hardware. This message appears only when an R&S FS300 is installed for the first time.

If the R&S FS300 is not automatically recognized, check that the USB master switch of the R&S FS300 is at AUTO (☞ R&S FS300 manual, Ch. 6.3.4.3 Configuring the Instrument Interfaces).
3. Click <Next> to continue the installation.

4. Select Search for a suitable driver for my device and click <Next> to continue the installation.
5. Select **CD-ROM drives** and click <Next> to continue the installation.

Then the search results for the driver data are displayed.

6. Click <Next> to continue the installation.
7. Click <b>Finish</b> to complete the installation.

This is followed by the installation of the device driver for the <b>Rohde & Schwarz Power Supply</b>. Windows generally "remembers" all the necessary information when installing the Spectrum Analyzer R&S FS300 and installs the Rohde & Schwarz Power Supply without a query. However, depending on the system, the installation assistant might be activated.

In this case, repeat instructions 3. to 7. to successfully complete the installation.
The drivers are now correctly installed and this can be checked using the device manager.

8. Create now the program version for specific instrument (6-183).

7.2.1.2.2 Installing Steps for Windows™ XP

Connecting R&S FS300 to the PC

R&S FS300 is connected to the PC via the USB interface. The connection cable has two plug types. Plug A is connected to the computer (computer manual) and plug B is connected to the R&S FS300 (R&S FS300 manual, Ch. 2.2 Rear View).

The CD ROM must be in the installation drive in order to install the driver.

1. Switch on the R&S FS300 and the PC.
2. Connect the instrument to the PC with the USB cable. The PC (Windows™) recognizes the instrument when it is connected and reports new hardware. This message appears only when an R&S FS300 is installed for the first time.
If the R&S FS300 is not automatically recognized, check that the USB master switch of the R&S FS300 is at AUTO (☞ R&S FS300 manual, Ch. 6.3.4.3 Configuring the Instrument Interfaces).

3. Select **Install the software automatically** and click **<Next>** to continue the installation.

4. Click **<OK>** to continue the installation.
5. Click <b>Finish</b> to successfully complete the installation.

This is followed by the installation of the device driver for the <b>Rohde & Schwarz Power Supply</b>. Windows generally "remembers" all the necessary information when installing the Spectrum Analyzer R&S FS300 and installs the Rohde & Schwarz Power Supply without a query. However, depending on the system, the installation assistant might be activated.

In this case, repeat instructions 3. to 5. to successfully complete the installation.
The drivers are now correctly installed and this can be checked using the device manager.

6. Create now the program version for specific instrument (7 6-183).
7.2.2 Connecting the PC-Software with the R&S FS300

Introduction

Due to the USB-Technology which is used in the R&S FS300, more than one instrument in the 300 Series can be connected with a PC at the same time. For each instrument a connection with the respective software which allows the opening and remote controlling of the specific instrument has to be created.

The creation of an instrument-specific connection of the Software R&S FS300-K1 by using the provided Series 300 Software Manager is explained in the following section. Before this process can be started, the R&S FS300-K1 Software needs to be installed on your PC (6-171) and one or more instruments have to be connected to the PC via USB-cable (6-187).

Note

No Authorization (Key Code) is required for the provided R&S FS300-K1 Software Version 2.5.

7.2.2.1 Starting the Series 300 Software Manager

Starting the service program

- In the Windows™ start-up directory select: Start\Programs\Rohde&Schwarz\Series300\Series 300 Software Manager

The service program initializes. The program interface is divided into two areas:

I  A list of all previously connected Smart instruments

II Information, status fields and command buttons for authorization

![Series 300 Software Manager Version 2.0](image-url)
7.2.2.2    Creating the Program Version

Selecting the instrument

1. In I click on the instrument for which you create a link.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Serial Number</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS300</td>
<td>0000100021</td>
<td>355001_0000000000</td>
</tr>
<tr>
<td>PS500</td>
<td>0000110016</td>
<td>355001_0000000000</td>
</tr>
<tr>
<td>FS500</td>
<td>0000100445</td>
<td>355001_0000000000</td>
</tr>
<tr>
<td>PS500</td>
<td>0000100379</td>
<td>355001_0000000000</td>
</tr>
<tr>
<td>FS500</td>
<td>0000100471</td>
<td>355001_0000000000</td>
</tr>
<tr>
<td>FS500</td>
<td>0000100160</td>
<td>355001_0000000000</td>
</tr>
<tr>
<td>FS500</td>
<td>0000110019</td>
<td>355001_0000000000</td>
</tr>
</tbody>
</table>

Creating the program version for specific instrument

2. Click <Create Program>. A program version for specific instrument is created and displayed in II with the status (✓). The program number is created from the instrument name (FS300) and the serial number (0000xxxxxx).

3. In II click <Exit> to close the service program. After correctly creating the program version, the option FS300 0000xxxxxx is available in the Windows™ start-up menu Start\Programs\Rohde & Schwarz\Series300.

Now the program FS300 0000xxxxxx can be started (6-188)
7.2.3 Uninstalling the PC Software

Installation steps for Windows™ 2000

1. Place the CD ROM, which came with the product, in the installation drive. The autorun function automatically initiates installation. Alternatively you may also initiate the installation in the start menu of Windows™ Start→Run using the Setup.exe from the CD. The uninstallation is prepared and the uninstallation assistant appears.

2. Click <Next> to continue the uninstallation.

3. Click <Finish> to complete the uninstallation.

Note: The PC software can also be uninstalled using the Windows™ control panel.
7.2.4 Update PC Software

Introduction

Old versions of the PC-Software can be updated with the Series 300 Software Manager. Therefore the old version has to be uninstalled (6-184). The new version can then be installed from the CD-ROM (6-171). After that, the links which already existing to the listed instruments have to be updated manually.

Starting the service program

1. Start the Series 300 Software Manager (6-182).
   The service program initializes and the window „Authorization: PC-Software” is displayed.

2. Click on the top bar Authorization: PC-Software and choose “Service: Update PC-Software” from the menu.

   The “Update PC-Software” window is displayed and has the following two partitions:
   I List of all Smart-Instruments that have been previously connected
   II Display of the current version of the program and the available version

![Update PC Software Window](image)
3. In I click on the instrument for which you wish to update a link.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Serial Number</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS30000</td>
<td>000010061</td>
<td>FS30000</td>
</tr>
<tr>
<td>AP3000</td>
<td>0000100309</td>
<td>AM3000_0000100002</td>
</tr>
<tr>
<td>FS3000</td>
<td>00001010156</td>
<td>FS30000_0000100196</td>
</tr>
<tr>
<td>FS0000</td>
<td>0000100445</td>
<td>FS0000_0000100045</td>
</tr>
<tr>
<td>FS0000</td>
<td>0000100242</td>
<td>FS0000_0000100024</td>
</tr>
<tr>
<td>FS0000</td>
<td>0000100917</td>
<td>FS0000_0000100017</td>
</tr>
<tr>
<td>AP3000</td>
<td>0000100952</td>
<td>AM3000_0000100052</td>
</tr>
<tr>
<td>FS3000</td>
<td>0000100200</td>
<td>FS3000_0000100020</td>
</tr>
<tr>
<td>FS0000</td>
<td>0000100951</td>
<td>FS3000_0000100095</td>
</tr>
<tr>
<td>FS3000</td>
<td>0000100418</td>
<td>FS3000_0000100418</td>
</tr>
<tr>
<td>FS0000</td>
<td>0000100039</td>
<td>FS3000_0000100039</td>
</tr>
</tbody>
</table>

✓ Instrument authorized or ready for remote
X Instrument not connected or program not exist
@ Instrument not authorized

4. Click in II on <Update>, to update the displayed link.
5. Click in II on <Exit>, to shut down the service program. The updated connection FS300 0000xxxxxx is displayed in the Windows™ Start Menu Start\Programme\Rohde & Schwarz\Series300.

Now the program FS300 0000xxxxxx can be started (6-188).
7.3 Starting the Remote Control

7.3.1 Connecting the Instrument to the PC

**Note**  
PC software R&S FS300-K1 must be installed before you can connect the R&S FS300 to the PC (6-171).

**Introduction**  
R&S FS300 is connected to the PC via the USB interface. The connection cable has two plug types. Plug A is connected to the computer (computer manual) and plug B is connected to the R&S FS300 (R&S FS300 manual, Ch. 2.2 Rear View).

**Prepare remote control**

1. Switch on the R&S FS300 and the computer.

**Connect instrument to PC**

2. Connect the instrument to the computer with the USB cable. The computer recognizes the attached instrument and sets up a connection. The following message appears on the monitor of the R&S FS300:

   ![Smart instruments logo]

   If the R&S FS300 is not automatically recognized, please check that the USB master switch of the R&S FS300 is at position AUTO (R&S FS300 manual, Ch. 6.3.4.3 Configuring the Instrument Interfaces).

**Note**  
In remote control mode, control of the R&S FS300 is deactivated and can only be reactivated by pressing the SYS key at the front panel of the instrument. Switching from remote to local control takes approximately 5 seconds.
7.3.2 Starting the Program

Starting the program

1. In the Windows™ start-up directory click on:
   
   Start\Programs\Rohde&Schwarz\Series300\FS300 0000xxxxxx

If the link is not available

2. If the program does not start, then click with the right mouse button in the Windows™ start-up directory on:
   
   Start\Programs\Rohde&Schwarz\Series300\FS300 0000xxxxxx

   Click Properties.

   Click <OK> to create a link between the program and start-up directory.

   ![Properties dialog box]

Start the program again (above, instruction 1.)
The program starts up and you may begin using the R&S FS300 remote control.

A new session opens automatically when you start the program. The current R&S FS300 settings are loaded. The following settings are display and evaluation functions and are not transferred to the PC software:

- Marker functions (6-209)
- Scale of measuring diagram (Range, Unit)
- Trace functions (6-212)
- Measure functions (6-214)

**Note**

If the message **Device not connected** appears on the program interface, you need to check the connection to the instrument (6-187).
7.3.3 Closing the Remote Control

Closing the program
1. In Windows™ click on the close symbol x.

You may also select the option Exit in the pull-down menu File.

Closing the remote control
2. Remove the USB cable from one side or press the SYS key at the front panel of the R&S FS300.
Switching between remote and local control takes approximately 5 seconds.

7.4 Getting Started

7.4.1 Level and Frequency Measurement

7.4.1.1 Measuring Task

Caution
The input stage of the R&S FS300 can be destroyed by overloads or DC components. If there is a possibility that the limits specified in the data sheet may be violated, the input must be protected with an attenuator and/or a DC block.

Measurement problem
Determining the level and frequency of a signal is one of the most common measuring tasks which can be solved with a spectrum analyzer. When measuring an unknown signal the PRESET (factory) setting (R&S FS300 manual, Ch. 6.1 R&S FS300 Factory Settings) is used as a start-up setting.

Solution
Important functions for the level and frequency measurement are setting the center frequency (CENTER) and the frequency display span (SPAN) as well as the MARKER functions.
7.4.1.2 Measuring Sequence

Introduction

In this example, a signal with a frequency of 200 MHz and a level of –30 dBm is applied to the HF input of the R&S FS300. The center frequency and the frequency display span are set manually. Carry out the following steps:

- Reset the R&S FS300
- Apply a signal to the R&S FS300
- Set the center frequency (Center) to 200 MHz
- Reduce frequency display span (Span) to 1 MHz
- Measure the level and frequency with the marker
- Measure the frequency with the built-in frequency counter

Resetting the R&S FS300

1. Start the PC software (FS300 0000123456.EXE) on your PC.

Alternatively you may also open a new session when the PC software is already started. To do so, press <Ctrl+N>. The default settings are now active (* R&S FS300 manual, Ch. 6.1 R&S FS300 Factory Settings).

Applying a signal to the R&S FS300

2. Apply the measuring signal to the HF input socket.

Setting the center frequency (Center) to 200 MHz

3. Press <Ctrl+Shift+C>. The input window Center is active.

4. Enter the value <200M> with the numeric keys. Complete the input by pressing <Enter>.

Reducing the frequency display span (Span) to 1 MHz

5. Press <Ctrl+Shift+S>. The input window Span is active.

6. Enter the value <1M> with the numeric keys. Complete the input by pressing <Enter>.
Measuring the level and frequency with the marker

7. Press <Ctrl+Shift+M>. The marker jumps to the signal peak. An arrow appears above the diagram at the position of the marker.

8. You can change the position of the marker by moving the arrow with the left <Mouse Button>. The parameter field above shows the marker values M1.

9. In the Function display Marker click on <Counter> with the left <Mouse Button>.

10. Set the resolution of the frequency counter in the selection window <Res>.

The exact frequency value C1 can be seen in the parameter field above.
7.5 Control Concept

7.5.1 PC Monitor Display

Introduction

The PC monitor provides continuous information about the results and parameters of the selected measuring functions. The display format for the measuring results and the insertion of the function displays depend on the current settings.

Structure of the program interface

The program interface is divided into three areas:

I. Diagram
II. Menus
III. Functions
7.5.1.1 Diagram

Diagram displays

- Measuring diagram with scale (a) and traces (i)
- Measuring value displays, e.g., display lines (h) and markers (f)
- Limit lines (k)
- Parameter field (c) and status displays (e)
- Pop-up error messages (d)

A 10 x 8 grid is superimposed on the diagram to facilitate traces analysis.

Parameter field and status display

- **RBW:** current resolution bandwidth (LN for max. sensitivity)
- **VBW:** current video bandwidth
- **SWT:** current sweep time
- **M1:** marker 1 with marker position and level value
- **M2:** marker 2 with marker position and level value
- **Ref:** current reference level
- **Att:** current input attenuation

The status display provides information about:

- **MAX** - current trace display, e.g., maximum value
- **Upp** - limit line Upp is switched on
- **Low** - limit line Low is switched on
- **Offs** - level offset is switched on

Note

Error messages are closed after several seconds.

Further system messages and warnings in illegal modes of operation are described in detail in chapter 9 of the R&S FS300 manual.
7.5.1.2 Menus

Different pull-down menus can be accessed in the menu area.

<table>
<thead>
<tr>
<th>Menu</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
</tr>
<tr>
<td></td>
<td>Amp</td>
</tr>
<tr>
<td></td>
<td>Marker</td>
</tr>
<tr>
<td></td>
<td>BW/Sweep</td>
</tr>
<tr>
<td></td>
<td>Trace</td>
</tr>
<tr>
<td></td>
<td>Trigger</td>
</tr>
<tr>
<td></td>
<td>Measure</td>
</tr>
</tbody>
</table>

In addition, Windows™-typical menu items can be called up via a toolbar (icons).

Menu for setting the measuring parameters and functions are also available as a toolbar and can be selected directly.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Amplitude</th>
<th>Marker</th>
<th>BW/Sweep</th>
<th>Trace</th>
<th>Trigger</th>
<th>Measure</th>
</tr>
</thead>
</table>

Note: The arrow after a menu option in the pull-down menu indicates that a submenu will appear after opening, e.g., Amp. 


7.5.1.3 Functions

Main functions display

The main functions of the R&S FS300 are always displayed in the top part of the function display. These are:

- Center frequency (Center)
- Frequency display span (Span)
- Reference level (Level)
- Sweep time (SWT)
- Resolution band width (RBW)

These may be changed at any time.

![Main function display](image)

Inserting specific functions

In the lower part of the function display, different function displays with input fields (1), selection fields (2) and control buttons (3) are displayed e.g., Amplitude or Trigger etc., according to menu selection (6-201).

![Inserting specific functions](image)

Note: If a selection is not highlighted, it has currently no function (current setting).
7.5.2 Input via Keyboard and Mouse

Introduction

The R&S FS300 is remote controlled via PC keyboard and mouse with the help of menus. The most important keys are:

- **Numeric keys**: 0 ... 9
- **Arrow keys**: ← / ↑ / ↓ / →
- **Function keys**: F5 ... F11
- **Action keys**: Enter, Esc
- **Tab key**: Tab
- **Space bar**: Space
- **Mouse buttons**: left, right

7.5.2.1 Numeric Keys

Function

The numeric keys are used to enter numerical parameters.

0 ... 9  
- At cursor, insert numbers <0> ... <9>  
- At cursor, insert decimal separating sign <,> oder <.> dependence on PC system settings  
- At cursor, insert minus sign <->

7.5.2.2 Arrow Keys

Function

In addition to numeric keys, the arrow keys are used to enter parameters. They can also be used to navigate through the menus.

← / ↑ / ↓ / →  
- Navigating the pull-down menus with all arrow keys

![Diagram of FS300 control concept with arrow keys and menus]
Navigating the selection fields with the \( \downarrow / \uparrow \) arrow keys

Positioning the cursor in the input fields with the \( \leftarrow / \rightarrow \) arrow keys

Increasing or decreasing numerical parameter inputs with the \( \downarrow / \uparrow \) arrow keys

7.5.2.3 Function Keys

Function keys open the menus to set the measuring parameters and measuring functions and insert the corresponding function display.

<table>
<thead>
<tr>
<th>Function</th>
<th>Function Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>F5</td>
<td>Inserts the Frequency</td>
<td>6-207</td>
</tr>
<tr>
<td>F6</td>
<td>Inserts the Amplitude</td>
<td>6-208</td>
</tr>
<tr>
<td>F7</td>
<td>Inserts the Marker</td>
<td>6-209</td>
</tr>
<tr>
<td>F8</td>
<td>Inserts the BW/Sweep</td>
<td>6-211</td>
</tr>
<tr>
<td>F9</td>
<td>Inserts the Trace</td>
<td>6-212</td>
</tr>
<tr>
<td>F10</td>
<td>Inserts the Trigger</td>
<td>6-214</td>
</tr>
<tr>
<td>F11</td>
<td>Inserts the Measure</td>
<td>6-214</td>
</tr>
</tbody>
</table>
7.5.2.4 Action Keys (Enter, Esc)

Function
The action keys complete the menu-operated settings.

Enter key
− This key **closes the input or selection**. The **new value** now applies.

Esc key
− This key **closes the selection**. The **old value** is preserved.

7.5.2.5 Tab Key

Function
The tab key activates the input fields, the selection fields and the buttons within a function display.

Tab key
− Jumps from one control element to another in a function display etc.

Note: The tab key can be only used to make selections when an input field, a selection field or a control button has been selected in the function display via a menu (§ 6-201) or with the mouse (§ 6-200).

7.5.2.6 Space Key

Function
After selecting an input field, a selection field or a control button with the tab key, different actions are initiated by pressing the space key:

Space key
− **Immediate function execution** of the function e.g., Zoom +

− **Toggle** a setting, e.g., switch on/off signal tracking

− **Open** selection fields, e.g., set the measuring unit for Amplitude
7.5.2.7 Mouse Buttons

Function

Placing the mouse pointer over and clicking on any program interface item will allow for different actions.

<table>
<thead>
<tr>
<th>Left mouse button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pull-down menus can be <strong>opened</strong> with the mouse</td>
</tr>
<tr>
<td></td>
<td>The contents of input fields can be <strong>highlighted</strong> with mouse button pressed and held</td>
</tr>
<tr>
<td></td>
<td>The cursor can be <strong>positioned</strong> in the input fields by clicking the mouse button</td>
</tr>
<tr>
<td></td>
<td>Selection fields can be <strong>opened</strong> and settings can be <strong>selected</strong> with mouse button pressed and held</td>
</tr>
<tr>
<td></td>
<td>Immediate <strong>execution</strong> of any function by clicking the mouse button</td>
</tr>
<tr>
<td></td>
<td><strong>Toggling</strong> a setting with multiple mouse clicks</td>
</tr>
<tr>
<td></td>
<td><strong>Moving</strong> markers and limits, also in the diagram area, with mouse button pressed and held</td>
</tr>
</tbody>
</table>
7.5.3 Calling up and Changing the Menus

Various methods are possible

The R&S FS300 is remote controlled via a menu. The keyboard and the mouse can be used to select a menu (6-197).

Instrument parameters (and program functions) can be selected in different ways on the PC interface, e.g., unit for the level display:

- Selecting with the pull-down menu

![Pull-down menu](image)

- Selecting with short keys

  Unit \(\text{Ctrl+Shift+U}\)

- Selecting with the toolbar menu and selecting the selection field directly in the function display

![Toolbar menu](image)

Note

The \(\Rightarrow\) arrow after a menu option in the pull-down menu indicates that a submenu will appear after opening, e.g., \(\text{Amp}\Rightarrow\).
7.5.4 Setting the Parameters

Introduction
Parameters can be set in different ways:
- Selecting an instrument function directly (command button)
- Selecting settings in the selection fields
- Inputting numerical parameters in the input fields
- Moving markers

The keyboard and mouse can be used for the settings (☞ 6-197).

7.5.4.1 Direct Selection of a Instrument Function

Various methods are possible

Some instrument functions are executed immediately after selection, e.g., automatic setting of the HF input attenuator.

Instrument parameters (control buttons) can be selected in different ways:
- Selecting and switching on using a pull-down menu. The current setting is indicated by a tick mark (✓).

- Selecting using a toolbar menu and switching on in the function display
7.5.4.2 Selecting the Settings

Several settings are available for certain instrument functions, e.g., level display unit.

The selection window can be reached in a number of different ways (☞ 6-201), e.g., selection using the toolbar menu.

Opening the selection window and selecting the instrument functions takes place in the function display. The current setting is indicated by a tick mark (✓).

7.5.4.3 Inputting the Numerical Parameters

Two methods are available for entering the numerical parameters, e.g., inputting the frequency display range:

- Inputting a value with numeric keys
- Inputting a value with arrow keys

You should use the arrow keys for inputting if the value to be measured cannot be determined accurately beforehand. Given that the screen is constantly updated while the values are changing, browsing is possible.

The input fields can be selected in a number of different ways (☞ 6-201), e.g., using short keys:

Inputting using the numeric keys can be done in a number of different ways:

- Highlighting and overwriting numbers
- Selecting a decimal point and inserting numbers
Selecting the unit

The entry is made in the active measurement unit, which is indicated after the numeric value in the entry field and can be changed. Make sure that there are no spaces between the numeric figure and the measurement unit.

You may omit the base unit (e.g. Hz, s, dBm). However, you must specify the unit size (valid values: G, M, k, m, u, n, p).

Input examples

- **Span:**
  - 15k
  - 15kHz
  - 150000
  - 15M

- **Sweep Time:**
  - 34m
  - 34ms
  - 34
  - 34u

Inputting with arrow keys

Inputting using the arrow keys can be done in a number of different ways:

- Selecting a decimal point and incrementation or decrementation with the \( / \) arrow keys on the keyboard

- Incrementing or decrementing with the arrow keys on the user interface

**Note:** When entering the center frequency, increment size can be set on the rotary knob (R&S FS300 manual, Ch. 6.2.1.3 Entering the Step Width of the Center Frequency). The value is then incremented or decremented according to this set value.

Invalid parameter entry

If a parameter entry is invalid, the value will automatically be limited, and an error message indicating the valid value range will appear in the parameter field, e.g.:

- Acknowledge the error message with the mouse or the Enter key and repeat the entry with the correct value.
7.5.4.4 Moving the Markers

Introduction
In the diagram area, lines (markers, limits, etc.) can be inserted to analyze the trace. In addition, an arrow is displayed at the edge of the diagram at the position of the corresponding line. The position of the line can be changed by moving the arrow with the left mouse button.

The marker values can be read in the parameter fields above.

7.6 Overview of all Menus and Functions (Shortcuts)

7.6.1 File

Menus to prepare for a Session

<table>
<thead>
<tr>
<th>Menu</th>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>Ctrl+N</td>
<td>Begin new session</td>
</tr>
<tr>
<td>Open</td>
<td>Ctrl+O</td>
<td>Open saved session</td>
</tr>
<tr>
<td>Save</td>
<td>Ctrl+S</td>
<td>Save current session</td>
</tr>
<tr>
<td>Save as...</td>
<td>Ctrl+A</td>
<td>Save current session as</td>
</tr>
<tr>
<td>Logfile</td>
<td></td>
<td>Create a log file for the current session</td>
</tr>
<tr>
<td>Export</td>
<td></td>
<td>Export data</td>
</tr>
<tr>
<td>Page Setup...</td>
<td></td>
<td>Page setup for printing</td>
</tr>
<tr>
<td>Print Window</td>
<td>Ctrl+P</td>
<td>Print current window</td>
</tr>
<tr>
<td>Exit</td>
<td>Ctrl+Q</td>
<td>Exit program</td>
</tr>
</tbody>
</table>

The following options are available in the pull-down menu File: open, save and close a session; create a log file; export data; print screen.
7.6.2 Function

Instrument functions are accurately described in chapter 6 of the R&S FS300 manual.

Menus for configuring and starting measurements

- **Freq**
  Selecting the frequency span
  (setting the x axis in the diagram area)

- **Amp**
  Setting the level axis and the RF input
  (setting the y axis in the diagram area)

- **Marker**
  Signal analysis with marker functions

- **BW/Sweep**
  Setting the bandwidths and the sweep time

- **Trace**
  Displaying the trace

- **Trigger**
  Triggering the measurement

- **Measure**
  Measurement functions
7.6.2.1  FREQ Menu

Main function display (always visible)

1. Center ▲▼  1.5 GHz
2. Span ▲▼  3 GHz
3. Level ▲▼  -20 dBm
4. SWF ▲▼  10 Hz
5. RBW L MHz

Function display (insert with F5 key)

3. Start ▲▼  0 Hz
4. Stop ▲▼  3 GHz
5. CF Step ▲▼  150 MHz

6. Full Zero Last
7. Zoom
8. Signal Tracking

Function and shortcut

Center Ctrl+Shift+C
Span Ctrl+Shift+S
Start Ctrl+Shift+B
Stop Ctrl+Shift+E
Center Stepsize

Entering the center frequency (1)
Entering the span (2)
Entering the start frequency (3)
Entering the stop frequency (4)

Open submenu:
Entering the step width of the center frequency

- manual
- auto
- = Center frequency
- = Marker frequency

Setting the step size manually (5)
Setting the step size automatically (9)
Setting the step size to the center frequency (9)
Setting the step size to the marker frequency (9)

Span Settings

Full Span
Zero Span
Last Span
Zoom In Ctrl++
Zoom Out Ctrl+-

Displaying the whole frequency range (6)
Switching over to the ZERO SPAN (11)
Restoring the previous setting (10)
Reducing the span (7)
Increasing the span (12)

Open submenu:
Signal tracking

on
off

Activating signal tracking (8)
De-activating signal tracking (8)
7.6.2.2 Amp Menu

Main function display (always visible)

Function display (insert with F6 key)

Function and shortcut

- **Ref Level** Ctrl+Shift+L: Entering the reference level (1)
- **Ref Level Offset** Ctrl+Shift+R: Entering a level offset (2)
- **Range** Ctrl+Shift+R: Selecting the level display range (3)
- **Unit** Ctrl+Shift+U: Selecting a unit for the level display (4)
- **RF Attenuation** Manual: Setting the RF input attenuation manually (6)
- **RF Attenuation Auto** Manual: Setting the RF input attenuation automatically (5), (7)
- **Set High Sense** Manual: Setting the high sensitivity automatically (8)
7.6.2.3 Marker Menu

Function display
(insert with F7 key)

<table>
<thead>
<tr>
<th>Function and shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marker 1</strong></td>
</tr>
<tr>
<td>Peak</td>
</tr>
<tr>
<td>Next Peak left</td>
</tr>
<tr>
<td>Next Peak right</td>
</tr>
<tr>
<td>Signal Count</td>
</tr>
<tr>
<td>Signal Count Resolution</td>
</tr>
<tr>
<td>off</td>
</tr>
<tr>
<td><strong>Open submenu:</strong></td>
</tr>
<tr>
<td>Activate marker 1</td>
</tr>
<tr>
<td>Place marker 1 on the trace maximum (6)</td>
</tr>
<tr>
<td>Place marker 1 on the next trace maximum to the left (7)</td>
</tr>
<tr>
<td>Place marker 1 on the next trace maximum to the right (8)</td>
</tr>
<tr>
<td>Measure the signal frequency: Start measurement (10)</td>
</tr>
<tr>
<td>De-activate marker 1</td>
</tr>
<tr>
<td><strong>Marker 2</strong></td>
</tr>
<tr>
<td>Peak</td>
</tr>
<tr>
<td>Next Peak left</td>
</tr>
<tr>
<td>Next Peak right</td>
</tr>
<tr>
<td>Marker norm</td>
</tr>
<tr>
<td>Marker delta</td>
</tr>
<tr>
<td>off</td>
</tr>
<tr>
<td><strong>Open submenu:</strong></td>
</tr>
<tr>
<td>Activate marker 2</td>
</tr>
<tr>
<td>Place marker 2 on the trace maximum (5)</td>
</tr>
<tr>
<td>Place marker 2 on the next trace maximum to the left (7)</td>
</tr>
<tr>
<td>Place marker 2 on the next trace maximum to the right (8)</td>
</tr>
<tr>
<td>Set marker 2 as a normal marker (NORM) (11)</td>
</tr>
<tr>
<td>Set marker 2 as a delta marker (DELTA) (13)</td>
</tr>
<tr>
<td>De-activate marker 2</td>
</tr>
<tr>
<td><strong>Marker &gt;</strong></td>
</tr>
<tr>
<td><strong>Open submenu:</strong></td>
</tr>
<tr>
<td>Accepting marker values as settings</td>
</tr>
<tr>
<td>Center = Marker Freq</td>
</tr>
<tr>
<td>Ref Level = Marker Level</td>
</tr>
<tr>
<td>Center Stepsize = Marker Freq</td>
</tr>
<tr>
<td>Set the center frequency to the marker frequency (4)</td>
</tr>
<tr>
<td>Set the marker level as a reference level (3)</td>
</tr>
<tr>
<td>Set the step size for entering the center frequency to the marker frequency (2)</td>
</tr>
</tbody>
</table>
Overview of all Menus and Functions (Shortcuts)

Marker Functions ➤

- **Open submenu:** Marker measurement functions
  - **Noise Marker** Measuring noise power density (15)
  - **n dB down** Measuring signal bandwidth (16)

D-Line Ctrl+Shift+D  Bring display line up on screen (14)

Limit Line  Bring limit line up on screen (6-219)

Ref fixed ➤

- **Open submenu:** Reference points for measuring level differences
  - **on** Activating the entry of arbitrary reference points (1)
  - **off** Using M1 marker values as a reference point (1)
  - **Ref Point Level** Entering the reference-point level (18)
  - **Ref Point Freq** Entering the reference-point frequency (17)
  - **Ref Point Time** Entering the reference-point time (19)

Marker Settings ➤

- **Open submenu:** Search criterion of functions NEXT PEAK LEFT/RIGHT
  - **Peak Excursion** Entering the peak excursion (9)
7.6.2.4 **BW/Sweep Menu**

**Main function display (always visible)**

- Center
- Span
- Level
- SWT
- RBW
- 1.5GHz
- 3GHz
- -20,0dBm
- 10Hz

**Function display (insert with F8 key)**

- BW/Sweep
- FcBW
- Coupl.
- RBW/Span
- Sweep
- Continue
- Single
- Repeat
- Normal
- 0

**Function and shortcut**

- **Res BW manual** + Shift+W
  - Setting the resolution bandwidth manually (2)
- **Res BW auto**
  - Activating automatic resolution bandwidth setting (9)
- **Video BW manual**
  - Setting the video bandwidth manually (3)
- **Video BW auto**
  - Activating automatic video bandwidth setting (10)
- **Coupl Ratio**
  - Setting the RBW/VBW coupling ratio
    - **RBW/VBW manual**
      - Setting the coupling ratio manually (4)
    - **RBW/VBW auto**
      - Activating the default setting for the coupling ratio (11)
- **Sweep**
  - Open submenu:
    - Setting the sweep time
      - **Cnt Sweep** + Ctrl+
        - Starting a continuous frequency sweep (5)
      - **Single Sweep** + Ctrl+
        - Performing an n-times sweep (6)
      - **No. of Sweeps**
        - Setting the number of sweeps (12)
      - **Repeat Single Sweep**
        - Repeating n-times sweeps (7)
      - **Sweep time manual**
        - Setting the sweep time manually (1)
      - **Sweep time auto**
        - Activating automatic sweep-time setting (8)
    - **RBW/Span Low Noise**
      - Changing automatic resolution bandwidth setting (12)
        - **Normal**
          - Automatic RBW limits for normal sensitivity
        - **Low Noise**
          - Automatic RBW limits for maximal sensitivity
7.6.2.4.1 RBW RBW/Span

**Note**
The setting becomes effective only if the resolution bandwidth coupling is in AUTO mode.

**Description**
You can change the automatic coupling between the SPAN and resolution bandwidth (RBW) by means of the RBW/Span function. Thus, you can switch the analyzer between the two settings “Normal” and “Low Noise” for even more accurate signal analysis, for example.

- **Normal**
  - Default setting
  - Corresponds to the normal operating mode and provides the shortest possible sweep times for a set SPAN

- **Low Noise**
  If the span is 1 GHz or lower, the resolution bandwidth is decreased in the “Low Noise” setting as compared with the “Normal” setting. As a result, the sweep time increases simultaneously. The resolution bandwidths (RBWs) are set in accordance with the table below:

<table>
<thead>
<tr>
<th>SPAN</th>
<th>RBW</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAN &gt; 1 GHz</td>
<td>1 MHz</td>
</tr>
<tr>
<td>1 GHz ≥ SPAN &gt; 50 MHz</td>
<td>300 kHz</td>
</tr>
<tr>
<td>50 MHz ≥ SPAN &gt; 10 MHz</td>
<td>100 kHz</td>
</tr>
<tr>
<td>10 MHz ≥ SPAN &gt; 5 MHz</td>
<td>30 kHz</td>
</tr>
<tr>
<td>5 MHz ≥ SPAN &gt; 1 MHz</td>
<td>10 kHz</td>
</tr>
<tr>
<td>1 MHz ≥ SPAN &gt; 200 kHz</td>
<td>3 kHz</td>
</tr>
<tr>
<td>200 kHz ≥ SPAN &gt; 100 kHz</td>
<td>1 kHz</td>
</tr>
<tr>
<td>100 kHz ≥ SPAN &gt; 50 kHz</td>
<td>500 Hz</td>
</tr>
<tr>
<td>50 kHz ≥ SPAN &gt; 20 kHz</td>
<td>300 Hz</td>
</tr>
<tr>
<td>20 kHz ≥ SPAN &gt; 1 kHz</td>
<td>200 Hz</td>
</tr>
</tbody>
</table>
7.6.2.5 Trace Menu

Function display
(insert with F9 key)

Function and shortcut

Open submenu:
Selecting the active trace
- Trace 1
- Trace 2

Open submenu:
Trace display mode
- Overwrite mode
- Max. hold
- Min. hold
- Averaging

Open submenu:
Freezing the trace
Blanking out the trace

Open submenu:
Trace difference
- Turning on the trace-difference mode
- Repositioning Trace 1 (result)
- Turning off the trace-difference mode
7.6.2.6 Trigger Menu

Function display (insert with F10 key)

1. Free Run
   - Free-running measurements (1)
2. External
   - Triggers by an external TTL signal
     - rising edge
     - falling edge
3. Video
   - Triggers by the display level (3), (6)
4. Offset:
   - Entering a trigger offset (4)

Function and shortcut

- Free Run
- External
- Video
- Offset:

Open submenu:
  - Triggering by an external TTL signal
    - rising edge
    - falling edge
  - Triggers by the display level
  - Entering a trigger offset

Note

The trigger function LINE (triggering by the AC-line frequency) is not supported.

7.6.2.7 Measure Menu

Function display (insert with F11 key)

1. Time Power Domain
   - Measure the power in the time domain (ZERO SPAN)
     - Peak
     - Mean
     - off
2. Marker 1+2 Function
   - TOI

Function and shortcut

- Time Power Domain
- Marker 1+2 Function
- TOI

Open submenu:
  - Measure the power in the time domain (ZERO SPAN)
    - Peak
    - Mean
    - off
    - TOI
  - Switch off the power measurement (3)
  - Measure the third-order intercept point (4)
7.6.3 View

Menus for configuring the program interface

- **large Window Ctrl+`** Switch on/off large window (6-228)
- **Color Ctrl+L** Set screen color (6-229)

7.6.4 Help

Help menus

- **Help** Start help function (6-230)
- **Info Ctrl+H** Display program information (6-230)

7.6.5 Zoom Functions

Diagram area (always visible)

<table>
<thead>
<tr>
<th>Functions</th>
<th>1</th>
<th>3</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zoom the screen window&lt;br&gt;(1) Move screen window in X direction (one grid unit)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Zoom screen window in/out in X direction&lt;br&gt;(2) Move screen window in Y direction (one grid unit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Zoom screen window in/out in Y direction&lt;br&gt;(3) Zoom screen window in/out in X direction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Zoom function (3) corresponds to the Zoom In/Out functions (6-207). Zoom function (4) corresponds to the Range functions (6-208).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note
7.7 Saving/Exporting Data (File)

7.7.1 Opening the Session

Application

A new session is opened automatically when the program is started (6-188). The current R&S FS300 settings are loaded. The following settings are display and evaluation functions and are not transferred to the PC software:

- Marker functions (6-209)
- Scale of measuring diagram (Range, Unit)
- Trace functions (6-212)
- Measure functions (6-214)

However, you may also open a new session while in remote control mode. Default settings are automatically loaded (R&S FS300 manual, Ch. 6.1 R&S FS300 Factory Settings).

You can save and load specific instrument settings if you plan to work with these on a regular basis.

7.7.1.1 Beginning New Measurement

- **Beginning the measurement with current instrument setting**
  - Start the PC software on your PC.

- **Beginning the measurement with factory setting**
  - Select menu item: New.
7.7.1.2 Loading the Saved Settings

**Note**
If you drag and drop an *.fs file (saved instrument settings) to the FS300-K1.exe icon while the program is closed, the program will open using the settings from this *.fs file.

**Beginning the measurement with saved instrument settings**

1. Select menu item: **Open**.

2. Select a file from the directory and click **<Open>**.

**Resetting the instrument settings**

- To load the instrument settings that were last loaded or the factory settings, press **<Preset>** in the main function display.
7.7.2 Saving the Session

**Application**

You can save specific instrument settings if you plan to work with them on a regular basis (Save Session).

You may also change a previously saved instrument setting and save it under a different file name (Save Session as...).

**Saving instrument settings**

1. Select menu item: **Save** or **Save as**...

2. Select a directory, enter a file name and click **<Save>**.
7.7.3 Monitoring the Measuring Values

Introduction

If you wish to monitor deviation of measuring values you may set limit lines (Limit Lines) to monitor them. A logfile is created which can be opened with any text editor or with Microsoft Excel™.

7.7.3.1 Inserting the Limit Lines

Application

Measuring values which overshoot the limit lines are monitored with an Upper Line and measuring values which undershoot the limit lines are monitored with a Lower Line. The shape of the limit lines are entered into a table in value pairs (frequency, amplitude), they may then be inserted into the measuring diagram.

You can create limit lines with up to 50 value pairs, these may be saved and loaded for later use.

Entering limit lines

1. Select menu item: Limit Line.

Edit Limit Lines window opens.

[Diagram showing Upper Line and Lower Line]
2. Use the left-hand table to enter the frequency and amplitude values for the lower lines and use the right-hand table to enter the upper lines. Each row in the table describes a reference point on the limit line. At least 2 value pairs (reference points) per line must be entered, e.g., lower line: -80 dB for full span.

<table>
<thead>
<tr>
<th>Frequency [MHz]</th>
<th>Level [dBm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-80.000000</td>
</tr>
<tr>
<td>2</td>
<td>-80.000000</td>
</tr>
<tr>
<td>3</td>
<td>-80.000000</td>
</tr>
<tr>
<td>4</td>
<td>-80.000000</td>
</tr>
<tr>
<td>5</td>
<td>-80.000000</td>
</tr>
<tr>
<td>6</td>
<td>-80.000000</td>
</tr>
<tr>
<td>7</td>
<td>-80.000000</td>
</tr>
<tr>
<td>8</td>
<td>-80.000000</td>
</tr>
<tr>
<td>9</td>
<td>-80.000000</td>
</tr>
<tr>
<td>10</td>
<td>-80.000000</td>
</tr>
</tbody>
</table>

**Note:** You may increase and decrease the amplitude values of a limit line for all value pairs with the input fields: **change lower/change upper**.

<table>
<thead>
<tr>
<th>Frequency [MHz]</th>
<th>Level [dBm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-85.000000</td>
</tr>
<tr>
<td>2</td>
<td>-85.000000</td>
</tr>
<tr>
<td>3</td>
<td>-85.000000</td>
</tr>
<tr>
<td>4</td>
<td>-85.000000</td>
</tr>
<tr>
<td>5</td>
<td>-85.000000</td>
</tr>
<tr>
<td>6</td>
<td>-85.000000</td>
</tr>
<tr>
<td>7</td>
<td>-85.000000</td>
</tr>
<tr>
<td>8</td>
<td>-85.000000</td>
</tr>
<tr>
<td>9</td>
<td>-85.000000</td>
</tr>
<tr>
<td>10</td>
<td>-85.000000</td>
</tr>
</tbody>
</table>

You may increase and decrease the frequency values of a limit line for all value pairs with the input fields: **change frequency [MHz]**.
Inserting limit lines

1. Tick the check boxes for **Lower Line** and/or **Upper Line** to activate the limit line(s).

<table>
<thead>
<tr>
<th>Frequency [MHz]</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.000000</td>
</tr>
<tr>
<td>2</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

2. Click **<APPLY>** to activate the limit line(s). The status information **Upp** and/or **Low** are displayed in the diagram.

Saving and loading limit lines

1. Press **<SAVE>** if you plan to use the current settings again.

   ![Save File as](image)

   The **Save File as** window opens.

2. Select a directory, enter a file name and click **<Save>**. The current settings are saved.

3. Press **<LOAD>** if you wish to use the saved settings again.

   ![File open](image)

   The **File open** window opens.

4. Select the (.lim) file from your directory and click **<Open>**. The saved settings (frequency and amplitude values) are loaded.

   - Press **<OK>** to close the **Edit Limit Lines** window. The current settings remain active in the diagram.
7.7.3.2 Monitoring

Aim
A logfile is created during the monitoring process, which documents over- and undershooting of a limit line. This allows random events to be captured.

Creating the logfile

1. Select menu item: Logfile.

   ![Logfile window](image)

   The Logfile window opens.

2. Click <change> if a logfile has not yet been created.

   ![Save File as window](image)

   The Save File as window opens. Select a directory, enter a file name and click <Save>. The current logfile path is displayed.

3. Click in the Comment window to enter a logfile comment.
### Starting the monitoring

1. Enter the maximum logfile memory size in KB. The default setting is "512 KB".

   ![logfile memory size input]

2. Click **<Enable recording>** to start the monitoring process. The button lights up red.

   ![logfile window with enable recording option]

   If an over- or undershoot of a limit is detected, the corresponding status information **Upp** and/or **Low** flashes in the diagram. The measuring values are monitored 10x per second and each over- or undershoot of a limit line is recorded.

### Stopping the monitoring

1. Click **<Enable recording>** to finish the monitoring process. The button no longer lights up red.

2. Click **<OK>** to close the **Logfile** window.

   ![logfile window with ok and cancel buttons]
7.7.3.3 Analyzing the Logfile

Logfile content

The logfile contains the measuring data, which were recorded during the monitoring process. A record is created from the following parameters when a limit line has been over- or undershot.

- **Date** - event date
- **Time** - event time
- **MinLimit (1)** - limit line level Upp
- **MaxLimit** - limit line level Low
- **EventFreq (2)** - event frequency value
- **EventLevel (3)** - event maximum level
- **Center** - center frequency
- **Span** - span
- **RBW** - resolution bandwidth
- **Ref Level** - reference level
- **Leveloffset** - level offset
- **SweepTime** - sweep time

Analyzing the logfile

If the logfile (.log) is saved as a text file (.txt) the data can be opened and analyzed in Microsoft Excel™.
7.7.4 Exporting the Measuring Data

Application
To record the measurements, you can save the current diagram with the most important parameter settings in ASCII code or you can save a screenshot of the current window as a JPEG.

7.7.4.1 Creating the ASCII File

Creating the ASCII file

1. Select menu item: ASCII file.

The Export ASCII window opens.

2. Click in the Please change comment window to enter a logfile comment and click <OK>.

The Save File as window opens.

3. Select a directory, enter a file name and click <Save>.
The ASCII file contains the following parameters:

- Center - center frequency
- Span - span
- RBW - resolution bandwidth
- Pixel - level values of the trace

Note
The number of exported level values (pixels) depends on the setting for the size of the window. (6-228, small window: 310 pixels, large window: 700 pixels)

7.7.4.2 Creating the Screenshot

Creating the screenshot

1. Select menu item: JPEG picture.

The Save File as window opens.

2. Select a directory, enter a file name and click <Save>.
7.7.5 Printing the Window

Page setup

1. Select menu item: Page setup.

The Page setup opens.

2. Check the <Print header> box (✓) to print a header with the file name, date and page number.

3. Check <Use default margins from preferences> to print page with the presettings.

You may also check <Custom margins> to print page with user-defined settings. You may then adjust the page margins: <Left>, <Right>, <Top> and <Bottom>.

4. Click <Printer setup> to select your printer settings.

5. Click <OK> to close the Page setup window.

Printing the window

6. Select menu item: Print Window from the File pull-down menu to print the current program window.
7.8 Customizing the Working Window (View)

7.8.1 Adjusting the Window Size

1. Select menu item: **Large Window** to enlarge the program window.

The diagram is enlarged by a factor of 2. In addition to the **Main Settings**, two function displays appear in the function display area. The first function display (e.g., **Amplitude**) refers to the current menu selection and the second function display (e.g., **Trace**) refers to the last menu selection.

2. Select the **Large Window** menu item again to reduce the window size.
7.8.2 Changing the Window Color

Changing the window color

1. Select menu item: Color.

The Screen Color window opens. Colors for the listed window elements can be changed.

2. Click on a color field to change the color for the corresponding windows element. A color scheme opens.

3. Move the mouse over the color bars and click on your preferred color. The color scheme closes and the new color appears in the color field of the window element.

4. Click <OK> to close the Screen Color window and to activate the new window colors.

You may also click <Reset> and <OK> to revert to the default color settings.
7.9 Getting Help (?)

7.9.1 Starting the Help

Starting the help

- Select menu item: Help to start the Windows™ Help for program FS300 0000xxxxxx.

Acrobat Reader™ (CD-ROM) starts up and the English R&S FS300-K1 operating manual opens.

7.9.2 Displaying the Program Version

Opening/closing the program version

1. Select menu item: Info for information about the FS300 0000xxxxxx program.

An information field opens.

2. Click in the information field with the mouse to close. You may also wait approximately 10 seconds for the information field to close automatically.
7.9.3 Displaying Module Data

Displaying module data

1. Select menu item: Service to obtain information about the individual modules.

The modules of the R&S FS300 will be output and displayed.

Starting self-diagnostics

2. Click the line <FS300> to select the generator module.

3. Click <Self test> to start self-diagnostics.

All modules are checked one after the other and the result, “Passed” or “Error”, is output.

4. Click <OK> to close the Service window.
8 Instrument Interfaces

This chapter

The chapter 8 contains a description of the R&S FS300’s interfaces.

Further information

The address of our Support Center and a list of Rohde & Schwarz service centers will be found at the front of this manual.

8.1 Keyboard Connector (KEYBOARD)

Connector

There is a 6-pin PS/2 connector KEYBOARD [21] on the R&S FS300’s rear panel for an external keyboard.

Pin assignment

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KEYBOARDDATA</td>
</tr>
<tr>
<td>2</td>
<td>MOUSEDATA</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>5V, KEYBOARD</td>
</tr>
<tr>
<td>5</td>
<td>KEYBOARDCLK</td>
</tr>
<tr>
<td>6</td>
<td>MOUSECLK</td>
</tr>
</tbody>
</table>

8.2 Monitor Connector (MONITOR)

Connector

There is connector MONITOR [20] on the rear panel of the R&S FS300 for an external monitor.

Pin assignment

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R</td>
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<tr>
<td>2</td>
<td>G</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
</tr>
<tr>
<td>4</td>
<td>(NC)</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
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<td>9</td>
<td>GND</td>
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<td>10</td>
<td>GND</td>
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<td>11</td>
<td>(NC)</td>
</tr>
<tr>
<td>12</td>
<td>(NC)</td>
</tr>
<tr>
<td>13</td>
<td>HSYNC</td>
</tr>
<tr>
<td>14</td>
<td>VSYNC</td>
</tr>
<tr>
<td>15</td>
<td>(NC)</td>
</tr>
</tbody>
</table>
8.3  Input for External Trigger (EXT TRIG/GATE IN)

Specification
The connector EXT TRIG/GATE IN [14] is for an external signal which is used to control measurements.

The signal has TTL levels (low < 0.7 V, high > 1.4 V), and the typical impedance is 10 kΩ.

Instrument setting
The TRIG menu (6-135) allows you to make the appropriate settings when an external signal is used to trigger measurements.

8.4  Reference Input and Output (REF IN and REF OUT)

External reference
If an external reference is used, the internal reference oscillator is synchronized to the 10 MHz reference signal at connector REF IN [22]. The input level must be 0.5 to 2V.

Internal reference
The 10 MHz signal from the internal reference oscillator is available at the REF OUT connector [23] so that other devices can be synchronized to the R&S FS300. The output level is 0 dBm.

Instrument setting
You can switch over between the internal and external reference in the CONFIG menu (6-159).

8.5  USB Interface (USB HOST, USB DEVICE)

Connector
The USB-Host [15] and USB-Device [16] connectors on the rear panel of the R&S FS300 are for a USB device.

Pin assignment

<table>
<thead>
<tr>
<th>Pin</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Vbus (Vcc)</td>
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<tr>
<td>2</td>
<td>D-</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td></td>
<td>Shell</td>
</tr>
<tr>
<td></td>
<td>Shield</td>
</tr>
</tbody>
</table>
9 Error Messages

This chapter
Refer to chapter 9 for a detailed description of errors that may occur in the R&S FS300. You will also find notes on troubleshooting.

The R&S FS300 displays detected errors and warnings on the screen. The various types of messages are described in the following:

- System messages
- Warnings indicating impermissible operating states

Further information
Chapter 6 describes all the R&S FS300's menus and the associated functions in detail.

9.1 System Messages

System messages inform you of internally detected errors. The following informations are displayed, e.g.:

- Type of error (\(x\))
- Four-digit error number (\(y\))
- Request for closing the system messages (\(z\))

The error number allows the service shop to determine the type of error. In the event of an system message, please write down the error number and proceed according to the following steps.

**Device Error**

"Error number"

A system error was detected in the instrument.

1. Please write down the error number and the corresponding instrument settings.
2. Contact your nearest Rohde & Schwarz representative (0-22). The instrument may have to be checked in the service shop.

**Overtemperature**

"Error number"

An impermissibly high temperature was detected in the instrument. The internal fans are switched to full power for approx. 30 seconds, and then the R&S FS300 is automatically switched off to prevent further overheating.

The overtemperature could be caused by too high an ambient temperature and/or reduced air circulation.

1. Let the instrument cool off for a while and remove any obstructions that could hinder air circulation.
2. If this doesn't eliminate the overtemperature, have the instrument checked by the service shop.

Note

Some errors can cause the instrument or parts of the instrument to be switched off immediately in order to avoid destruction of components. Whenever an system message occurs, an entry is made under SYSTEM MESSAGES (\(\uparrow\) 6-168).
9.2 Warnings Indicating Impermissible Operating States

Warnings

Red labels at the upper left corner of the measurement grid tell the user that the measurement results may be incorrect. This can be caused by excessively high signal levels at the input or by incorrect settings on the instrument. The warning remains on the screen until the problem has been eliminated.

There are three types of messages that can be displayed on the screen:

**OVERLOAD**

A level above 13 dBm is detected at the R&S FS300 input and the current input attenuation setting is less than 20 dB. In this case, the instrument automatically increases the input attenuation by 20 dB to prevent the subsequent stages from being overdriven. The displayed signal level decreases by 20 dB as a result of the additional attenuation, without the display being corrected.

1. To obtain a correct level display, the reference level must be increased (6-82) until the message disappears.
2. If the message does not disappear, it is possible that the input attenuation is set to Manual. Raise the input attenuation above 20 dB (6-87), or switch to automatic setting of the input attenuation (6-88).

**Note:** This display will appear even if the signal is outside the currently selected span. In FULL SPAN mode (6-76), check whether a signal exceeds the permissible value and reduce the level if necessary.

**PLL unlock**

The control loop, which is used to set the frequency of the internal reference oscillator with crystal accuracy, does not lock. This causes a frequency error, and the spectrum analyzer no longer operates according to specifications. The cause for this may be an internal instrument error or the absence of the 10 MHz reference signal at the external input REF IN. The absence of the reference signal, however, is not indicated unless the reference has been switched to “external”.

1. If the missing external reference signal is the cause of this error message, connect a 10 MHz signal to the REF IN [22] input or switch the reference to “internal” (6-159).
2. If the missing external reference signal is not the cause of this error message, an internal instrument error has occurred. In this case, switch the instrument off and on again. If the error message is still present, the instrument must be sent to the service shop to be checked.

**ADC overload**

The level of the input signal is approx. 20 dB above the set reference level. In this case, the analog/digital converter is being overdriven, causing intermodulation products and distortions in the spectrum.

- This can be remedied by increasing the value for the reference level in the instrument (6-82).
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