

Operating Manual

Arbitrary and Function Generator R&S® AM 300

Order No. 1147.1998.03



ROHDE & SCHWARZ

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Mühlendorfstraße 15
81671 München, Germany

3rd edition 02/2005
Printed in Germany.
Printed on FFC bleached paper.

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Chapter Overview

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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
- Installation and configuration of PC software
- Putting into operation of remote control

By way of an introduction, a typical R&S AM300 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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Data Sheet



Note

As a highly innovative company we seek to ensure that our products constantly undergo further development. For updates on newly added applications and product characteristics please visit our website <http://www.smart.rohde-schwarz.com>.

Channels

| | | |
|---------------------------|--|---------------------|
| Number of channels | | 2 |
| Phase | | |
| Setting range | | -180° to +180° |
| Resolution | | 0.01° |
| Operating modes | | CH1, CH2, CH1 + CH2 |

Waveform

| | | |
|------------------|---|---------------------|
| Standard | sine, triangle, ramp, square, pulse, exponential rising, exponential falling, noise | |
| Arbitrary | | |
| Waveform length | points per channel | 16 to 262144 (256K) |
| Level resolution | | 14-bit |

Frequency

| | | |
|--|-----------|----------------------|
| Sine | | 10 µHz to 35 MHz |
| Triangle, ramp, square, exponential | | 10 µHz to 500 kHz |
| Square low jitter | | 10 µHz to 50 MHz |
| Noise | | 35 MHz bandwidth |
| Pulse | | 10 µHz to 16.667 MHz |
| Arbitrary | | |
| Repetition frequency | 16 points | Max. 6.25 MHz |
| Sample frequency | | 10 µHz to 100 MHz |
| Resolution | | 10 µHz |

Output Parameters

| | | |
|--|---------------------------------|---------------------------|
| Output voltage (50 Ω) | | |
| Setting range | at AM: 1 mV to 5 V (V_{SS}) | 1 mV to 10 V (V_{SS}) |
| Resolution | | 0.1 mV (4 digits) |
| Accuracy | | $\pm 2\%$ |
| Frequency response (referenced to 10 kHz sine) | | |
| 10 $\mu\text{Hz} \leq f \leq 30\text{ MHz}$ | | $\pm 0.1\text{ dB}$ |
| 30 MHz < f $\leq 35\text{ MHz}$ | | $\pm 0.25\text{ dB}$ |
| Units | | V (V_{SS}), dBm |

Spectral Purity (Sine)

| | | |
|--|--------------------------------------|--------------------|
| Harmonic distortion | | |
| | ≥ 3 (U_{SS}) output voltage | < 3 V (V_{SS}) |
| 20 Hz $\leq f \leq 1\text{ MHz}$ | < -60 dBc | < -65 dBc |
| 1 MHz < f $\leq 5\text{ MHz}$ | < -55 dBc | < -55 dBc |
| 5 MHz < f $\leq 35\text{ MHz}$ | < -35 dBc | < -40 dBc |
| Non-harmonic distortion | | |
| 10 $\mu\text{Hz} \leq f \leq 5\text{ MHz}$ | typ. (-70 dBc) | < -60 dBc |
| 5 MHz < f $\leq 25\text{ MHz}$ | typ. (-55 dBc) | < -45 dBc |
| 25 MHz < f $\leq 35\text{ MHz}$ | typ. (-50 dBc) | < -40 dBc |
| SSB phase noise (10 kHz offset) | | |
| 10 MHz | | -118 dBc (1 Hz) |
| 35 MHz | | -117 dBc (1 Hz) |

Signal Characteristic

| | | |
|---|--|-------------------------|
| Square | | |
| Duty cycle | | |
| f $\leq 500\text{ kHz}$ | | 1 % to 99 %, selectable |
| 10 $\mu\text{Hz} \leq f \leq 50\text{ MHz}$ | | 50 % fixed |
| Rise/fall time | | |
| 10 $\mu\text{Hz} \leq f \leq 10\text{ MHz}$ | | < 10 ns |
| 10 MHz < f $\leq 50\text{ MHz}$ | | < 5 ns |
| Overshoot | | < 5 % |
| Pulse | | |

Data Sheet

R&S AM300

| | | |
|-----------------------|--|---------------------------------------|
| Period | | 70 ns to 9999 s |
| Pulse width | | 20 ns to 9999 s |
| Rise time | | < 10ns |
| Overshoot | | < 5 % |
| Ramp/triangle | | |
| Symmetry | | 0 % to 100 % |
| Linearity | | $\pm 0.1 \%$ ($f < 10 \text{ kHz}$) |
| Exponential | | |
| Type | | rising or falling |
| Arbitrary | | |
| Rise time | | < 10 ns |
| Linearity | | $\pm 0.1 \%$ ($f < 10 \text{ kHz}$) |
| Download time via USB | | 16 s (binary 256 k points) |

Output Characteristic

| | | |
|--|--|---------------------|
| Offset (50 Ω) | | |
| Setting range | $\pm 5 \text{ V}$, $ \text{signal level} + \text{offset} \leq 5 \text{ V}$ | |
| Accuracy | $\pm 1 \%$ of setting $\pm 2 \text{ mV} + 0.5 \%$ of signal level | |
| Signal output | | |
| Impedance | | 50 Ω nominal |
| Protection | | short-circuit proof |
| Filter | | |
| Internal | | |
| Operating modes | manual, automatic | |
| Lowpass filter cutoff frequency | 35 MHz, 37 MHz, 75 MHz | |
| Filter types | Bessel 9th order, Cauer 9th order | |
| External filter connection | | |
| Impedance (output and input) | 50 Ω nominal | |
| Output voltage | 2 V (V_{SS}) | |

Modulation¹⁾

| | | |
|---------------------------|--|------------------------|
| Modulation modes | AM, FM, ϕ M, FSK, PSK | |
| AM | | |
| Carrier waveforms | sine, triangle, ramp, square, exponential, pulse and arbitrary | |
| Modulation waveforms | sine, square, triangle, ramp, exponential, noise | |
| Modulation frequency | | 10 mHz to 100 kHz |
| Modulation depth | | 0 to 100 % |
| resolution | | 0.1 % |
| Source | | internal |
| FM | | |
| Carrier waveforms | sine, triangle, ramp, square, exponential and arbitrary | |
| Modulation waveforms | sine, square, triangle, ramp, exponential, noise | |
| Modulation frequency | | 10 mHz to 100 kHz |
| Frequency deviation | | 100 mHz to 17.5 MHz |
| Source | | internal |
| ϕM | | |
| Carrier waveforms | sine, triangle, ramp, square, exponential and arbitrary | |
| Modulation waveforms | sine, square, triangle, ramp, exponential, noise | |
| Modulation frequency | | 10 mHz to 100 kHz |
| Phase deviation | | -180° to +180° |
| Source | | internal |
| FSK | | |
| Carrier waveforms | sine, triangle, ramp, square, exponential and arbitrary | |
| Modulation waveforms | square | |
| Modulation frequency | | 0.1 mHz to 2 MHz |
| Frequency deviation | 35 MHz for sine | 10 μ Hz to 500 kHz |
| Source | | internal, external |
| PSK | | |
| Carrier waveforms | sine, triangle, ramp, square, exponential and arbitrary | |
| Modulation waveforms | | square |
| Modulation frequency | | 0.1 mHz to 2 MHz |
| Phase deviation | | -180° to +180° |
| Source | | internal, external |

Gate/Burst

| | | |
|------------------------------------|---|--------------------|
| Waveforms | sine, triangle, ramp, square, exponential and arbitrary | |
| Gate settings | block end; sample & hold, burst | |
| Number of periods per burst | | 1 to 65535 |
| Start phase | | -180° to +180° |
| Gate length (internal) | | 100 ns to 9999 s |
| Gate source | | internal, external |

Sweep

| | | |
|-----------------------------|---|---------------------|
| Waveforms | sine, triangle, ramp, square, exponential and arbitrary | |
| Type | | linear, logarithmic |
| Direction | | upwards |
| Start/stop frequency | 10 MHz to max. signal frequency (sine 35 MHz) | |
| Sweep time | | 1 ms to 999 s |
| Marker | | frequency marker |

Trigger

| | | |
|-------------------------------|-----------------------|-------------------------------|
| Source | | manual, internal, external |
| Delay | | |
| Setting range | | 0 ns, 150 ns bis 9999 s |
| Resolution | | 10 ns |
| Internal trigger | | |
| Repetition period | 2 MHz to 101 μ Hz | 500 ns to 9901 s |
| Resolution | | 10 ns |
| External trigger input | | |
| Input voltage | | TTL-compatible |
| Edge | | rising or falling, selectable |
| Pulse width | | > 100 ns |
| Input impedance | | > 1 k Ω (DC coupling) |
| Latency (burst, sweep) | | < 100 ns (typically) |
| Sync output | | |
| Outputs | | 2 |
| Voltage | | TTL-compatible |
| Pulse width | | \geq 50 ns |
| Polarity | | selectable |

R&S AM300**Data Sheet**

| | | |
|-----------|--|--|
| Impedance | | 50 Ω |
| Sources | | comparator, phase accumulators, markers, trigger |

Reference

| | | |
|--|--|-----------------------------|
| Reference oscillator (internal) | | |
| Frequency | | 10 MHz |
| Stability | | < 1 ppm |
| Aging | | < 1 ppm/year |
| Reference input | | |
| Frequency | | 10 MHz, 5 MHz, 2 MHz |
| Frequency deviation | | < $5 * 10^{-6}$ |
| Input voltage | | 0.5 V to 2 V (50 Ω) |
| Input impedance | | 50 Ω |
| Reference output | | |
| Frequency | | 10 MHz |
| Output voltage | | > 0.5 V (50 Ω) |
| Impedance | | 50 Ω |

Interfaces

| | | |
|-------------------|---|-------------------------|
| USB host | | |
| Connector | | "B plug" connector type |
| Protocol | | version 1.1 |
| Command set | device-specific command set, remote control via Windows driver (Windows 2000/XP™) | |
| USB device | | |
| Connector | | "A plug" connector type |
| Protocol | | version 1.1 |
| Additional memory | | USB memory stick |

Power Supply

| | | |
|----------------------------|--|---|
| Input voltage range | | 100 V to 240 V AC (autoranging), 50 to 60 Hz, |
| Power consumption | | < 35 VA |

General Data

| | | |
|--------------------------------------|---|---|
| Display | | |
| Type | | 5.4" active colour TFT display |
| Number of points | | 320 x 240 |
| Memory locations | | |
| Device settings | | 8 |
| Ambient conditions | | |
| Operating temperature range | meets DIN EN 60068-2-1/2 | +5° C to +45° C |
| Storage temperature range | | -20° C to +70° C |
| Relative humidity | meets DIN EN 60068-2-3 (non-condensing) | 95 % at +40° C |
| Mechanical loading | | |
| Sine | meets DIN EN 60068-2-6, DIN EN 61010-1 and MIL-T-28800D Class 5 | 5 to 150 Hz: max. 2g at 55 Hz, 55 to 150 Hz: 0.5g constant |
| Random | meets DIN EN 60068-2-64 | 10 to 500 Hz: 1.9g |
| Shock | meets DIN EN 60068-2-27 and MIL-STD-810 | shock spectrum |
| Electromagnetic compatibility | meets EN 55011 Class B and EN 61326 (EMC Directive 89/336/EEC) | |
| Noise field strength | | < 10 V/m |
| Protection class | DIN EN 61010-1/IEC61010-1 UL3111-1; CSA22.2 No:1010.1 | |
| Dimensions (W x H x D) | | 219 mm x 147 mm x 350 mm |
| Weight | | approx. 6.2 kg |

¹⁾ Modulation possible only when frequency coupling is switched on.

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

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

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 $\pm 10\%$ shall apply to the nominal voltage and of $\pm 5\%$ 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 dustcloth. Never use solvents such as thinners, acetone and similar things, as they may damage the front panel labeling or plastic parts.
15. Any additional safety instructions given in this manual are also to be observed.

Certificate of Quality

Certified Quality System
ISO 9001
DQS REG. NO 1954-04

**Certificate of
quality**

Dear Customer,

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

The Rohde & Schwarz quality management system is certified according to ISO 9001.



EC Certificate of Conformity



Certificate No.: 2003-39

This is to certify that:

| Equipment type | Stock No. | Designation |
|----------------|---------------------|---|
| AM300 | 1147.1498.03 | Arbitrary and function generator with two channels |

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)
- relating to electromagnetic compatibility (89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN61010-1 : 2001-12

EN55011 : 1998 + A1 : 1999, Klasse B

EN61326 : 1997 + A1 : 1998 + A2 : 2001

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 2003

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

Munich, 2003-08-21
Central Quality Management FS-QZ/Becker

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where and when you
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CustomerSupport.Feedback@rohde-schwarz.com

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Monday to Friday (except US-state holidays)
8:00 AM – 8:00 PM Eastern Standard Time (EST)

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From outside USA: +1 410 910 7800 (opt 2)
Fax: 410 910 7801

E-Mail: Customer.Support@rsa.rohde-schwarz.com

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Monday to Friday (except German-state holidays)
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| Mexico | Rohde & Schwarz de Mexico (RSMX) S. de R.L. de C.V. German Centre Oficina 4-2-2 Av. Santa Fé 170 Col. Lomas de Santa Fé 01210 Mexico D.F. | +52 (55) 85 03 99 13 +52 (55) 85 03 99 16 latinoamerica@rsd.rohde-schwarz.com |
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| Nepal | ICTC Pvt. Ltd. Hattisar, Post Box No. 660 Kathmandu | +977 (1) 443 48 95 +977 (1) 443 49 37 ictc@mos.com.np |

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| Nicaragua | siehe Mexico | |
| Nigeria | Ferrostaal Abuja Plot 3323, Barada Close P.O.Box 8513, Wuse Off Amazon Street Maitama, Abuja | +234 (9) 413 52 51 +234 (9) 413 52 50 fsabuja@rosecom.net |
| Norway | ROHDE & SCHWARZ NORGE AS Enebakkveien 302 B 1188 Oslo | +47 (23) 38 66 00 +47 (23) 38 66 01 - |
| Oman | Mustafa Sultan Science & Industry Co.LLC. Test & Measurement Products Way No. 3503 Building No. 241 Postal Code 112 Al Khuwair, Muscat | +968 63 60 00 +968 60 70 66 m-aziz@mustafasultan.com |
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| Papua-New Guinea | siehe Australia | |
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| Saudi Arabia | Gentec Haji Abdullah Alireza & Co. Ltd. P.O.Box 43054 Riyadh | +966 (1) 465 64 28 +966 (1) 465-64 28 akanbar@gentec.com.sa |

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| | | |
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| South Africa | Protea Data Systems (Pty.) Ltd. Communications and Measurement Division Private Bag X19 Bramley 2018 | +27 (11) 719 57 00 +27 (11) 786 58 91 unicm@protea.co.za |
| South Africa | Protea Data Systems (Pty.) Ltd. Cape Town Branch Unit G9, Centurion Business Park Bosmandam Road Milnerton Cape Town, 7441 | +27 (21) 555 36 32 +27 (21) 555 42 67 unicm@protea.co.za |
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| Sri Lanka | Dynatel Communications (PTE) Ltd. 451/A Kandy Road Kelaniya | +94 (1) 90 80 01 +94 (1) 91 04 69 dyna-svc@slt.net.lk |
| Sudan | SolarMan Co. Ltd. P.O.Box 11 545 North of Fraouq Cementry 6/7/9 Bldg. 16 Karthoum | +249 (11) 47 31 08 +249 (11) 47 31 38 solarman29@hotmail.com |
| Sweden | ROHDE & SCHWARZ SVERIGE AB Marketing Div. Flygfältsgatan 15 128 30 Skarpnäck | +46 (8) 605 19 00 +46 (8) 605 19 80 info@rss.se |
| Switzerland | Roschi Rohde & Schwarz AG Mühlestr. 7 3063 Ittigen | +41 (31) 922 15 22 +41 (31) 921 81 01 sales@roschi.rohde-schwarz.com |
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| Tunisia | TELETEK 71, Rue Alain Savary Residence Alain Savary (C64) 1003 Tunis | +216 (71) 77 22 88 +216 (71) 77 05 53 |
| Turkey | ROHDE & SCHWARZ International GmbH Liaison Office Istanbul Bagdad Cad. 191/3, Arda Apt. B-Blok 81030 Selamicesme-Istanbul | +90 (216) 385 19 17 +90 (216) 385 19 18 rsturk@superonline.com |
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| 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 | +971 (2) 631 20 40 +971 (2) 631 30 40 rsuaeam@emirates.net.ae |
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| USA | Rohde & Schwarz, Inc. Broadcast & Comm. Equipment 8661-A Robert Fulton Drive Columbia, MD 21046-2265 | +1 (410) 910 78 00 +1 (410) 910 78 01 rsatv@rsa.rohde-schwarz.com rsacomms@rsa.rohde-schwarz.com |
| USA | Rohde & Schwarz Inc . Marketing & Support Center/T&M Equipment 2540 SW Alan Blumlein Way M/S 58-925 Beaverton, OR 97077-0001 | +1 (503) 627 26 84 +1 (503) 627 25 65 info@rsa.rohde-schwarz.com |
| USA | Rohde & Schwarz Inc. Systems & EMI Products 8080 Tristar Drive Suite 120 Irving, Texas 75063 | +1 (469) 713 53 00 +1 (469) 713 53 01 info@rsa.rohde-schwarz.com |

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| Venezuela | Representaciones Bopic S.A. Calle C-4 Qta. San Jose Urb. Caurimare Caracas 1061 | +58 (2) 129 85 21 29 +58 (2) 129 85 39 94 incotr@cantv.net |
| Vietnam | Schmidt Vietnam Co., (H.K.) Ltd., Representative Office in Hanoi Intern. Technology Centre 8/F, HITC Building 239 Xuan Thuy Road Cau Giay, Tu Liem Hanoi | +84 (4) 834 61 86 +84 (4) 834 61 88 svnhn@schmidtgroup.com |
| West Indies | siehe Mexico | |

1 Introduction

| | |
|----------------------------|--|
| This chapter | Chapter 1 describes the use of the R&S AM300, provides information on functions and supplies tips regarding storage and transportation procedures. Warranty conditions are also explained. |
| Further information | Chapter 2 contains an overview of R&S AM300 control elements, indicators, etc. Chapter 3 describes how to put the instrument into operation. |

1.1 Application Range of the R&S AM300

| | |
|---------------------------------|---|
| Application | <p>The R&S AM300 dual-channel signal generator is capable of producing both arbitrary and function signals. It offers powerful functionality and spectral purity at a favourable price. Due to its excellent characteristics the instrument represents digitally created signals with almost no distortion. The R&S AM300 is therefore the reference signal source for a host of applications.</p> <p>With its high sample rate of up to 100 MS/s, a 256k points waveform memory per channel and the Waveform Composer software, it can produce virtually any waveform, whether for use in the laboratory, in production or in the service department.</p> <p>The two channels on the instrument are coupled precisely in phase, making it possible to generate analog I/Q signals with which to modulate a signal generator such as the R&S SM300.</p> <p>The upper frequency limits of 35 MHz for sine signals and 50 MHz for square signals offers enough leeway for future tasks.</p> |
| Performance | <p>The main characteristics are as follows:</p> <ul style="list-style-type: none">▪ Two channels, each with separately selectable waveform, frequency and amplitude▪ Differential phase can be set with 0.01° resolution▪ Harmonic suppression for sine wave (1 MHz) typically 70 dB (0.03 %)▪ Highly stable reference frequency (1 ppm/year)▪ Jitter-free clock generator to 50 MHz▪ USB interface (with file management on USB memory stick)▪ Standard waveforms: sine, triangle, ramp, square, exponential, noise, pulse▪ Frequency range: 35 MHz for sine, 50 MHz for square▪ Modulation modes: AM, FM, ϕM, FSK, PSK, burst |
| Operation from keypad | All functions and parameters can be set via menus using a keypad and a rotary knob. Current parameters and operating states are clearly arranged on a TFT colour display. |
| Remote control from a PC | The R&S AM300 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 AM300-K1, Acrobat Reader™) |

**Note**

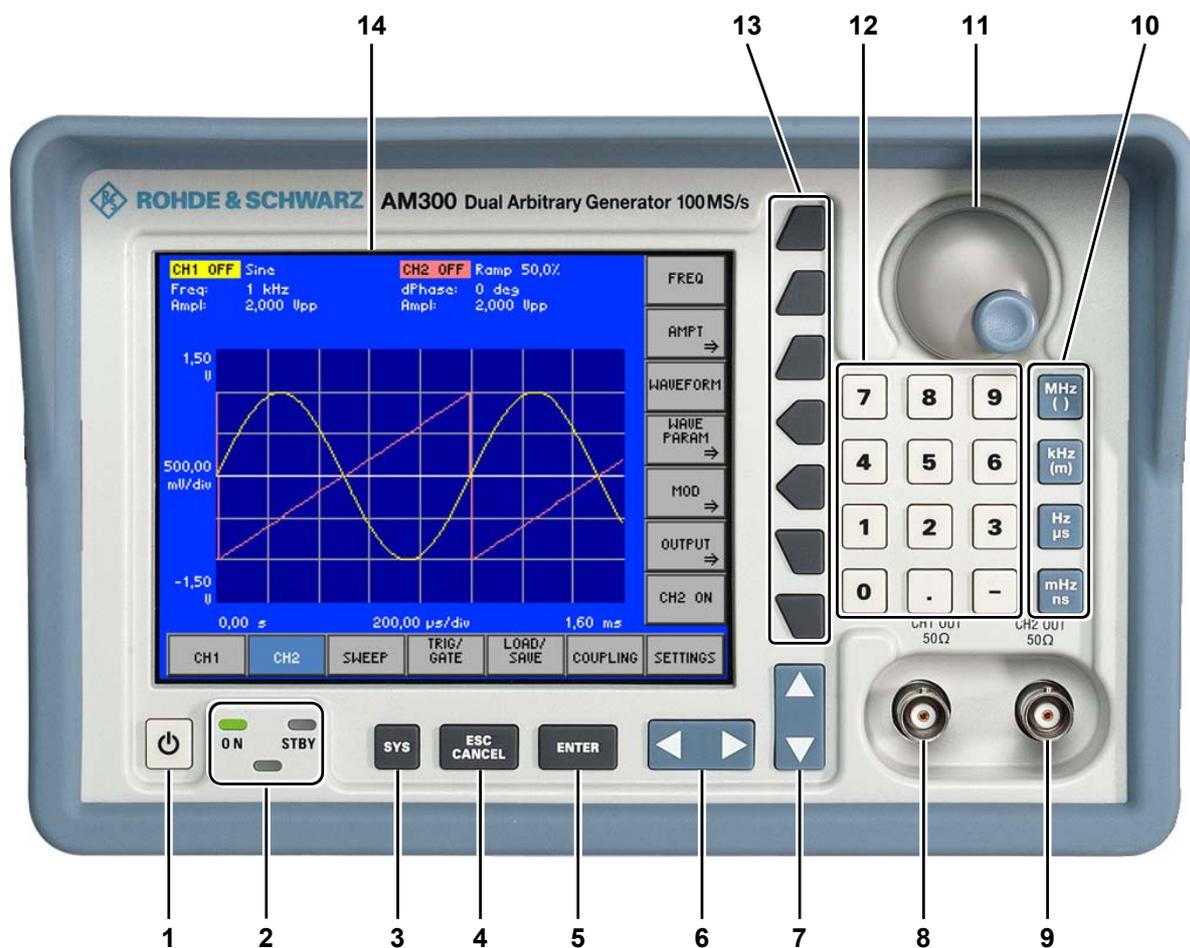
If you wish to generate user-defined (arbitrary) waveforms on a PC, you need the PC software known as Waveform Composer R&S AM300-K2 (order number 1147.2013.02).

1.3 Warranty

| | |
|---|--|
| Warranty conditions | Rohde & Schwarz guarantees that the R&S AM300 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 AM300 | Please observe the packaging instructions (➤ 0-17). 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 AM300 in accordance with our general installation and service conditions. |

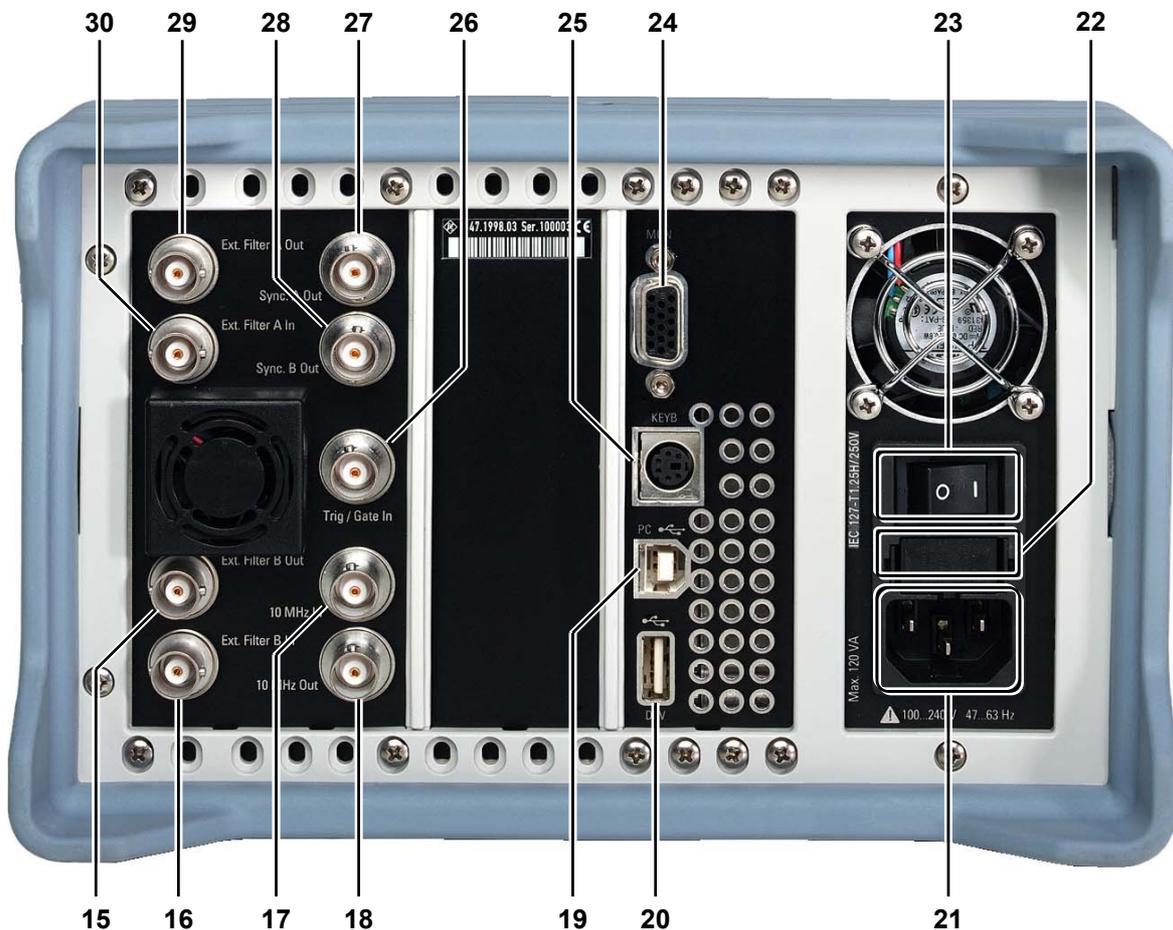
2 Control Elements

2.1 Front View



- | | | | |
|---|----------------------|----|-----------------------------------|
| 1 | ON/STANDBY switch | 8 | Signal output CH1 (BNC connector) |
| 2 | ON/STANDBY indicator | 9 | Signal output CH2 (BNC connector) |
| 3 | SYS key | 10 | Unit keys |
| 4 | ESC/CANCEL key | 11 | Rotary knob |
| 5 | ENTER key | 12 | Numerical keys |
| 6 | Cursor keys ◀ / ▶ | 13 | Function keys |
| 7 | Cursor keys ▼ / ▲ | 14 | Screen |

2.2 Rear View



- | | |
|--|---|
| <p>15 Output for external filter signal of channel CH2</p> <p>16 Input for external filter signal of channel CH2</p> <p>17 Input for external reference (10 MHz, 5 MHz, 2 MHz)</p> <p>18 Output for internal/external reference (10 MHz)</p> <p>19 Connector for external USB host</p> <p>20 Connector for external USB device</p> <p>21 AC supply connector</p> <p>22 AC line fuses</p> | <p>23 AC line switch</p> <p>24 Connector for external monitor</p> <p>25 Connector for external keyboard</p> <p>26 Input for external trigger/gate signal</p> <p>27 Output for sync signal of channel CH2</p> <p>28 Output for sync signal of channel CH2</p> <p>29 Output for external filter signal of channel CH1</p> <p>30 Input for external filter signal of channel CH1</p> |
|--|---|

3 Putting the R&S AM300 into Operation

This chapter

Chapter 3 describes how to put the R&S AM300 into operation.

Further information

Chapter 2 contains an overview of the R&S AM300'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 AM300 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 AM300'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 AM300

Recommended procedure

When you unpack the R&S AM300, proceed as follows:

1. Remove the R&S AM300 from its packaging and check that the delivery is complete using the accessory list (↗ 1-35).
2. Carefully check the R&S AM300 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 AM300 was transported and the packaging material (↗ 0-17).

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

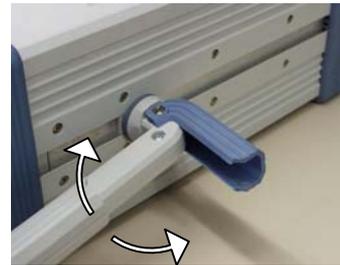
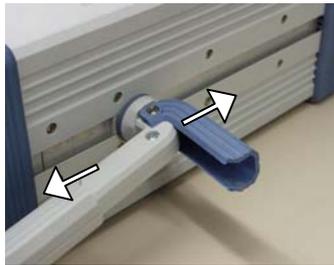
The R&S AM300 must be assembled on a firm, level surface only. The instrument has a carrying handle which is also used for various setup options. This handle can be moved into any position, depending on the particular field of application.

R&S AM300**Setting up the Instrument****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 AM300 to the AC Line



Caution

The R&S AM300 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 AM300 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 AM300 to the AC line.
The power supply connector [21] is at the rear of the instrument.
2. Connect the power cord to the AC line.

3.4 Switching On the R&S AM300



Hazard

The AC line is still connected to the R&S AM300 when the instrument is in the standby mode.

AC line switch on the rear panel

The R&S AM300 is connected to the AC line via power supply connector [21]. AC line switch [23] which isolates the R&S AM300 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 AM300 by means of the AC line switch [23] 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 AM300 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 AM300

1. Press the AC line switch [23] 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 AM300. The instrument does not contain any parts the operator can repair.

Function test

After the R&S AM300 has been switched on (↗ 3-40), 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 [14]. Booting the R&S AM300 takes approx. 2 minute and is completed when the waveform and menü bar (↗ 5-48) appear.

In error case

If the application display (↗ 5-48) does not appear and the red or the red or green LED flash alternately, switch the R&S AM300 off and on. In case the error continues, return the instrument to our service center for checking. When the red and green LEDs flash alternately [2] an internal error has been recognized. Return the instrument to our service center for checking.

3.6 EMC

EMC requirements

The R&S AM300 meets the EMC Directive 89/336/EEC (applied standards EN 55011 Class B and EN 61326).

To prevent EMI, the R&S AM300 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 AM300 must comply with EMC directives.

3.7 Connecting an External Keyboard



Caution

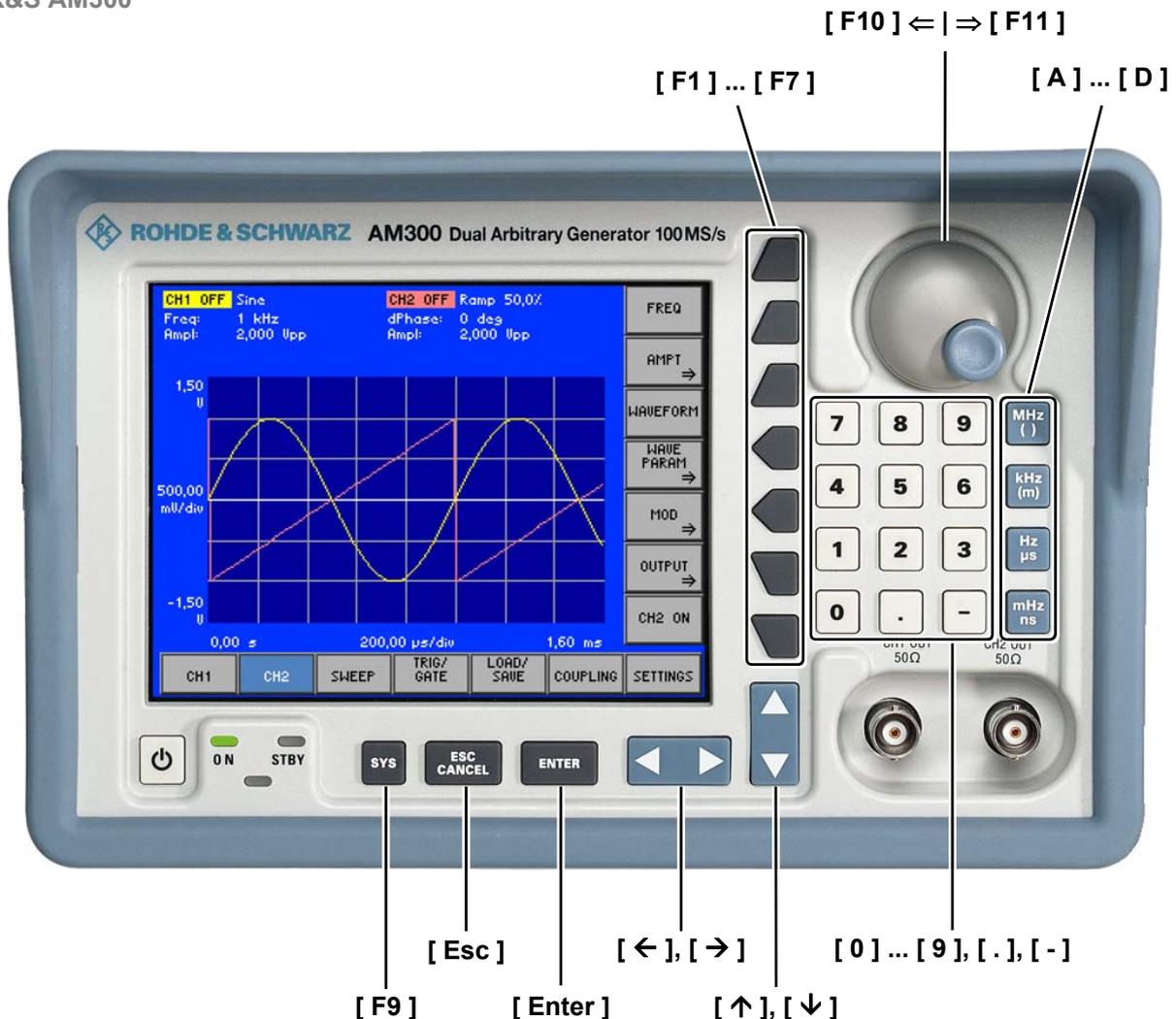
Only connect the keyboard when the R&S AM300 is off or in the STANDBY mode, otherwise malfunctions may occur at a later date.

Use

You can connect an external PC keyboard via the 6-pin PS/2 KEYB connector [25] on the R&S AM300'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 AM300.

The keyboard is detected automatically when it is connected.

Key assignment for operating the R&S AM300



4 Getting Started

This chapter

Chapter 4 uses a number of simple settings to illustrate how to operate the R&S AM300.

For the following example, the initial setting for instrument is the default setting (factory). This is set in the menu PRESET (➤ 6-191). 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 AM300's menus and the associated functions in detail.

4.1 Amplitude and Frequency Settings

Introduction

In this example the **square** waveform is applied to the output CH1 [8] with a frequency of 250 kHz and an amplitude $V_{pp} = 5\text{ V}$ and with a duty cycle of 20 %. The parameters are set up manually.

Steps in setting up

Perform the following steps:

1. Reset the R&S AM300.

- Press the **SYS** key.
- Using the **◀ ▶** cursor keys select **PRESET** from the bottom menu bar.
- Press the **PRESET** key.

2. Select square waveform.

- Using the **◀ ▶** cursor keys select **CH1** from the bottom menu bar.
- Press the **WAVEFORM** key.
- Use the rotary knob to select the **Square** setting. Finish the selection procedure with **ENTER**.

3. Set the signal frequency at 250 kHz.

- Stay in the **CH1** menu.
- Press the **FREQ** key.
- Use the numeric keys to enter the value **2 5 0**. Finish the entry with the **kHz (m)** unit key.

4. Set signal amplitude $V_{pp} = 5$ V.

- Stay in the **CH1** menu.
- Press the **AMPT** key.
- Press the **V_{pp}** key.
- Use the numeric keys to enter the value **5**. Finish the entry with the **ENTER** key.
- Use the **RETURN AMPT** key to exit the submenu.

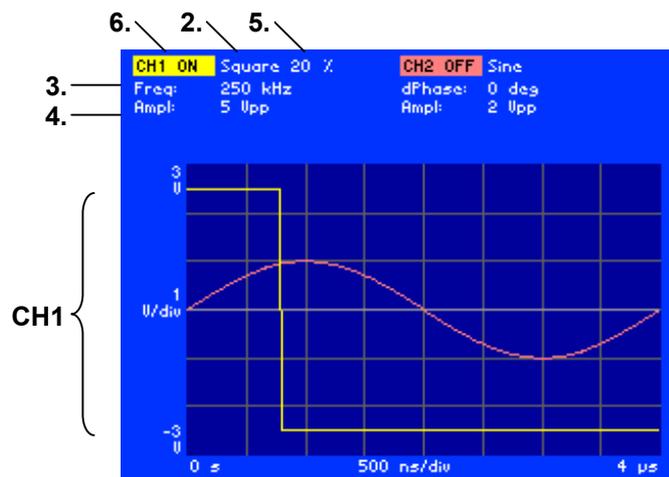
5. Set the duty cycle at 20 %.

- Stay in the **CH1** menu.
- Press the **WAVE PARAM** key.
- Press the **RECT DUTY** key.
- Use the numeric keys to enter the value **20**. Finish the entry with the **ENTER** key.
- Use the **RETURN WAVE PARAM** key to exit the submenu.

6. Switch the output on.

- Stay in the **CH1** menu.
- Press the **CH1 ON** key.

Display
at the R&S AM300



5 Manual Operating Concept

This chapter Chapter 5 contains an overview of the R&S AM300'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 6 contains an in-depth description of the menu functions .
Chapter 4 contains a brief introduction that takes you step-by-step through some simple settings.
In Chapter 7 you can find notes how the R&S AM300 is remote-controlled.

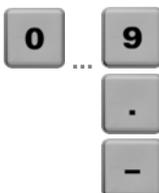
5.1 Making Entries from the Keypad

Introduction The R&S AM300 is operated using menus in conjunction with a keypad and a rotary knob. The keypad comprises the following sections:

- Numerical keys [12]
- Unit keys [10]
- Cursor keys [6, 7]
- Function keys [13]
- 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 **MHz** when a **frequency setting** is being made
- Assigns **s** when a **time setting** is being made
- Assigns **V** when a **voltage setting** is being made



- Assigns **kHz** when a **frequency setting** is being made
- Assigns **ms** when a **time setting** is being made
- Assigns **mV** when a **voltage setting** is being made



- Assigns **Hz** when a **frequency setting** is being made
- Assigns **μs** when a **time setting** is being made



- Assigns **mHz** when a **frequency setting** is being made
- Assigns **ns** when a **time setting** is being made

**Note**

In the case of all other entries, the unit keys assume the same function as the Enter key (↵ 5-47).

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.



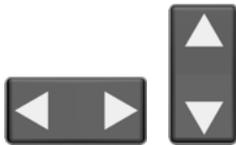
The rotary knob has several functions:

- **Incrementing** (turn clockwise) or **decrementing** (turn counter-clockwise) numerical instrument parameters using a specified step size.

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 (↵ 5-50).



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 AM300.

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

The SYS key is for opening and quitting the SYS menu (system and service functions).



- 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 [13] and the measurement diagram is replaced by the system parameters (↗ 6-190).
- By repeatedly pressing the SYS key [3], you can quit the SYS menu and accept the new settings.

5.2 Screen Display

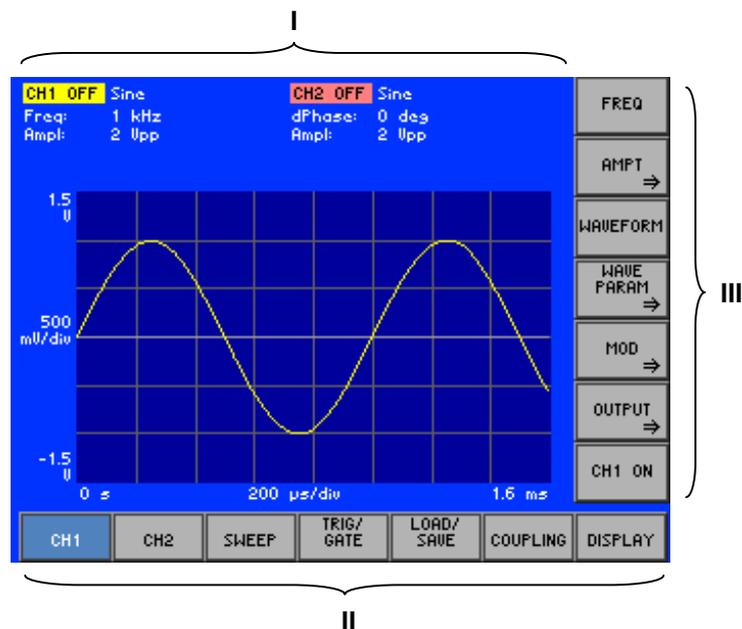
Introduction

The screen [14] 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

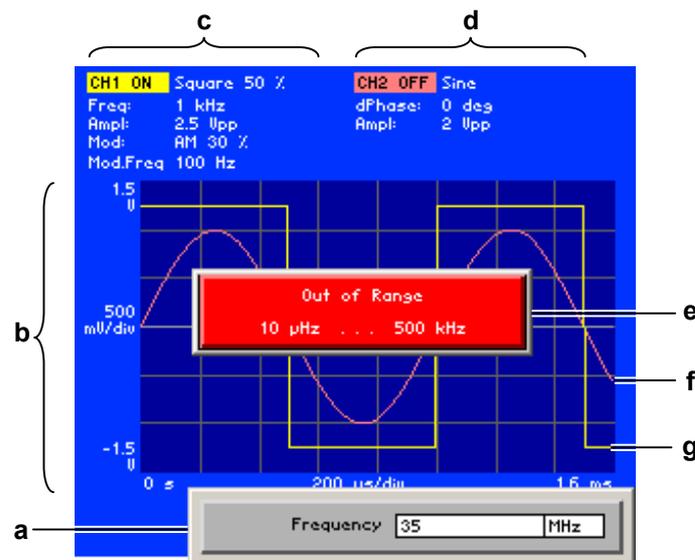


5.2.1 Diagram Area

Display window

The display window contains:

- Curve diagram (b) with waveforms of channels CH1 (g) and CH2 (f)
- Parameter field with settings of channels CH1 (c) and CH2 (d)
- Selection fields and entry fields that come up on the screen (a)
- Error messages that come up on the screen (e)



Curve diagram

A 8 x 6 grid is superimposed on the diagram area to make it easier to analyze waveforms.

Current parameter field

The parameter field displays the current parameter settings of the channel concerned, e.g. CH 1:

| | |
|--------------------|--|
| CH1 ON/OFF: | - Signal output status |
| Square | - Waveform currently set |
| 50 % | - Current duty cycle |
| Freq.: | - Signal frequency (carrier frequency) |
| Ampl: | - Signal amplitude |
| Mod: | - Modulation currently applied |
| AM | - Modulation mode |
| 30 % | - Modulation depth |
| Mod.Freq: | - Modulation frequency |

Note: The parameter "dphase: 0 deg" under channel CH2 in the parameter field indicates that frequency coupling exists between the waveforms on channels CH1 and CH2 (↗ 6-174).

5.2.2 Menu Area

Menu display

Menus for setting the setting parameters and the setting functions are displayed in the menu area. The selected menu is highlighted, e.g. CH1.

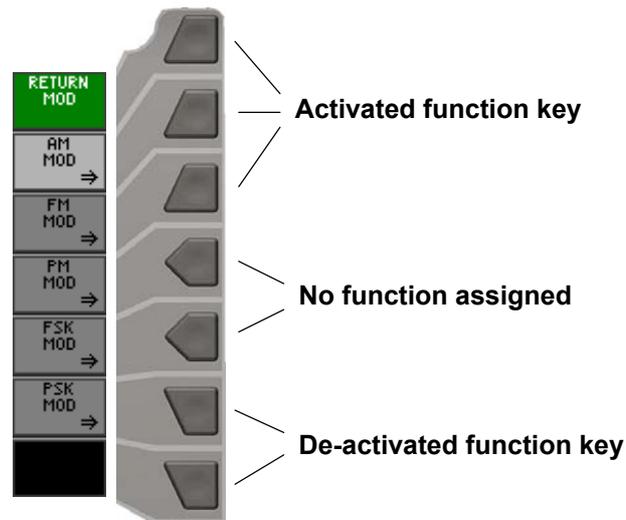


5.2.3 Function Area

Displaying the current assignment for the function keys

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.



5.3 Calling and Changing Menus

Introduction

Operating the R&S AM300 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:

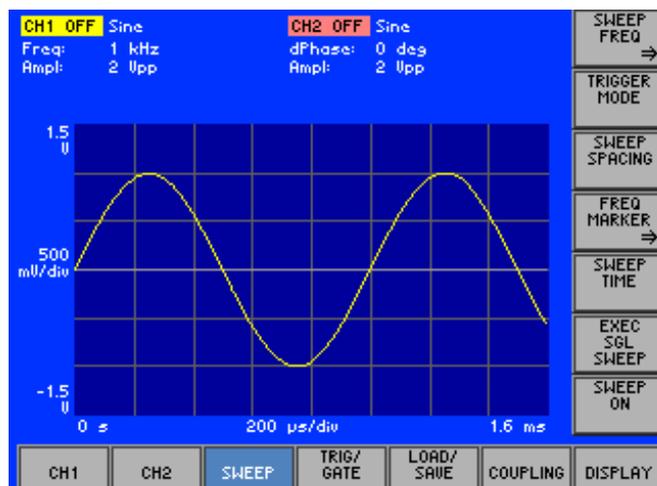
- Direct execution of an instrument function
- Toggling of a setting
- Opening of entry or selection windows
- Opening of submenus

The ◀ or ▶ cursor keys [6] are used for menu navigation.

Calling or changing menus

1. Select a **menu**, e.g. **SWEEP**, with the ◀ or ▶ [6] **cursor keys**.

The menu name is highlighted and the appropriate function is assigned to the function keys [13].



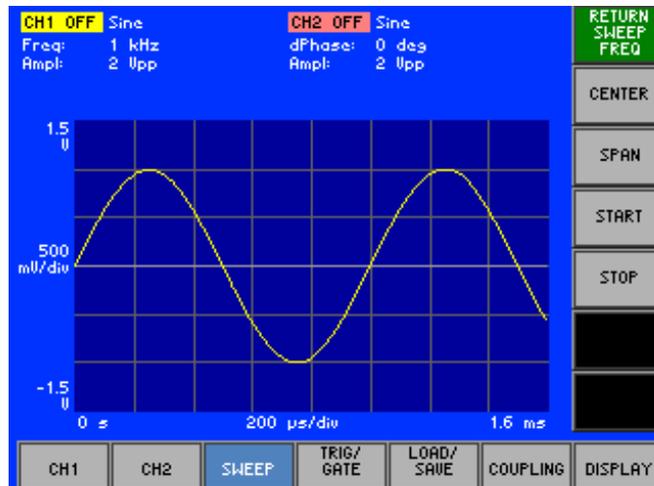
Note

A double arrow ⇒ pointing to a function key, e.g. **SWEEP FREQ** ⇒, tells you that pressing this key will call a submenu.

Calling/quitting submenus

2. Press the  function key in the  menu.

The SWEEP FREQ submenu opens and the new functions are assigned to the function keys [13].



3. Press the  function key in the  submenu.

The submenu is closed and the previous functions remain assigned to the function keys [13].

 **Note**

You can also exit the submenu by using the cursor keys ◀ oder ▶ [6].

5.4 Setting Parameters

There is a choice of methods

Parameters can be set in a number of ways:

- Direct selection of an instrument function (function key)
- Toggling of a setting
- Selecting settings from selection fields
- Entering numerical parameters in entry fields

The numerical keys [12], the unit keys [10], the rotary knob [11], 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.:
Scaling the diagram area automatically (↗ 6-181)

1. Select the **menu**  with the ◀ or ▶ [6] **cursor keys**.
2. Press the  **function key** in the  **menu**.
3. Press the  **function key** in the  **submenu**.
the X/Y axis of the kurve diagram is automatically scaled.

5.4.2 Toggling a Setting

Introduction

When a menu is selected, a number of instrument functions will be displayed in the function area. Some instrument functions can be switched on or off by a stroke of the function key (toggling).

The function key is highlighted when the instrument function is active.

e. g.:
Switching on/off the channel output CH2 (↗ 6-144)

1. Select the  menu with the ◀ or ▶ cursor key [6].
2. Press the  **function key** in the  **menu**.
The function key is **highlighted** and new setting is saved. The output signal with the currently set parameters is present.
3. To deactivate the channel output CH2, press the  **function key** in the  **menu**.
The function key is **no longer** highlighted and the output signal are no longer present at the channel output.

Note

If the function key is in a submenu, not only is that function key highlighted but so too is the function key for the submenu when the instrument function is active. This means you can easily tell which instrument functions are active without having to call the submenu(s) concerned.

5.4.3 Selecting Settings

Introduction

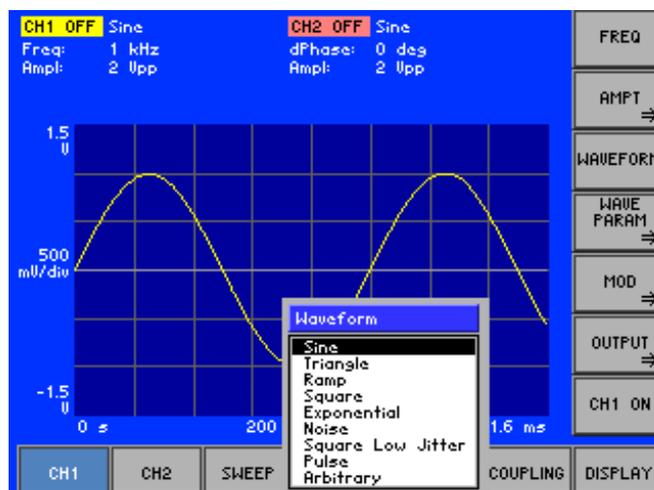
When you select a menu, a number of instrument functions are displayed in the function area. If certain function keys are then pressed, a selection field is displayed in the diagram area. You can then choose and activate any of the settings offered for selection.

The function key you select is highlighted.

e.g.:
Selecting a
waveform
(➔ 6-72)

1. Press the **WAVEFORM** function key in the **CH1** menu.

A selection field containing the available settings is displayed. The default setting is „Sine“.



2. Select a waveform with **rotary knob** [11].
3. Press the **ENTER** key [5] to close the selection field.

The new setting is saved and the waveform is displayed in the diagram area with at least one period.

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

Note

If there are more than 12 options, a scroll bar is displayed on the right next to the selection field. At any one time, only 12 options are displayed on the screen.

5.4.4 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:

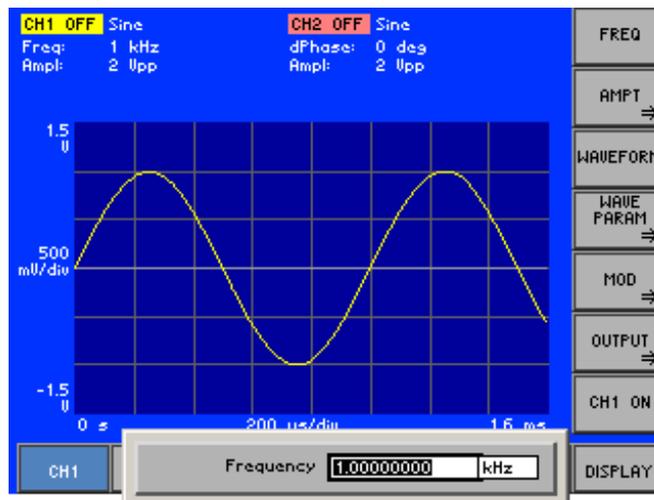
- **Entry** of a number with the **numerical keys**
- **Entry** of a number with the **cursor keys** and **rotary knob**

5.4.4.1 Entry with the Numerical Keys

e.g.:
Frequency setting of
the current
waveform
(↗ 6-75)

1. Press the **FREQ** function key in the **CH1** menu.

An entry field containing the current setting is displayed.



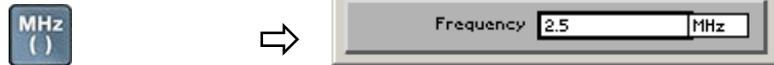
Entering
a new value

2. Overwrite the old value, e.g. **2.5 MHz**, with the **numerical keys** [12].

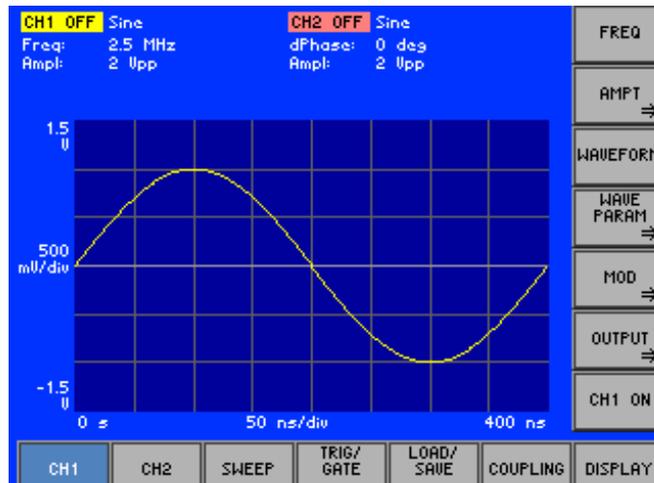


Note: If a numerical key is pressed after the entry field is brought up on the screen, the old value will be erased. However, a complete new value must now be entered using the numerical keys.

- Terminating entries 3. a) Press a **unit key** [10], e.g. **MHz**, to terminate the entry.



The R&S AM300 sets the value that has been set numerically using the **new unit**. The entry window is closed.



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



The R&S AM300 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.

- c) 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 AM300 and an error message is issued:



- Acknowledge the error message with the **ENTER** key [5] and enter the parameter again within the indicated value range.

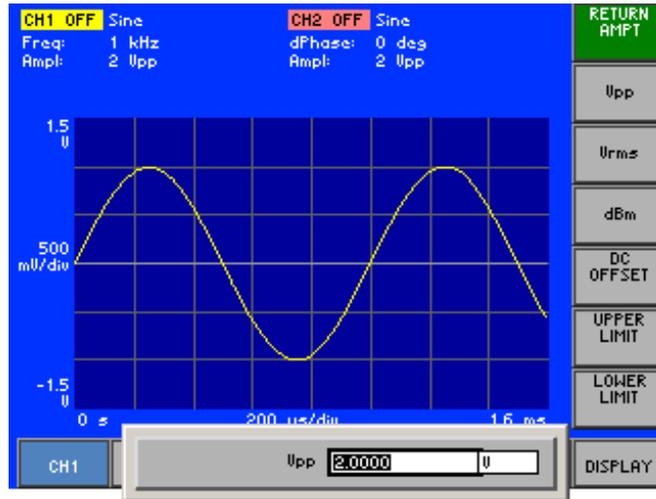
Note

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.

5.4.4.2 Entry using the Cursor Keys and the Rotary Knob

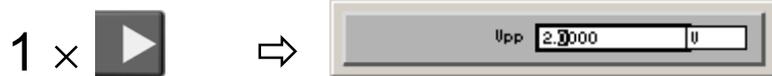
e.g.:
Setting the signal
amplitude
(↗ 6-77)

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



Entering
a new value,
e.g. 2.5

3. Using the **cursor keys** ◀ and ▶ [6], position the cursor on a decimal place in the entry field.



4. a) Press the ◻ or ▲ **cursor key** [7] until you obtain the value you want. Pressing the ▲ cursor key once increments the value by one; pressing the ◻ cursor key once decrements the value by one.



- b) Turn the **rotary knob** [11] until you obtain the value you want.

Turning clockwise increases the value; turning counter-clockwise reduces the value.



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.

Using another unit
of measure to
display a value

5. Press a **unit key** [10], e.g. kHz, to display the value in mV.



The numerically set value is displayed using the **new unit**. The input window is **not** closed.

Terminating entries

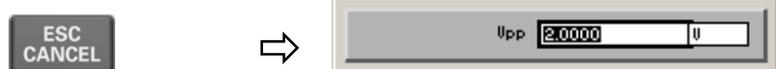
6. a) Press the **ENTER** key [5] to terminate the entry.



The R&S AM300 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.

- b) Press the **ESC/CANCEL** key [4] to abort the entry.



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 Arbitrary and Function Generator

5.5.1.1 CH1 Menu (CH2)

Function key assignment

| | | |
|--------|---|----------|
| FREQ | Set the frequency of the current waveform | (↗ 6-75) |
| AMPT → | Open submenu: Set the amplitude of the current waveform | |

| | Sine | Triangle Ramp Square | Exponential | Noise | Pulse | Arbitrary |
|---------------------------|------------------|----------------------------|------------------|-----------------|----------------|-------------|
| Signal amplitude | U _{pp} | U ₊ | U _{inf} | U _{pp} | U _p | SCALING |
| | U _{rms} | U ₋ | U ₀ | | | |
| DC component | dBm | U _{pp} | | DC OFFSET | DC OFFSET | DC OFFSET |
| | DC OFFSET | DC OFFSET | | | | |
| Output voltage limitation | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT |
| | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT |
| | ↗ 6-78 | ↗ 6-85, 6-87, 6-88 | ↗ 6-89 | ↗ 6-90 | ↗ 6-91 | ↗ 6-93 |

| | | |
|--------------|---|----------|
| WAVEFORM | Select waveform | (↗ 6-72) |
| WAVE PARAM → | Open submenu: Set function parameters of the current waveform | |

| | Sine Triangle Square Low Jitter | Ramp | Square | Exponential | Pulse | Arbitrary |
|--|---------------------------------------|-------------|-------------|-------------|--------------|------------------|
| | START PHASE | START PHASE | START PHASE | START PHASE | PULSE PERIOD | START PHASE |
| | | SYM-METRY | RECT DUTY | POLARITY | PULSE WIDTH | LOAD FROM MEMORY |
| | | | | | POLARITY | LOAD FROM STICK |
| | | | | | | ARB MODE |
| | | | | | | SAMPLE FREQ |
| | | | | | | RANGE/MARKER → |
| | ↗ 6-97, 6-100, 6-103 | ↗ 6-101 | ↗ 6-103 | ↗ 6-105 | ↗ 6-107 | ↗ 6-109 |

Overview of all Menus and Functions

R&S AM300



Open submenu:
Modulate waveform



Exit submenu



Open submenu:
Set amplitude modulation



Exit submenu



Set modulation frequency (↗ 6-116)



Set modulation depth (↗ 6-116)



Select modulation signal (↗ 6-115)



Switch modulation on/off (↗ 6-117)



Open submenu:
Set frequency modulation



Exit submenu



Set modulation frequency (↗ 6-120)



Set modulation depth (↗ 6-120)



Select modulation signal (↗ 6-119)



Switch modulation on/off (↗ 6-121)



Open submenu:
Set phase modulation



Exit submenu



Set modulation frequency (↗ 6-124)



Set phase deviation (↗ 6-124)



Select modulation signal (↗ 6-123)



Switch modulation on/off (↗ 6-125)



Open submenu:
Set frequency shift keying



Exit submenu



Set modulation frequency (↗ 6-127)



Set modulation period (↗ 6-127)



Set hopping frequency (↗ 6-128)



Select modulation source (↗ 6-127)



Select modulation signal polarity (↗ 6-128)



Switch modulation on/off (↗ 6-129)

**Open submenu:**

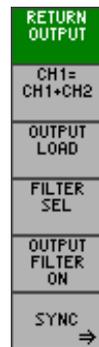
Set phase shift keying



- RETURN PSK MOD Exit submenu
- PSK FREQ Set modulation frequency (↗ 6-131)
- PSK PERIOD Set modulation period (↗ 6-131)
- PSK PHASE Set phase shift (↗ 6-132)
- PSK SOURCE Select modulation source (↗ 6-131)
- POLARITY Select modulation signal polarity (↗ 6-132)
- PSK ON Switch modulation on/off (↗ 6-133)

**Open submenu:**

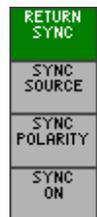
Configure signal output



- RETURN OUTPUT Exit submenu
- CH1=CH1+CH2 Switch channel summing on/off (↗ 6-135)
- OUTPUT LOAD Enter the terminating impedance (↗ 6-136)
- FILTER SEL Select anti-aliasing filter (↗ 6-137)
- OUTPUT FILTER ON Switch output filter on/off (↗ 6-138)

Open submenu:

Synchronize output from channel CH1 (CH2)



- RETURN SYNC Exit submenu
- SYNC SOURCE Select synchronization source (↗ 6-140)
- SYNC POLARITY Select synchronization output polarity (↗ 6-142)
- SYNC ON Switch synchronized output on/off (↗ 6-142)



Switch on output channel 1

(↗ 6-143)

5.5.1.2 SWEEP Menu

Function key assignment

| | | |
|---|---|-----------|
|  | Open submenu: Set the sweep frequency range | (↗ 6-147) |
|  | Exit submenu | |
|  | Entering the center frequency | (↗ 6-148) |
|  | Entering the frequency range | (↗ 6-148) |
|  | Entering the starting frequency | (↗ 6-149) |
|  | Entering the stopping frequency | (↗ 6-149) |
|  | Select trigger mode | (↗ 6-150) |
|  | Select sweep scaling | (↗ 6-151) |
|  | Open submenu: Set frequency marker | |
|  | Exit submenu | |
|  | Set marker frequency | (↗ 6-153) |
|  | Switch frequency marker on/off | (↗ 6-153) |
|  | Set sweep time | (↗ 6-151) |
|  | Start once-only sweep | (↗ 6-150) |
|  | Switch SWEEP operating mode on/off | (↗ 6-154) |

5.5.1.3 TRIG/GATE Menu

Function key assignment

| | | |
|---------------------|---|-----------|
| TRIGGER MODE | Select trigger mode | (↗ 6-157) |
| TRIGGER DELAY | Set trigger delay | (↗ 6-159) |
| POLARITY | Select active trigger edge | (↗ 6-159) |
| FREQ INT TRIG | Set internal trigger generator frequency | (↗ 6-160) |
| PERIOD INT TRIG | Set internal trigger generator period | (↗ 6-160) |
| GATE/ BURST ⇒ | Open submenu: Set Gate/Burst operating mode | |
| RETURN GATE/ BURST | Exit submenu | |
| GATE FUNCTION | Select gate function | (↗ 6-163) |
| GATE LENGTH | Set gate length | (↗ 6-166) |
| GATE EXTERN | Control gate via external trigger signal | (↗ 6-166) |
| POLARITY | Select gate polarity | (↗ 6-167) |
| BURST CYCLES | Set number of burst signal periods | (↗ 6-168) |
| GATE ON | Switch Gate/Burst mode on/off | (↗ 6-168) |
| EMEC SINGLE TRIGGER | Execute once-only triggering | (↗ 6-157) |

5.5.1.4 LOAD/SAVE Menu

Function key assignment

| | | |
|-----------------|---|-----------|
| MEM -> CH1 | Load waveform from the internal flash memory into channel CH1 | (↗ 6-170) |
| MEM -> CH2 | Load waveform from the internal flash memory into channel CH2 | (↗ 6-170) |
| STICK -> CH1 | Load waveform from the external USB stick into channel CH1 | (↗ 6-171) |
| STICK -> CH2 | Load waveform from the external USB stick into channel CH2 | (↗ 6-171) |
| CH1 -> MEM | Store waveform from channel CH1 in the internal flash memory | (↗ 6-172) |
| CH2 -> MEM | Store waveform from channel CH2 in the internal flash memory | (↗ 6-172) |
| DELETE MEM | Delete waveform from internal flash memory | (↗ 6-173) |

5.5.1.5 COUPLING Menu

Function key assignment

| | | |
|-------------------|---|-----------|
| FREQ CH1=CH2 | Switch frequency coupling on/off | (↗ 6-175) |
| AMPT CH1=CH2 | Switch amplitude coupling on/off | (↗ 6-175) |
| OUTPUT CH1=CH2 | Switch output coupling on/off | (↗ 6-175) |
| PHASE CH1=CH2 | Switch phase coupling on/off | (↗ 6-175) |
| COUPLING OFF | Switch off all coupling in channels CH1 and CH2 | (↗ 6-175) |

5.5.1.6 DISPLAY Menu

Function key assignment


Open submenu:
 Display waveforms

| | | |
|----------------|--|-----------|
| RETURN CHANNEL | Exit submenu | |
| CH1 U-T | Switch channel CH1 display on/off | (↗ 6-179) |
| CH2 U-T | Switch channel CH2 display on/off | (↗ 6-179) |
| CH1-X CH2-Y | Switch on display of voltage values from CH1 and CH2 | (↗ 6-180) |


Open submenu:
 Scaling of diagram area

| | | |
|--------------------|------------------------------|-----------|
| RETURN SCALING | Exit submenu | |
| X-AXIS AUTO | Scale X axis automatically | (↗ 6-182) |
| X-AXIS SCALING | Scale X axis manually | (↗ 6-182) |
| X-AXIS POSITION | Set starting value of X axis | (↗ 6-182) |
| Y-AXIS AUTO | Scale Y axis automatically | (↗ 6-184) |
| Y-AXIS SCALING | Scale Y axis manually | (↗ 6-184) |
| Y-AXIS POSITION | Set starting value of Y axis | (↗ 6-184) |


Open submenu:
 Zoom the screen window

| | | |
|-------------|--|-----------|
| RETURN ZOOM | Exit submenu | |
| MOVE X | Move screen window in X direction | (↗ 6-187) |
| MOVE Y | Move screen window in Y direction | (↗ 6-187) |
| ZOOM X | Zoom screen window in/out in X direction | (↗ 6-188) |
| ZOOM Y | Zoom screen window in/out in Y direction | (↗ 6-188) |
| ZOOM XY | Zoom screen window in/out in X/Y direction | (↗ 6-188) |
| AUTO XY | Automatically scale X/Y axis | (↗ 6-187) |

5.5.2 SYSTEM Functions

5.5.2.1 PRESET Menu

Function key
assignment

| | | |
|---|---------------------------------------|-----------|
|  | Calls an instrument default setting | (↗ 6-192) |
|  | Selects an instrument default setting | (↗ 6-192) |

5.5.2.2 STATUS Menu

Function key
assignment

| | | |
|---|---|-----------|
|  | Display of waveform settings in channel CH1 | (↗ 6-194) |
|  | Display of waveform settings in channel CH2 | (↗ 6-195) |
|  | Display of modulation settings in channel CH1 | (↗ 6-196) |
|  | Display of modulation settings in channel CH2 | (↗ 6-197) |
|  | Display of trigger settings | (↗ 6-198) |
|  | Display of sweep settings | (↗ 6-199) |

5.5.2.3 FILE Menu

Function key
assignment

| | | |
|---|------------------------------|-----------|
|  | Saves a user-defined setting | (↗ 6-201) |
|  | Loads a user-defined setting | (↗ 6-201) |
|  | Prints out a screenshot | (↗ 6-203) |

5.5.2.4 CONFIG Menu

Function key assignment

| | | |
|---|--|-----------|
|  | Sets the date and time | (↗ 6-205) |
|  | Selects an internal or external reference source | (↗ 6-207) |
|  | Configures the instrument interfaces | (↗ 6-209) |
|  | Sets the screen saver mode | (↗ 6-211) |
|  | Selects an internal or external monitor | (↗ 6-213) |

5.5.2.5 SERVICE Menu

Function key assignment

| | | |
|--|---------------------|-----------|
|  | Performs a selftest | (↗ 6-214) |
|--|---------------------|-----------|

5.5.2.6 INFO Menu

Function key assignment

| | | |
|---|--------------------------------|-----------|
|  | Displays module data | (↗ 6-216) |
|  | Displays instrument statistics | (↗ 6-216) |
|  | Displays system messages | (↗ 6-217) |

6 Working with the R&S AM300

In this chapter Chapter 6 fully explains all the functions of the arbitrary and function generator, and the application of these functions. The menus are described in the same sequence as the procedure for configuring and producing an output signal:

- R&S AM300 default settings
- Setting signal parameters
- Selecting and configuring output signals

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 Factory Default Settings

Switching on for the first time When the R&S AM300 (↗ 3-40) is switched on, the settings used when the instrument was last switched off are restored. When you switch on for the first time and if the "Factory" setting has been selected as the PRESET default setting (↗ 6-201), the factory default settings are activated:

| | Parameter | Setting | |
|----------------------------|-------------------------------------|-------------------|-------------------|
| | | Channel CH1 | Channel CH2 |
| Waveform | Waveform (WAVEFORM) | Sine | Sine |
| | Signal frequency (FREQ) | 1 kHz | 1 kHz |
| | Signal amplitude (AMPL) | 2 V _{pp} | 2 V _{pp} |
| | DC component (DC OFFSET) | 0 V | 0 V |
| | Start phase (START PHASE) | 0 deg | 0 deg |
| Channel coupling | Frequency coupling (FREQ CH1 = CH2) | On | |
| | Amplitude coupling (AMPT CH1 = CH2) | Off | |
| | Output coupling (OUTPUT CH1 = CH2) | Off | |
| | Phase coupling (PHASE CH1 = CH2) | Off | |
| Function parameters | Duty cycle (RECT DUTY) | 50 % | 50 % |
| | Pulse period (PULSE PERIOD) | 1 ms | |
| | Pulse width (PULSE WIDTH) | 200 μs | 200 μs |
| | Polarity (POLARITY) | Normal | Normal |
| | Symmetry (SYMMETRY) | 50 % | 50 % |
| | Sample frequency (SAMPLE FREQ) | 100 MHz | |
| | Arbitrary mode (ARB MODE) | Normal | |
| Signal output | Signal output (CHx ON) | Off | Off |
| | Signal filter type (FILTER SEL) | Auto | Auto |
| | Output filter (OUTPUT FILTER ON) | Auto | Auto |
| Synchronization | Sync source (SYNC SOURCE) | Comparator | Comparator |

R&S AM300**Factory Default Settings**

| | | | |
|-------------------------------|---|---------|----------|
| | Sync polarity (SYNC POLARITY) | Normal | Normal |
| | Sync output (SYNC ON) | Off | Off |
| Amplitude modulation | Modulation signal (AM WAVEFORM) | Sine | Sine |
| | Modulation frequency (AM FREQ) | | 100 Hz |
| | Modulation depth (AM DEPTH) | 50 % | 50 % |
| | AM status (AM ON) | Off | Off |
| Frequency modulation | Modulation signal (FM WAVEFORM) | | Sine |
| | Modulation frequency (FM FREQ) | | 100 Hz |
| | Frequency deviation (FM DEVIATION) | | 100 Hz |
| | FM status (FM ON) | | Off |
| Phase modulation | Modulation signal (PM WAVEFORM) | Sine | Sine |
| | Modulation frequency (PM FREQ) | | 100 Hz |
| | Phase deviation (PM PHASE) | 0 deg | 0 deg |
| | PM status (PM ON) | Off | Off |
| Frequency shift keying | Modulation frequency (FSK FREQ) | | 100 Hz |
| | Hopping frequency (HOPPER FREQ) | | 100 Hz |
| | Modulation source (FSK SOURCE) | | Internal |
| | FSK status (FSK ON) | | Off |
| Phase shift keying | Phase shift (PSK PHASE) | 180 deg | 180 deg |
| | Modulation frequency (PSK FREQ) | | 100 Hz |
| | Modulation source (PSK SOURCE) | | Internal |
| | PSK status (PSK ON) | Off | Off |
| Sweep | Start frequency (START) | | 20 kHz |
| | Stop frequency (STOP) | | 100 kHz |
| | Sweep time (SWEEP TIME) | | 1 ms |
| | Scaling (SWEEP SPACING) | | Linear |
| Frequency markers | Marker frequency (MARKER FREQ) | | 60 kHz |
| | Marker status (MARKER ON) | | Off |
| Trigger | Trigger mode (TRIGGER MODE) | | Free Run |
| | Trigger slope (POLARITY) | | High |
| | Trigger delay (TRIGGER DELAY) | | 0 s |
| | Frequency of the internal trigger generator (FREQ INT TRIG) | | 200 Hz |
| Gate | Gate function (GATE FUNCTION) | | Burst |
| | Burst period (BURST CYCLES) | | 1 |
| | Gate length (GATE LENGHT) | | 200 µs |
| | Gate mode (GATE ON) | | Off |
| Reference frequency | Reference frequency source (REF) | | Internal |

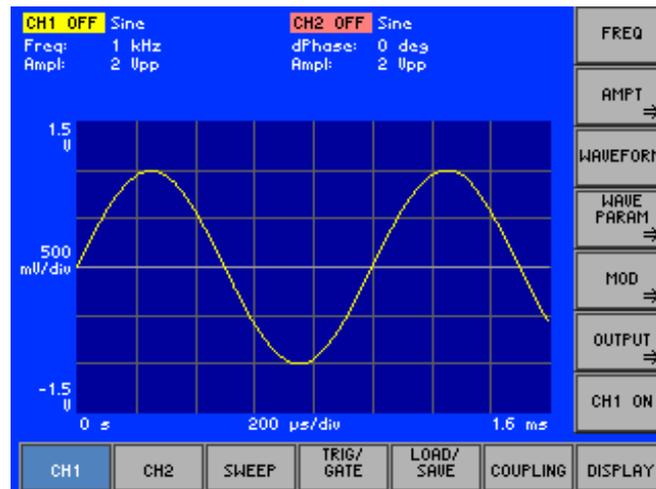
6.2 Arbitrary and Function Generator

Introduction

The arbitrary and function generator is capable of generating multiple standard and user-defined waveforms with variable parameters. These waveforms can be modulated, swept, synchronized and gated.

User interface

After switching on the R&S AM300, the user interface of the arbitrary and function generator is active. In the default state, the following is displayed.



Menus for configuring and setting output parameters

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

| | | |
|-----------|--|-----------|
| CH1 | Configuring Output Signal CH1 (Menu CH1) | (↗ 6-71) |
| CH2 | Configuring Output Signal CH2 (Menu CH2) | (↗ 6-144) |
| SWEEP | Sweep Settings (SWEEP Menu) | (↗ 6-145) |
| TRIG/GATE | Trigger Settings (TRIG/GATE Menu) | (↗ 6-155) |
| LOAD/SAVE | Loading User-Defined Waveforms (LOAD/SAVE Menu) | (↗ 6-169) |
| COUPLING | Setting Dependences between the Channels (COUPLING Menu) | (↗ 6-174) |
| DISPLAY | Screen Settings (DISPLAY Menu) | (↗ 6-177) |

6.2.1 Configuring Output Signal CH1 (Menu CH1)

What the settings are for

The CH1 and CH2 menus can be used to enter all the setting options needed to output a user-configurable standard waveform or a user-defined (arbitrary) waveform at output CH1 or CH2 respectively.

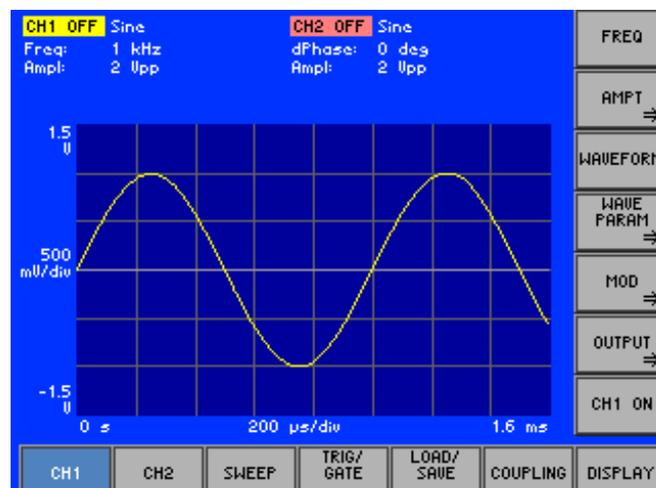
The screen displays a period of the currently set signal. The channels are colour coded.

Note: If you wish to see all the waveform settings for channel CH1 or CH2 at a glance, you can have the parameters clearly displayed for you together with their current settings (↗ 6-194, 6-195).

Selecting the CH1 menu

- Use the ◀ or ▶ **cursor key** to select the **CH1** menu.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|---------------------|---|-----------|
| FREQ | Set the frequency of the current waveform | (↗ 6-75) |
| AMPT → | Open submenu: Set the amplitude of the current waveform | (↗ 6-77) |
| WAVEFORM | Select waveform | (↗ 6-72) |
| WAVE PARAM → | Open submenu: Set function parameters of the current waveform | (↗ 6-96) |
| MOD → | Open submenu: Modulate waveform | (↗ 6-112) |
| OUTPUT → | Open submenu: Configure signal output | (↗ 6-134) |
| CH1 ON | Switch on output channel 1 | (↗ 6-143) |



Note

The **FREQ** function key is not available for the **Pulse** waveform. The frequency can be entered via the pulse period (↗ 6-108).

6.2.1.1 Selecting a Waveform

Application

The R&S AM300 can generate the following waveforms:

Standard waveform

- Sine
- Triangle
- Ramp
- Square
- Exponential
- Noise
- Square Low Jitter
- Pulse

User-defined waveform

- Arbitrary

Waveform combinations in channels CH1 and CH2

The two channels on the R&S AM300 can operate in two different configurations. The channels are either coupled by frequency or operate independently. As a result, different waveform options can be combined in both channels:

| | | WAVEFORM CH2 | | | | | | | | | |
|--------------|---------------------------|--------------|----------|------|--------|-------------|-------|-------------------|-------|------------------|---------------------------|
| | | Sine | Triangle | Ramp | Square | Exponential | Noise | Square Low Jitter | Pulse | Arbitrary Normal | Arbitrary Sample Accurate |
| WAVEFORM CH1 | Sine | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| | Triangle | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| | Ramp | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| | Square | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| | Exponential | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| | Noise | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| | Square Low Jitter | □ | □ | □ | □ | □ | □ | × | | □ | |
| | Pulse | | | | | | | | ■ | | |
| | Arbitrary Normal | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |
| | Arbitrary Sample Accurate | □ | □ | □ | □ | □ | □ | | | | ■ |

- - may always be combined
- - may only be combined when frequency coupling is **off** (↗ 6-174)
- × - may only be combined when frequency coupling is **on** (↗ 6-174)

Application range of the Square/Square Low Jitter waveforms**Square**

During signal generation in function generator mode (standard waveforms, e.g. sine) the amplitude information is read out from the waveform memory using a fixed sample rate of 100 MHz. This gives a fixed time grid of 10 ns for signal changes. For any frequency the edge of a square signal generally lies between the sampling times and this results in an error of up to 10 ns, which is seen in the form of a jitter.

The advantages of this setting are:

- the duty cycle can be set
- may be combined with any waveform in channel CH2

but:

- possible jitter (< 10 ns) at high frequencies

Square Low Jitter

During "Square Low Jitter" signal generation, the square signal is read out with a variable sample rate. This rate depends on the set signal frequency and the sampling times always occur on the edges of the square signals.

The advantages of this setting are:

- high frequencies (up to 50 MHz) can be set
- low jitter during signal generation

but:

- fixed duty cycle (50 %)
- no other waveforms may be set in channel CH2 (for frequency coupling, ↗ 6-174)

**Note**

The **Square Low Jitter** waveform is generated on both channels when frequency coupling is on. If a channel is switched from the **Square Low Jitter** waveform to another waveform, both channels are changed to the new waveform.

When frequency coupling is off, the **Square Low Jitter** waveform is available in channel CH1 only. Any waveform except pulse may be set in channel CH2.

Selecting a waveform

1. In the **CH1** menu press the **WAVEFORM** function key.

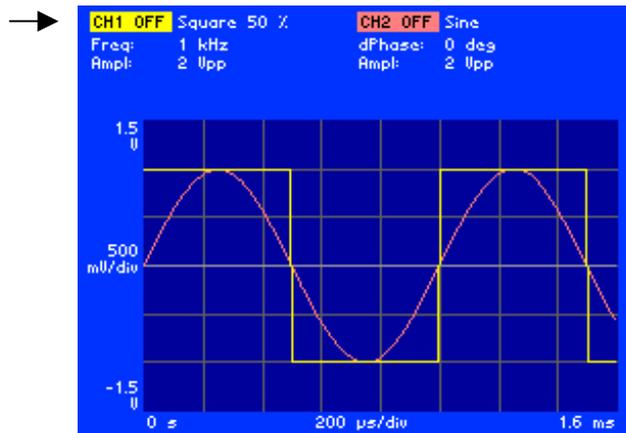
A selection field with default settings is displayed. The default is "Sine".



2. Use the **rotary knob** [11] to select a waveform, e.g. "Square".
3. Press the **ENTER** [5] key to close the selection field.

The new setting is stored and the waveform is displayed in the diagram area with at least one period. The channels are colour coded (CH1: yellow; CH2: red).

The currently applicable waveform and duty cycle are displayed in the parameter field after the channel name CH1 or CH2, e.g. "CH1: Square 50.0 %".



Note

If you select the **Arbitrary** waveform and a user-defined waveform is not loaded in channel CH1 (CH2), the message "Please load a Waveform into CH1 (CH2)" is displayed. Having acknowledged the message by pressing the **ENTER key** [5] you can load a user-defined waveform (↵ 6-169) and repeat the setting.

6.2.1.2 Setting the Frequency of the Current Waveform

Application

The frequency for the currently applicable waveform can be set in relation to a channel (↗ 6-72). When frequency coupling is **on** (↗ 6-175) the frequency setting also applies to the other channel.

Instead of entering a frequency in the case of the **Pulse** waveform, enter the pulse period in the WAVE PARAM menu (↗ 6-108).

Setting the frequency

1. In the **CH1** menu press the **FREQ** function key.

The entry field for the frequency is displayed together with the current setting. The default is "1 kHz".



2. Enter a new value (↗ 5-55).

The permissible entry range for the frequency depends on the current waveform:

$$f_{\min} \leq \text{frequency} \leq f_{\max} \quad \text{in } 10 \mu\text{Hz steps}$$

where: f_{\min} - minimum frequency
 f_{\max} - maximum frequency

Frequency range of the waveforms

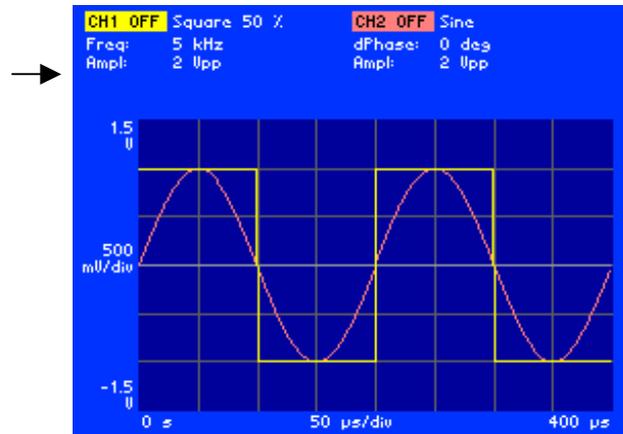
| Waveform | f_{\min} | f_{\max} |
|---------------------------|--------------------|-----------------------|
| Sine | 10 μ Hz | 35 MHz |
| Triangle, Ramp | 10 μ Hz | 500 kHz |
| Square | 10 μ Hz | 500 kHz |
| Exponential | 10 μ Hz | 500 kHz |
| Noise | 35 MHz (bandwidth) | |
| Square Low Jitter | 10 μ Hz | 50 MHz |
| Pulse | 100 μ Hz | 16.6667 MHz |
| Arbitrary Normal | 10 μ Hz | 35 MHz |
| Arbitrary Sample Accurate | 10 μ Hz | 100 MHz (sample rate) |

Note

The **Noise** waveform is a sequence of 262144 random numbers stored in the waveform memory. When the signal is being generated it therefore exhibits a periodicity which is dependent on the signal frequency setting. The repetition frequency is at its lowest when the signal frequency is 381.46973 Hz .

If the noise signal is also frequency-modulated with the aid of a noise signal, a suitable choice of parameter can reduce the periodicity to < 3 mHz.

Frequency display The new setting is stored and displayed in the diagram area. The divisions of the time axis (grid lines) change in accordance with the frequency setting.



The currently applicable signal frequency is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Freq: 5 kHz".

If the signal frequencies of channels CH1 and CH2 are coupled (↗ 6-175), the display below the channel name CH2 does not show the signal frequency but the phase difference between the channels, e.g.. "dPhase: 0 deg".

Error message if a parameter is exceeded

The value range for the frequency depends on the waveform. On changing the waveform the frequency is adopted for the new waveform provided it is still within the permitted value range.

If you wish to set a frequency that would be outside the value range of the newly selected waveform, a message is displayed with note of the valid frequency range.

6.2.1.3 Setting the Amplitude of the Current Waveform

What the settings are for

You can use the AMPT submenu to set the signal amplitude, DC component and output voltage limits of the currently applicable waveform. The signal amplitude refers to the unmodulated fundamental.

Different parameters can be set, depending on the chosen waveform.

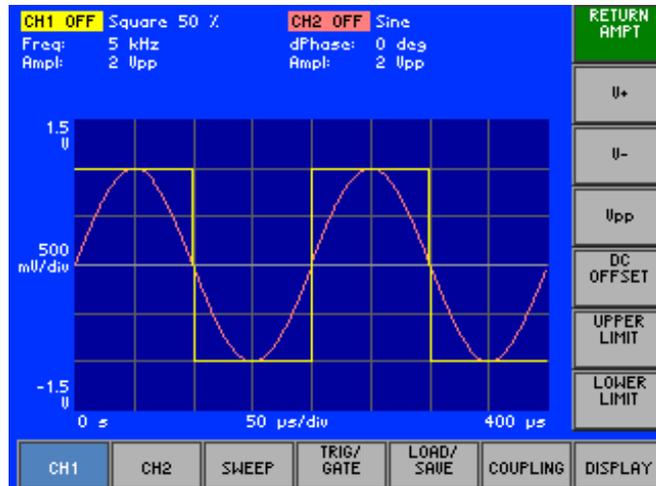
The R&S AM300 computes the voltage at the output as a function of the terminating resistance. The corrected voltage value is displayed (↗ 6-136).

Selecting the AMPT submenu

- In the **CH1** menu press the **AMPT** function key.

Depending which waveform has been set (↗ 6-72) a submenu is opened and the function keys [13] are assigned the appropriate function (e.g. **Square**).

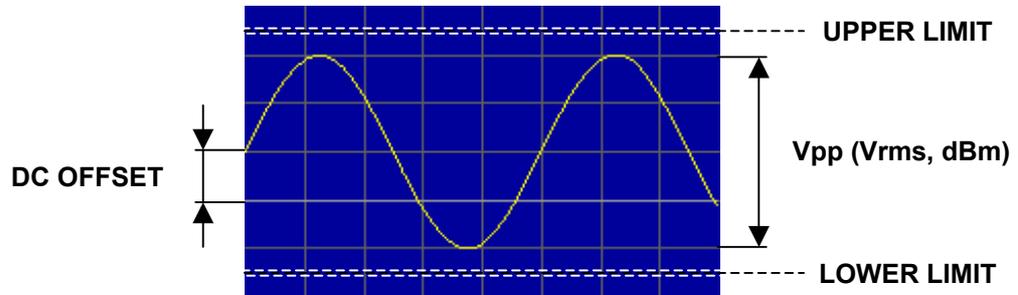
Function key assignment according to the set waveform



| | Sine | Triangle Ramp Square | Exponential | Noise | Pulse | Arbitrary |
|---------------------------|------------------|----------------------|------------------|-----------------|----------------|-------------|
| Signal amplitude | U _{pp} | U+ | U _{inf} | U _{pp} | U _p | SCALING |
| | U _{rms} | U- | U ₀ | | | |
| | dBm | U _{pp} | | | | |
| DC component | DC OFFSET | DC OFFSET | | DC OFFSET | DC OFFSET | DC OFFSET |
| Output voltage limitation | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT | UPPER LIMIT |
| | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT | LOWER LIMIT |
| | ↗ 6-78 | ↗ 6-85, 6-87, 6-88 | ↗ 6-89 | ↗ 6-90 | ↗ 6-91 | ↗ 6-93 |

6.2.1.3.1 SINE Waveform

Application You can set the following amplitude parameters for the **Sine** waveform:



Selecting the AMPT submenu

1. Select the **Sine** waveform (↗ 6-72).
2. In the **CH1** menu press the **AMPT** function key.
The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|--------------------|--|----------|
| RETURN AMPT | Exit submenu | |
| Vpp | Set signal amplitude as peak-to-peak value | (↗ 6-79) |
| Vrms | Set signal amplitude as rms value | (↗ 6-79) |
| dBm | Set signal amplitude in dBm | (↗ 6-79) |
| DC OFFSET | Set DC component | (↗ 6-81) |
| UPPER LIMIT | Set upper limit for output voltage | (↗ 6-83) |
| LOWER LIMIT | Set lower limit for output voltage | (↗ 6-83) |

Note

The **dBm** function key is only available if an output load of 50 Ω has been entered (↗ 6-136).

Setting the Signal Amplitude

Application

The signal amplitude can be entered in different forms:

- V_{pp} - as a peak-to-peak value in volts
- V_{rms} - as an rms value in volts
- dBm - as a power value in decibels

Setting the signal amplitude as a peak-to-peak value V_{pp}

1. In the **AMPT** submenu press the **V_{pp}** function key.

An entry field containing the current setting is displayed. The default setting is 2 V.



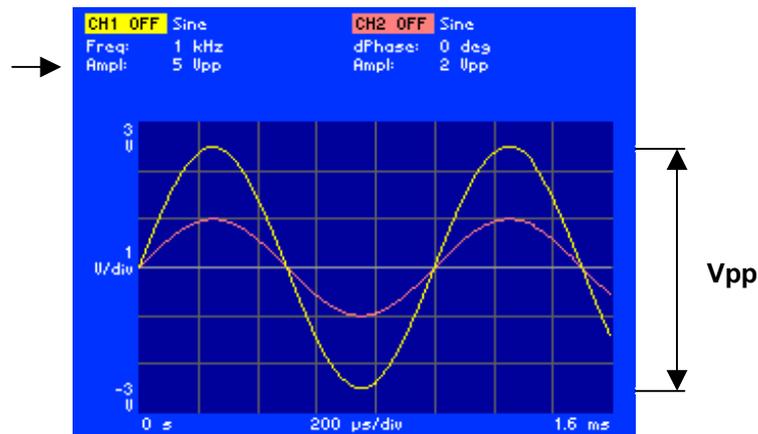
2. Enter a new value (↗ 5-55).

The permissible entry range for the peak-to-peak with a terminating resistance of 50 Ω is:

$$1 \text{ mV} \leq V_{pp} \leq 10 \text{ V in } 0.1 \text{ mV steps}$$

Level display

The new setting is stored and then displayed in the diagram area. The divisions on the level axis (grid lines) change in accordance with the amplitude setting.



The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Ampl: 5 V_{pp} ".

Restricting the value range

The entry range for the signal amplitude can be restricted by the following parameters:

- DC component DC OFFSET (↗ 6-81)
- Limitation of output voltage LOWER/UPPER LIMIT (↗ 6-83)

Setting the signal amplitude as an rms value V_{rms}

1. In the **AMPT** submenu press the **U_{rms}** function key.
An entry field containing the current setting is displayed.



2. Enter a new value (↗ 5-55).
The value range for the rms value V_{rms} results from the conditions for the peak-to-peak value V_{pp} and the DC offset.
The rms value refers only to a waveform which is symmetrical about zero and disregards DC offset.

Setting the signal amplitude in dBm

1. In the **AMPT** submenu press the **dBm** function key.
An entry field containing the current setting is displayed.



2. Enter a new value (↗ 5-55).
The value range for the power P [dBm] results from the conditions for the peak-to-peak value V_{pp} .
The rms value refers only to a waveform which is symmetrical about zero and disregards DC offset.

Note

The signal amplitude can only be entered in dBm if a terminating resistance of 50 Ω has been selected (↗ 6-136).

Setting the DC Component

Application

The DC OFFSET is a DC component that is added to the signal amplitude. When this is done the sum of the DC offset and the peak value must not exceed the maximum permissible range (↗ 6-79).

Setting the DC component DC OFFSET

1. In the **AMPT** submenu press the **DC OFFSET** function key.

An entry field containing the current setting for the DC offset is displayed. The default setting is 0 V.



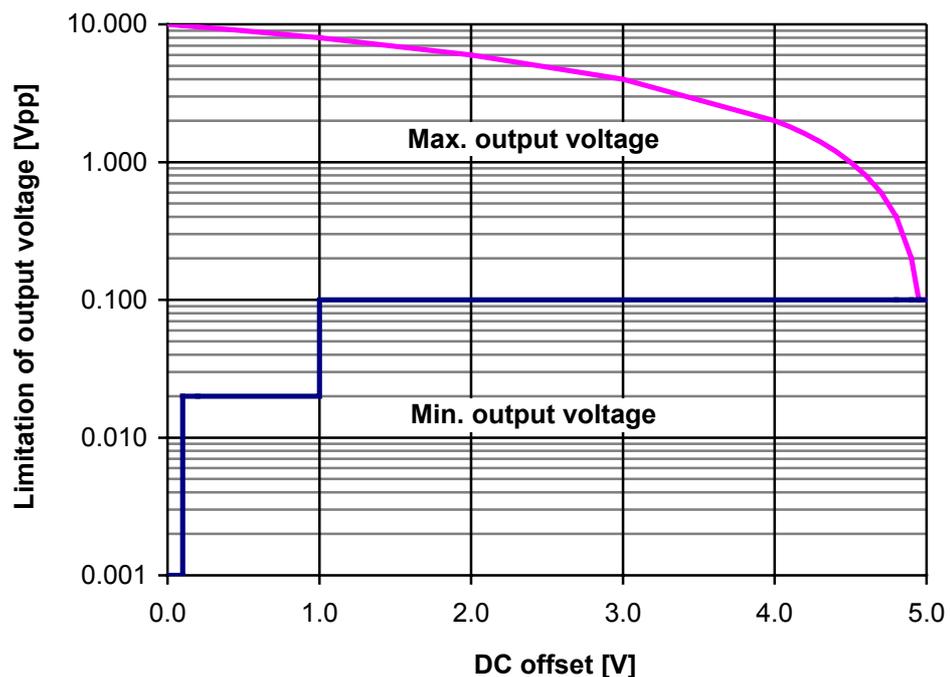
2. Enter a new value (↗ 5-55).

The permissible entry range for the DC component depends on the currently applicable signal amplitude and is defined as:

$$DC_{\min} \leq DC \text{ offset} \leq DC_{\max} \quad \text{in } 0.1 \text{ mV steps}$$

where: DC_{\min} - Minimum DC offset
 DC_{\max} - Maximum DC offset

Value range for DC offset as a function of the signal amplitude



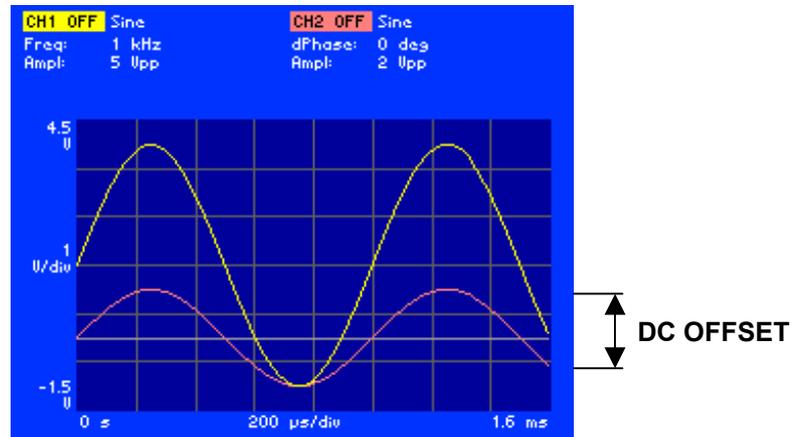
The DC offset and signal amplitude combinations that can be set are within the two limit lines.

$$V_{\text{out_min}} = 0.02 V_{\text{pp}} \quad \text{for } 0.1 \text{ V} \leq |\text{offset}| < 1 \text{ V}$$

$$V_{\text{out_min}} = 0.10 V_{\text{pp}} \quad \text{for } 1 \text{ V} \leq |\text{offset}| \leq 5 \text{ V}$$

where: $V_{\text{out_min}}$ - Value range of the output voltage

Display The new setting is stored and then displayed in the diagram area. The zero-symmetrical waveform is raised by the DC offset, e.g. 1.5 V.



Setting the Limitation of the Output Voltage

Note

Before setting the limit values you need to lower the currently applicable output voltage of the channels so that they are within the desired limit values.

Application

The maximum voltage at the output of the R&S AM300 can be limited. This is intended to prevent a device under test being mistakenly destroyed.

Setting the UPPER LIMIT value for the output voltage

1. Set the signal amplitude (↗ 6-79) and DC component (↗ 6-81) of the waveform so that the sum of the two values does not exceed the desired limit value.

2. In the  submenu press the  function key.

An entry field containing the current setting for the UPPER LIMIT value is displayed. The default setting is +5 V.



3. Enter a new value (↗ 5-55).

The permissible entry range for the UPPER LIMIT value is:

$$+1 \text{ mV} \leq \text{upper Limit} \leq +5 \text{ V} \quad \text{in } 1 \text{ mV steps}$$

Setting the LOWER LIMIT value for the output voltage

1. Set the signal amplitude (↗ 6-79) and DC component (↗ 6-81) of the waveform so that the sum of the two values is not less than the desired limit value.

2. In the  submenu press the  function key.

An entry field containing the current setting for the LOWER LIMIT value is displayed. The default setting is -5 V.



3. Enter a new value (↗ 5-55).

The permissible entry range for the LOWER LIMIT value is:

$$-1 \text{ mV} \geq \text{lower limit} \geq -5 \text{ V} \quad \text{in } 1 \text{ mV steps}$$

Monitoring the output voltage

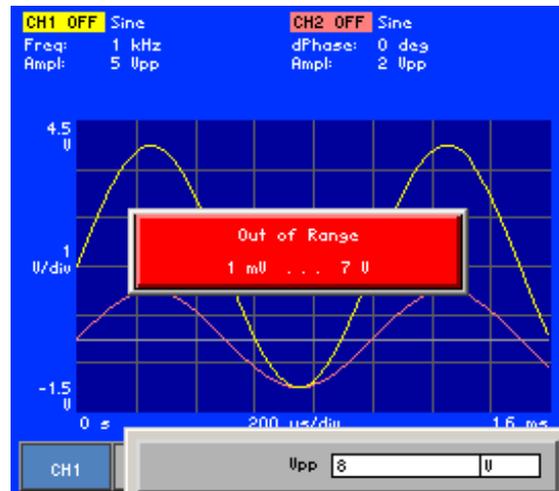
The new setting is stored and the following parameters are monitored:

- Signal amplitude V_{pp} (↗ 6-79)
- DC component DC OFFSET (↗ 6-81)

Error message if a parameter is exceeded

If you wish to set an output voltage that would be outside one of the limit values, you receive a message containing the currently allowable setting range, e.g.:

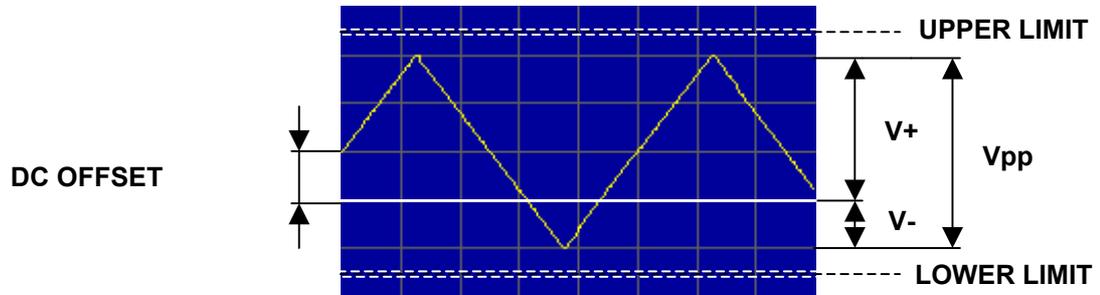
UPPER LIMIT = +5 V, DC OFFSET = 1.5 V, new $V_{pp} = 8$ V
permissible $V_{pp} = 1$ mV ... 7 V



Note: Having acknowledged the message by pressing the **ENTER** key [5] you can repeat the setting.

6.2.1.3.2 TRIANGLE Waveform

Application You can set the following amplitude parameters for the **Triangle** waveform:



**Selecting
the AMPT
submenu**

1. Select the **Triangle** waveform (↗ 6-72).

2. In the **CH1** menu press the **AMPT** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|---|--|----------|
|  | Exit submenu | |
|  | Set positive peak value | (↗ 6-86) |
|  | Set negative peak value | (↗ 6-86) |
|  | Set signal amplitude as peak-to-peak value | (↗ 6-79) |
|  | Set DC component | (↗ 6-81) |
|  | Set upper limit for output voltage | (↗ 6-83) |
|  | Set lower limit for output voltage | (↗ 6-83) |

Setting the Signal Amplitude

Application

The signal amplitude can be entered in different forms:

- **V+**, **V-** - as a positive and negative peak value relative to the zero line on the measurement diagram
- **V_{pp}** - as a peak-to-peak value (↗ 6-79)

Note: When the amplitude parameters change the other parameters associated with them are computed and synchronized.

Setting a positive peak value V+

1. In the **AMPT** submenu press the **V+** function key.

An entry field containing the current setting is displayed. The default setting is 1 V.



2. Enter a new value (↗ 5-55).

The permissible entry range for the positive peak value is:

$$0.5 \text{ mV} \leq V+ \leq +5 \text{ V} \quad \text{in } 0.1 \text{ mV steps}$$

Setting a negative peak value V-

1. In the **AMPT** submenu press the **V-** function key.

An entry field containing the current setting is displayed. The default setting is -1 V.



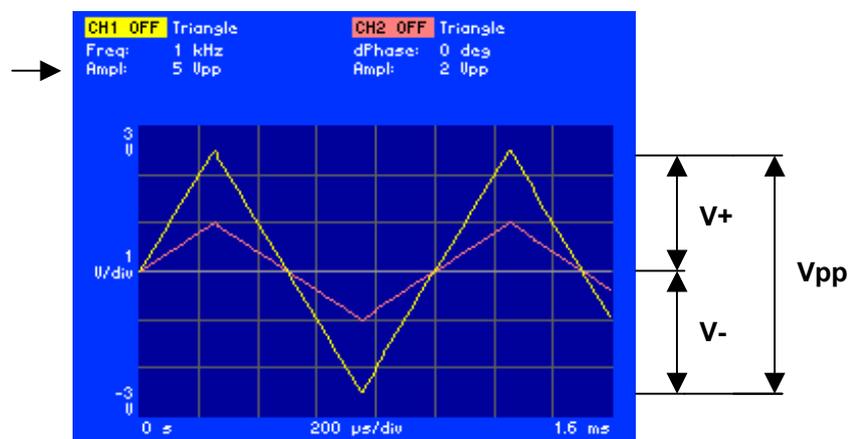
2. Enter a new value (↗ 5-55).

The permissible entry range for the negative peak value is:

$$-0.5 \text{ mV} \geq V- \geq -5 \text{ V} \quad \text{in } 0.1 \text{ mV steps}$$

Level display

The new setting is stored and then displayed in the diagram area. The divisions on the level axis (grid lines) change in accordance with the amplitude setting.



The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Ampl: 5 V_{pp}".

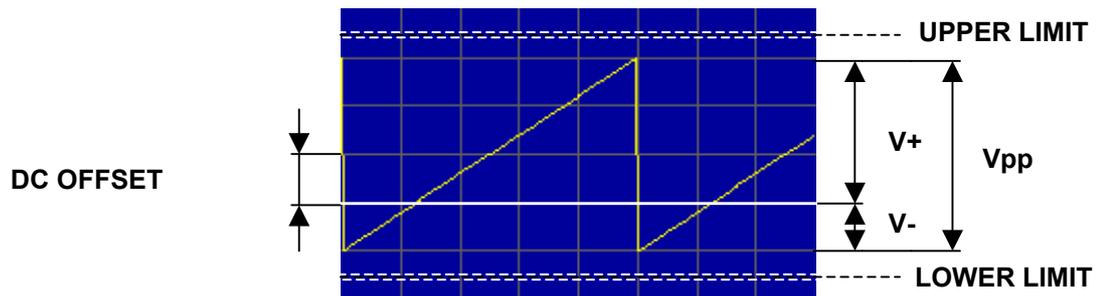
Restricting the value range

The entry range for the signal amplitude can be restricted by the following parameters:

- DC component DC OFFSET (↗ 6-81)
- Limitation of output voltage LOWER/UPPER LIMIT (↗ 6-83)

6.2.1.3.3 RAMP Waveform**Application**

You can set the following amplitude parameters for the **Ramp** waveform:

**Selecting the AMPT submenu**

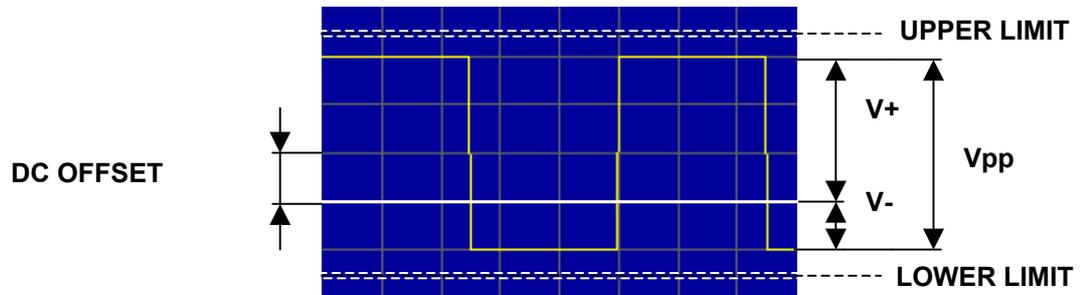
1. Select the **Ramp** waveform (↗ 6-72).
2. In the **CH1** menu press the **AMPT** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|---|--|----------|
|  | Exit submenu | |
|  | Set positive peak value | (↗ 6-86) |
|  | Set negative peak value | (↗ 6-86) |
|  | Set signal amplitude as peak-to-peak value | (↗ 6-79) |
|  | Set DC component | (↗ 6-81) |
|  | Set upper limit for output voltage | (↗ 6-83) |
|  | Set lower limit for output voltage | (↗ 6-83) |

6.2.1.3.4 SQUARE and SQUARE LOW JITTER Waveforms

Application You can set the following amplitude parameters for the **Square** and **Square Low Jitter** waveforms:

**Selecting the AMPT submenu**

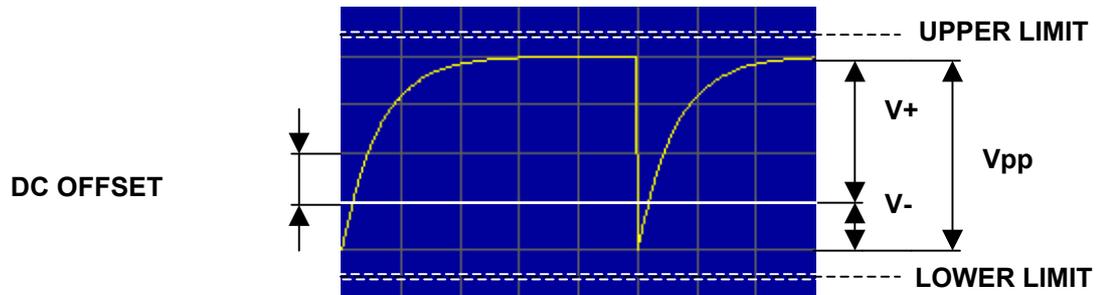
1. Select the **Square** or **Square Low Jitter** waveform (↗ 6-72).
2. In the **CH1** menu press the **AMPT** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|---|--|----------|
|  | Exit submenu | |
|  | Set positive peak value | (↗ 6-86) |
|  | Set negative peak value | (↗ 6-86) |
|  | Set signal amplitude as peak-to-peak value | (↗ 6-79) |
|  | Set DC component | (↗ 6-81) |
|  | Set upper limit for output voltage | (↗ 6-83) |
|  | Set lower limit for output voltage | (↗ 6-83) |

6.2.1.3.5 EXPONENTIAL Waveform

Application You can set the following amplitude parameters for the **Exponential** waveform:

**Selecting the AMPT submenu**

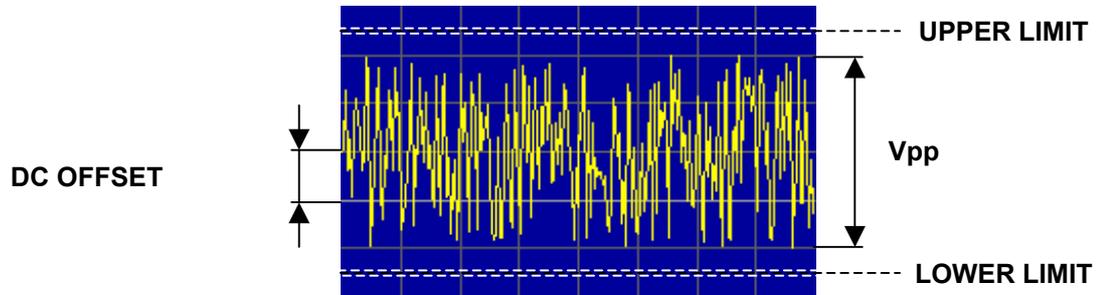
1. Select the **Exponential** waveform (↗ 6-72).
2. In the **CH1** menu press the **AMPT** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|---|--|----------|
|  | Exit submenu | |
|  | Set positive peak value | (↗ 6-86) |
|  | Set negative peak value | (↗ 6-86) |
|  | Set signal amplitude as peak-to-peak value | (↗ 6-79) |
|  | Set DC component | (↗ 6-81) |
|  | Set upper limit for output voltage | (↗ 6-83) |
|  | Set lower limit for output voltage | (↗ 6-83) |

6.2.1.3.6 NOISE Waveform

Application You can set the following amplitude parameters for the **Noise** waveform:



**Selecting
the AMPT
submenu**

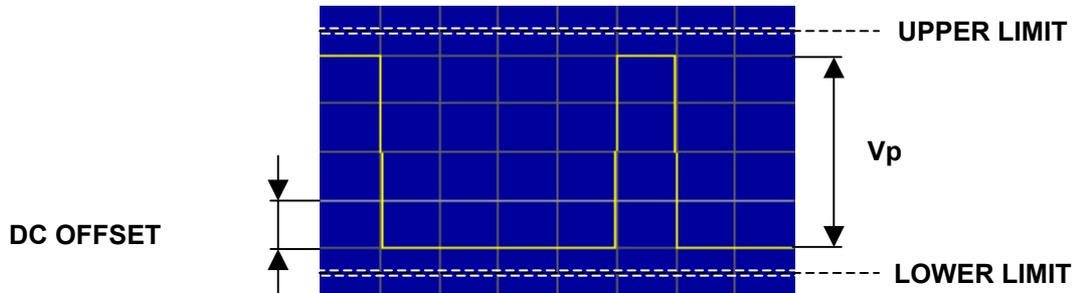
1. Select the **Noise** waveform (↗ 6-72).
2. In the **CH1** menu press the **AMPT** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|---|--|----------|
|  | Exit submenu | |
|  | Set signal amplitude as peak-to-peak value | (↗ 6-79) |
|  | Set DC component | (↗ 6-81) |
|  | Set upper limit for output voltage | (↗ 6-83) |
|  | Set lower limit for output voltage | (↗ 6-83) |

6.2.1.3.7 PULSE Waveform

Application You can set the following amplitude parameters for the **Pulse** waveform.



**Selecting
the AMPT
submenu**

1. Select the **Pulse** waveform (↗ 6-72).
2. In the **CH1** menu press the **AMPT** function key.
The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|---|------------------------------------|----------|
|  | Exit submenu | |
|  | Set absolute value of amplitude | (↗ 6-92) |
|  | Set DC component | (↗ 6-81) |
|  | Set upper limit for output voltage | (↗ 6-83) |
|  | Set lower limit for output voltage | (↗ 6-83) |

Setting the Signal Amplitude

Application

You can set the level of the **Pulse** waveform via the absolute value of the amplitude V_p .

Setting the absolute value of the amplitude V_p

1. In the **AMP** submenu press the **V_p** function key.

An entry field containing the current setting is displayed. The default setting is 100 mV.



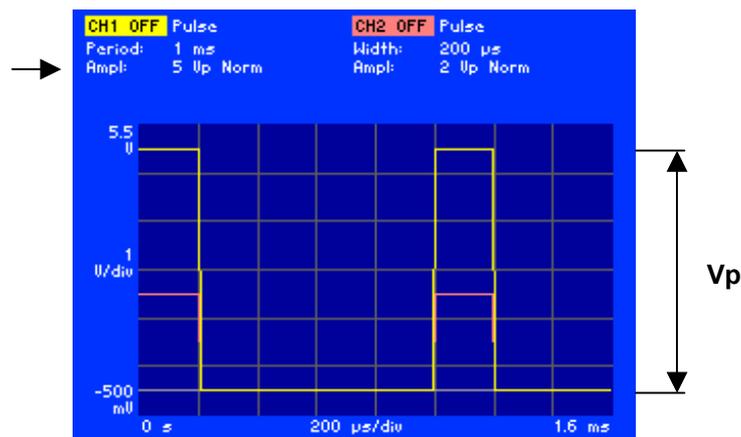
2. Enter a new value (↗ 5-55).

The permissible entry range for the absolute value is:

$$0 \text{ mV} \leq V_p \leq 10 \text{ V} \text{ in } 0.1 \text{ mV steps}$$

Level display

The new setting is stored and then displayed in the diagram area. The divisions on the level axis (grid lines) change in accordance with the amplitude setting.



The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Ampl: 5 V_p Norm". The extension "Norm" indicates that the pulse is not inverted (↗ 6-108).

Restricting the value range

The entry range for the signal amplitude can be restricted by the following parameters:

- DC component DC OFFSET (↗ 6-81)
- Limitation of output voltage LOWER/UPPER LIMIT (↗ 6-83)

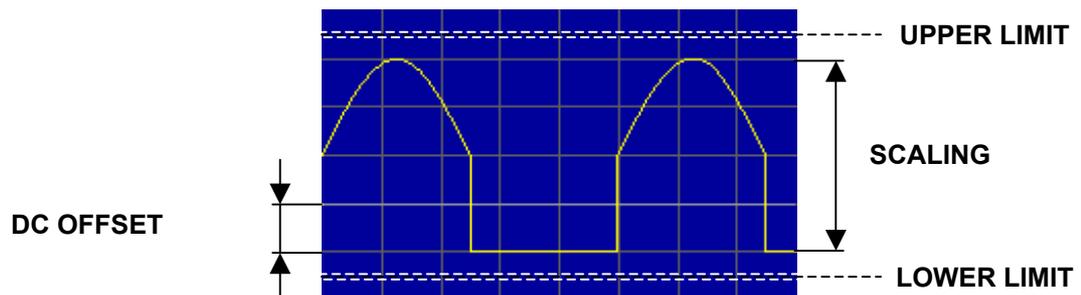
6.2.1.3.8 Setting the ARBITRARY Waveform

 Note

Before selecting the **Arbitrary** waveform you need to load a user-defined waveform (↗ 6-169). Otherwise you receive the message "Please load a Waveform into Chx".

Application

You can set the following amplitude parameters for the **Arbitrary** waveform.



Selecting the AMPT submenu

1. Select the **Arbitrary** waveform (↗ 6-72).
2. In the **CH1** menu press the **AMPT** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|---|------------------------------------|----------|
|  | Exit submenu | |
|  | Set scaling | (↗ 6-94) |
|  | Set DC component | (↗ 6-81) |
|  | Set upper limit for output voltage | (↗ 6-83) |
|  | Set lower limit for output voltage | (↗ 6-83) |

Setting the Signal Amplitude

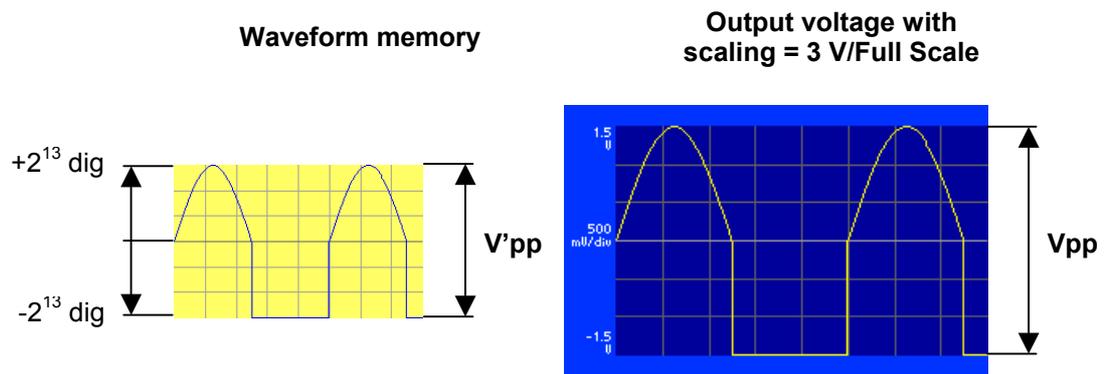
Application

You cannot enter a voltage directly for user-defined waveforms. The scaling is used to define the response to voltage. This represents the peak-to-peak voltage V_{pp} when the full digital value range ($+2^{13}$ to -2^{13}) is being used.

The following relationship applies:

$$V_{pp} = V'_{pp} * \text{scaling}$$

This means that a digital value of -2^{13} ($+2^{13}$) in the waveform memory at a scaling of 3 V/Full Scale yields an output voltage of 3 V_{pp} at 50 Ω .



Setting the scaling

1. In the **AMPT** submenu press the **SCALING** function key.

An entry field containing the current setting is displayed. The default setting is 2 V FS (Full Scale).



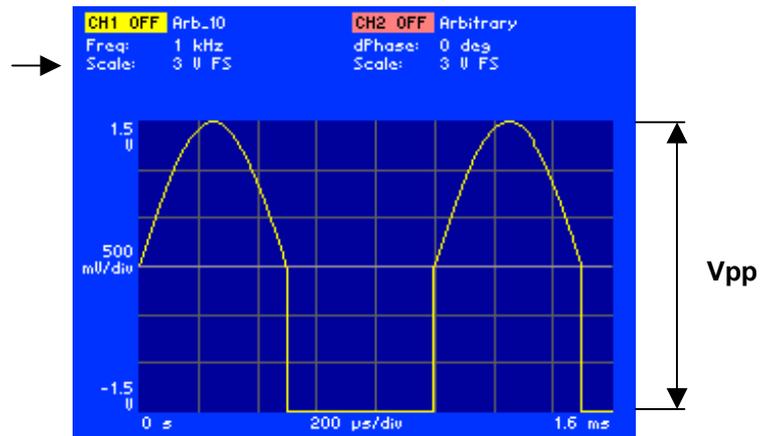
2. Enter a new value (\nearrow 5-55).

The permissible entry range for the scale factor is:

$$1 \text{ mV} \leq \text{scaling} \leq 10 \text{ V} \quad \text{in } 0.1 \text{ mV steps}$$

Level display

The new setting is stored and then displayed in the diagram area. The divisions on the level axis (grid lines) change in accordance with the set scaling.



The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Scale: 3 V FS". The extensions "FS" stands for Full Scale.

Restricting the value range

The entry range for the signal amplitude can be restricted by the following parameters:

- DC component DC OFFSET (↗ 6-81)
- Limitation of output voltage LOWER/UPPER LIMIT (↗ 6-83)

6.2.1.4 Setting the Function Parameters for the Current Waveform

What the settings are for

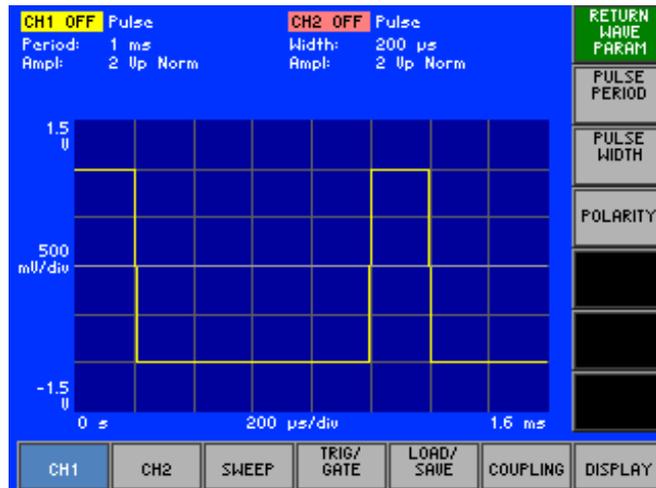
You can use the WAVE PARAM submenu to set special function parameters for the current waveform.

Different parameters can be set, depending on the chosen waveform.

Selecting the WAVE PARAM submenu

- In the **CH1** menu press the **WAVE PARAM** function key.

Depending which waveform has been set (e.g. **Pulse**) a submenu is opened and the function keys [13] are assigned the appropriate function.



Function key assignment according to the set waveform

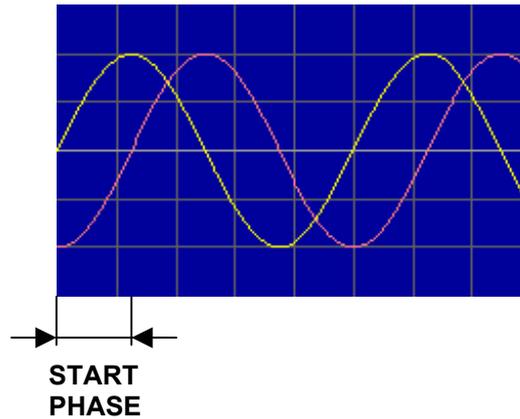
| Sine Triangle Square Low Jitter | Ramp | Square | Exponential | Pulse | Arbitrary |
|---------------------------------|-------------|-------------|-------------|--------------|------------------|
| START PHASE | START PHASE | START PHASE | START PHASE | PULSE PERIOD | START PHASE |
| | SYM-METRY | RECT DUTY | POLARITY | PULSE WIDTH | LOAD FROM MEMORY |
| | | | | POLARITY | LOAD FROM STICK |
| | | | | | ARB MODE |
| | | | | | SAMPLE FREQ |
| ↗ 6-97, 6-100, 6-103 | ↗ 6-101 | ↗ 6-103 | ↗ 6-105 | ↗ 6-107 | ↗ 6-109 |

Note

No further signal parameters can be set in the case of the **Noise** waveform.

6.2.1.4.1 SINE Waveform

Application You can set the start phase for the **Sine** waveform .



**Selecting the
WAVE PARAM
submenu**

1. Select the **Sine** waveform (↗ 6-72).
2. In the **CH1** menu press the **WAVE PARAM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Exit submenu



Set start phase

(↗ 6-98)

Setting the Start Phase

Application

The start phase enables the signal to be phase shifted relative to the reference phase. In the BURST operating mode, use the start phase to define the phase of the signal at the start of the burst. If different phase values are set in channels CH1 and CH2, their difference determines the phase shift on both channels.

When frequency coupling is off (↗ 6-175) the start phase has significance for the BURST operating mode only. Otherwise there is no unequivocal phase relationship between the channels.

When phase coupling is on (↗ 6-175) the phase relationship between the two channels is always zero.

Setting the start phase

1. In the **WAVE PARAM** submenu press the **START PHASE** function key.

An entry field containing the current setting is displayed. The default setting is 0 deg.



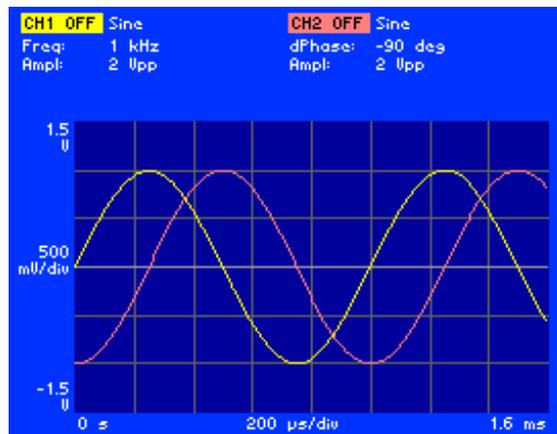
2. Enter a new value (↗ 5-55).

The permissible entry range for the start phase is:

$$-180 \text{ deg} \leq \text{start phase} \leq +180 \text{ deg} \quad \text{in } 0.01^\circ \text{ steps}$$

Display

The new setting is stored and then displayed in the diagram area. The active waveform is shifted in accordance with the phase setting, e.g. -90 degrees.



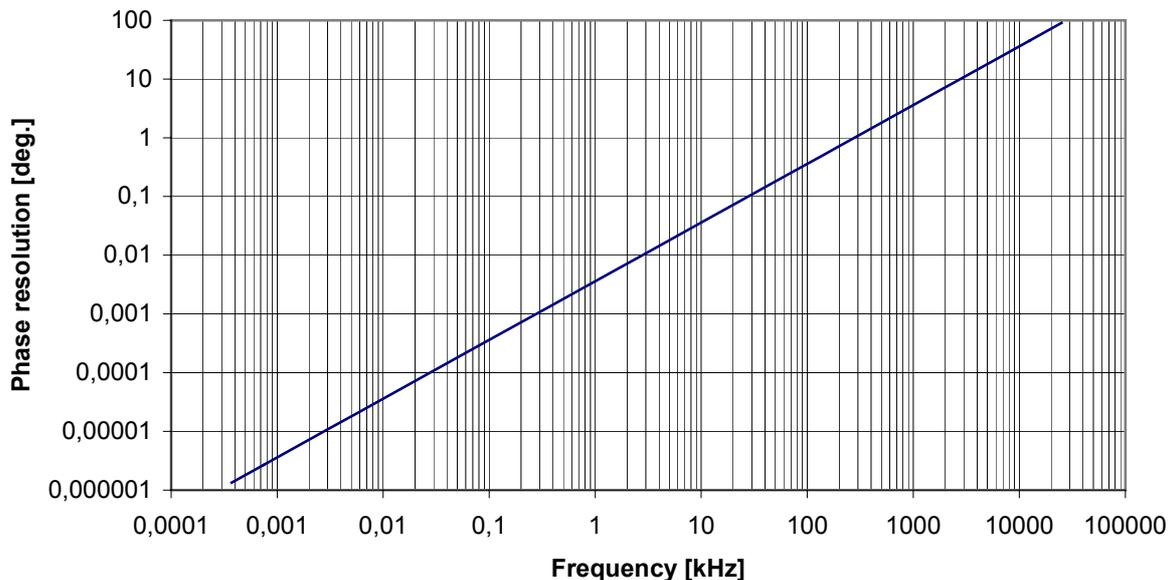
START
PHASE

The currently applicable phase shift of waveform 2 relative to waveform 1 is displayed in the parameter field below the channel name CH2, e.g. "dPhase: -90 deg".

Uncertainty of a start phase depends on the frequency

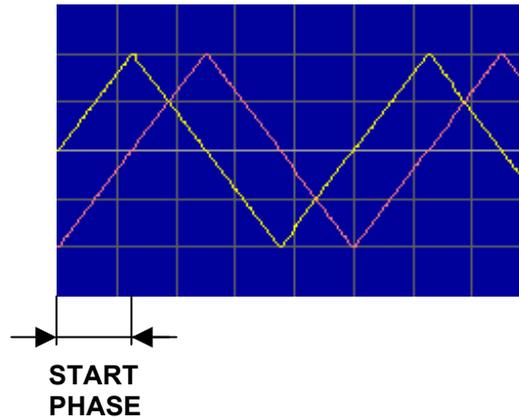
The uncertainty of a signal's start phase depends on the frequency that has been set. This restriction applies not to sine waveforms, since you can clearly reconstruct the phase also at higher frequencies due to the sampling theorem. With all other waveforms such as square, triangular, ramp, exponential and arbitrary, you must pay attention to the effect of the frequency on the uncertainty of the start phase. This is due to the decreasing number of points across the frequency that are available to generate the curve. In the worst case, only two points are available, resulting in an uncertainty of 180 °.

Therefore, the standard waveforms square, triangular and exponential in the R&S AM300 are restricted to a max. frequency of 500 kHz. The uncertainty arising at the max. frequency is 2.8 °. However, if these waveforms are generated by means of Waveform Composer and loaded as arbitrary curves into the R&S AM300, it is possible to set also higher frequencies. The following diagram shows the max. uncertainty of the phase as a function of the frequency that has been set.

Phase resolution vs. output frequency for non-sinusoidal signal

6.2.1.4.2 TRIANGLE Waveform

Application You can set the start phase for the **Triangle** waveform. For a start phase of zero the waveform starts at zero crossing



**Selecting the
WAVE PARAM
submenu**

1. Select the **Triangle** waveform (↗ 6-72).
2. In the **CH1** menu press the **WAVE PARAM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

**RETURN
WAVE
PARAM**

Exit submenu

**START
PHASE**

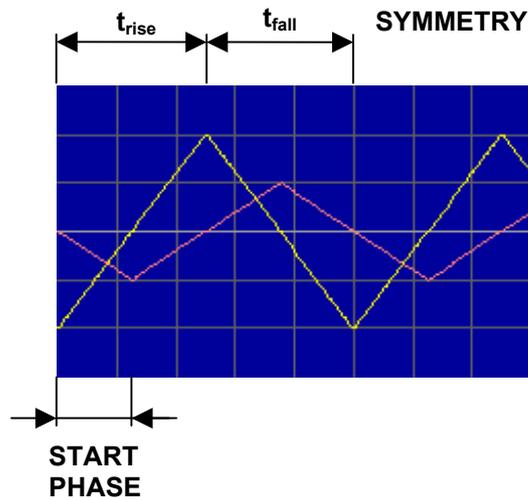
Set start phase

(↗ 6-98)

0.1.1.1.1 RAMP Waveform

Application

You can set the start phase and symmetry for the **Ramp** waveform. For a start phase of zero the waveform starts with a rising edge.



Selecting the WAVE PARAM submenu

1. Select the **Ramp** waveform (↗ 6-72).
2. In the **CH1** menu press the **WAVE PARAM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

RETURN
WAVE
PARAM

Exit submenu

START
PHASE

Set start phase

(↗ 6-98)

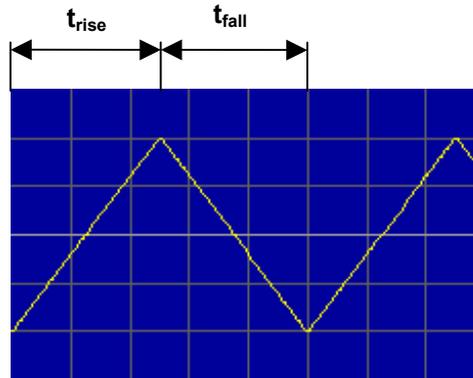
SYM-
METRY

Set symmetry

(↗ 6-102)

Setting the Symmetry

Application



The symmetry of the **Ramp** waveform can be set via the ratio between the length of the rising edge t_{rise} and the total period of the signal $t_{\text{rise}} + t_{\text{fall}}$.

$$\text{SYMMETRY} = \frac{t_{\text{rise}}}{t_{\text{rise}} + t_{\text{fall}}} \cdot 100\%$$

Setting the symmetry

1. In the **WAVE PARAM** submenu press the **SYM-METRY** function key.

An entry field containing the current setting is displayed. The default setting is 50 %.



2. Use the **rotary knob** [11] to set a symmetry.

The permissible entry range is:

$$0\% \leq \text{symmetry} \leq 100\%$$

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

Display

The new setting is stored and then displayed in the diagram area. The signal edges are shifted in accordance with the symmetry setting.

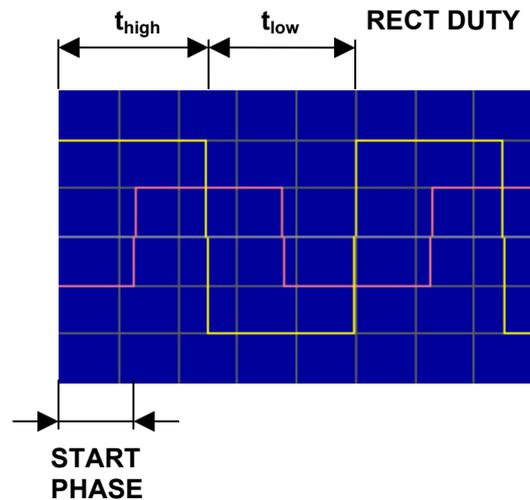


The currently applicable symmetry of the waveform is displayed in the parameter field beside the channel name, e.g. "CH1: Ramp 100 %".

6.2.1.4.3 SQUARE and SQUARE LOW JITTER Waveforms

Application

You can set the start phase and the duty cycle for the **Square** waveform. In the case of the **Square Low Jitter** waveform you can set only the start phase.



Selecting the WAVE PARAM submenu

1. Select the **Square** or **Square Low Jitter** waveform (↗ 6-72).
2. In the **CH1** menu press the **WAVE PARAM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Exit submenu



Set start phase

(↗ 6-98)



Set duty cycle

(↗ 6-104)

Note

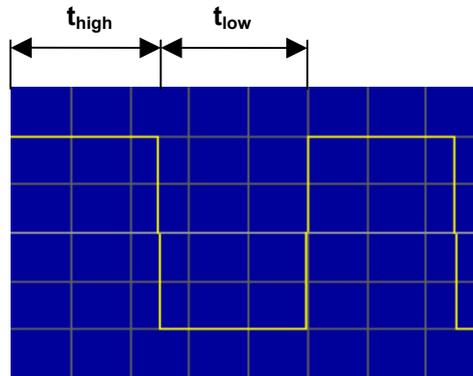
The **RECT DUTY** function key is not available in the case of the **Square Low Jitter** waveform.

Phase setting accuracy decreases with increasing frequency for the **Square** and **Square Low Jitter** waveforms:

- up to 1 kHz < 0.01°
- up to 10 kHz < approx. 0.04°
- up to 100 kHz < approx. 0.4°
- up to 1 MHz < approx. 4°

Setting the Duty Cycle

Application



The duty cycle for a squarewave signal can be set via the ratio of the length of the high state t_{high} to the total period of the signal $t_{\text{high}} + t_{\text{low}}$.

$$\text{RECT DUTY} = \frac{t_{\text{high}}}{t_{\text{high}} + t_{\text{low}}} \cdot 100\%$$

Setting the duty cycle

1. In the **WAVE PARAM** submenu press the **RECT DUTY** function key.

An entry field containing the current setting is displayed. The default setting is 50 %.



2. Use the **rotary knob** [11] to set a duty cycle.

The permissible entry range is:

$$0.1 \% \leq \text{rect duty} \leq 99.9 \%$$

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

Display

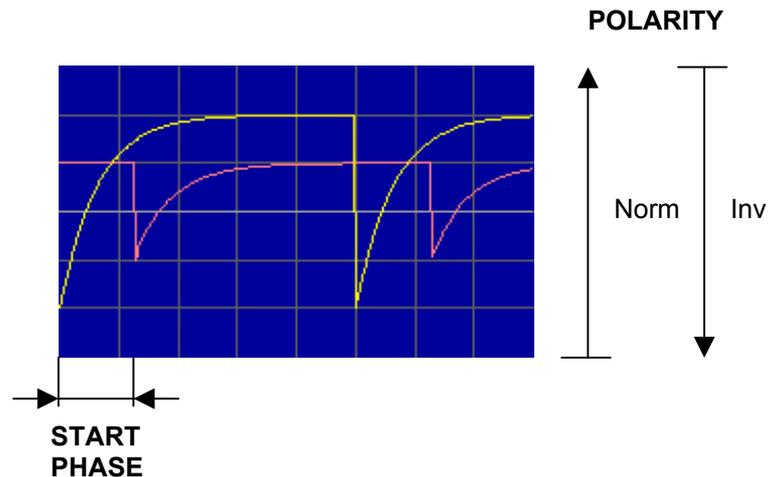
The new setting is stored and then displayed in the diagram area. The high/low states are shifted in accordance with the duty cycle setting.



The currently applicable duty cycle of the waveform is displayed in the parameter field beside the channel name, e.g. "CH1: Square 80 %".

6.2.1.4.4 EXPONENTIAL Waveform

Application You can set the start phase and the polarity for the **Exponential** waveform:



Selecting the WAVE PARAM submenu

1. Select the **Exponential** waveform (↗ 6-72).
2. In the **CH1** menu press the **WAVE PARAM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Exit submenu



Set start phase

(↗ 6-98)



Select polarity of waveform

(↗ 6-106)



Note

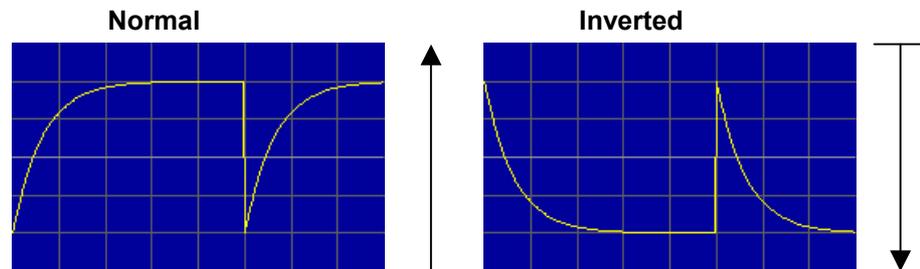
The exponential function e^{-x} is stored in RAM in the value range $x = 0$ to $x = 2 * \pi (= 6.283)$. If you wish to produce a particular time constant, you can do so by setting the frequency according to the formula $f = 1/(2 * \pi * T)$.

Individual adjustments can be performed with the aid of the Burst function.

Setting the Waveform Polarity

Application

You can use the polarity to determine whether the waveform will be displayed in normal or inverted mode. In the case of inversion, the waveform is logically inverted.



Setting the polarity

1. In the **WAVE PARAM** submenu press the **POLARITY** function key.

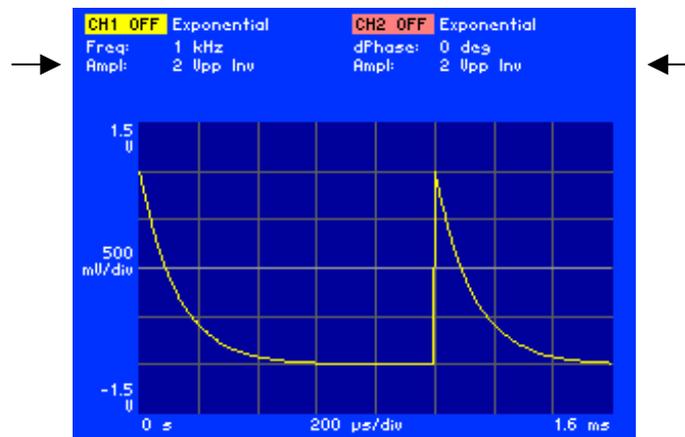
An entry field containing the current setting is displayed. The default setting is Normal.



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER** key [5] to close the selection field.

Display

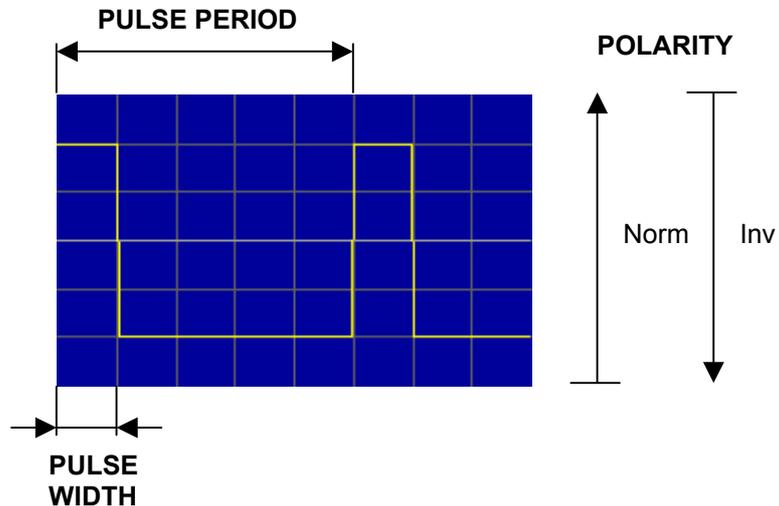
The new setting is stored and then displayed in the diagram area.



The amplitude and currently applicable polarity of the waveform are displayed in the parameter field below the channel name, e.g. "CH1: Ampl: 2 V_{pp} Inv".

6.2.1.4.5 PULSE Waveform

Application You can set the following parameters for the **Pulse** waveform:



Selecting the WAVE PARAM submenu

1. Select the **Pulse** waveform (↗ 6-72).
2. In the **CH1** menu press the **WAVE PARAM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|--------------------------|-----------------------------|-----------|
| RETURN WAVE PARAM | Exit submenu | |
| PULSE PERIOD | Set pulse period | (↗ 6-108) |
| PULSE WIDTH | Set pulse width | (↗ 6-108) |
| POLARITY | Select polarity of waveform | (↗ 6-106) |

Note

The **Pulse** waveform is always generated in both channels simultaneously with the same period. If frequency coupling between the channels is off, you can set a different pulse width in each of the two channels.

If either of the channels is changed from the **Pulse** waveform to a different waveform, both channels are switched to the new waveform.

Setting the Pulse Parameters

Application

The **FREQ** function key in the CH1 menu (↗ 6-75) is not available for the **Pulse** waveform. Instead you can set the signal frequency indirectly via the pulse period.

Setting the pulse period

1. In the **WAVE PARAM** submenu press the **PULSE PERIOD** function key.

An entry field containing the current setting is displayed. The default setting is 1 ms.



2. Enter a new value (↗ 5-55).
The permissible entry range for the pulse period is:

$$70 \text{ ns} \leq \text{pulse period} \leq 9999 \text{ s} \quad \text{in } 10 \text{ ns steps}$$

Setting the pulse width

3. In the **WAVE PARAM** submenu press the **PULSE WIDTH** function key.

An entry field containing the current setting is displayed. The default setting is 200 μs .

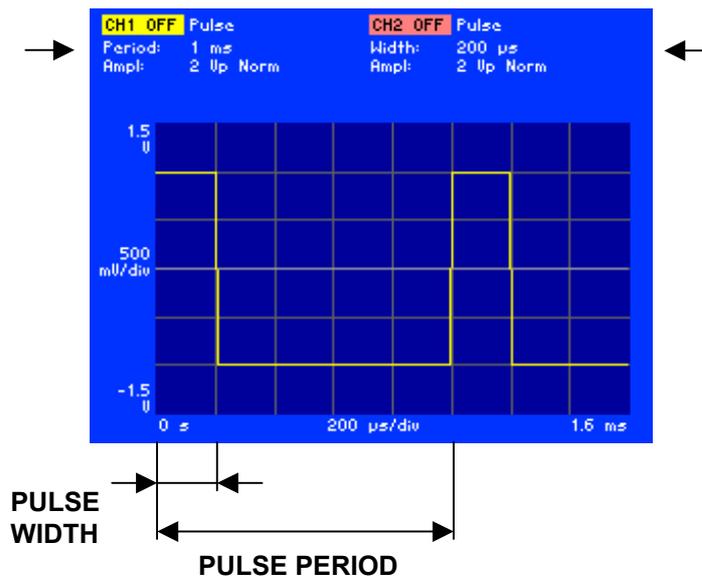


4. Enter a new value (↗ 5-55).
The permissible entry range for the pulse width is:

$$20 \text{ ns} \leq \text{pulse width} \leq 9999 \text{ s} \quad \text{in } 10 \text{ ns steps}$$

Display

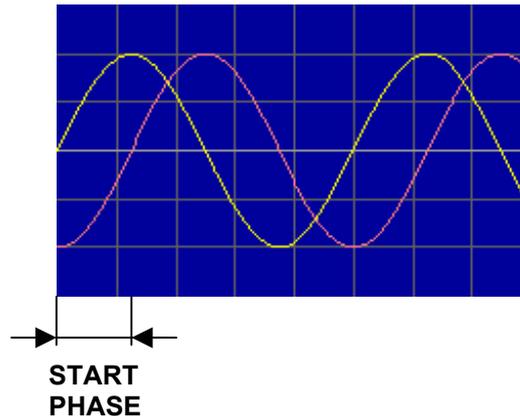
The new setting is stored and then displayed in the diagram area. The divisions of the time axis (grid lines) change in accordance with the period setting.



The currently applicable pulse period is displayed in the parameter field below the channel name CH1, e.g. "Period: 1 ms", and the currently applicable pulse width is displayed below the channel name CH2, e.g. "Width: 200 μs ".

6.2.1.4.6 ARBITRARY Waveform

Application You can set the following parameters for the **Arbitrary** waveform:



**Selecting the
WAVE PARAM
submenu**

1. Select the **Arbitrary** waveform (↗ 6-72).
2. In the **CH1** menu press the **WAVE PARAM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|----------------------------------|--|-----------|
| RETURN WAVE PARAM | Exit submenu | |
| START PHASE | Set start phase | (↗ 6-98) |
| LOAD FROM MEMORY | Load waveform from internal flash memory | (↗ 6-170) |
| LOAD FROM STICK | Load waveform from external USB stick | (↗ 6-171) |
| ARB MODE | Select Arbitrary mode | (↗ 6-110) |
| SAMPLE RATE | Set sample frequency | (↗ 6-110) |

Selecting the Arbitrary Mode

Note

Before you select the **Arbitrary** waveform, you must load a user-defined waveform (➤ 6-169). Otherwise you receive the message "Please load a Waveform into Chx".

Application

Generation of the **Arbitrary** waveform can be read from the internal waveform memory in two ways, depending on the range of applications:

Normal

In the case of signal generation in function generator mode, the signal is read from the memory using a fixed sample rate (100 MHz). The frequency is set by varying the address step in the memory (corresponding to the phase increment in periodic signals). This means that the Arbitrary signal is less accurately mapped with increasing signal frequency; signal edges or pulses are distorted.

This setting is suitable for generating user-defined periodic signals, e.g. cardiac, sine square.

The advantages of this setting are:

- may be used in combination with other waveforms and frequencies in channel CH2
- high signal frequencies (up to 35 MHz) may be set

but:

- the signal is not faithfully mapped

Sample Accurate

In the case of "Sample Accurate" signal generation the Arbitrary signal is read using a constant address increment of 1 sample. This means that all the values in the memory are used for generating the signal. The signal frequency is varied by changing the sample frequency.

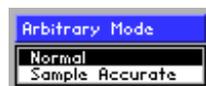
The advantages of this setting are:

- the signal is faithfully mapped

Selecting Arbitrary mode

1. In the  submenu press the  function key.

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



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

Setting the sample frequency

In "Sample Accurate" Arbitrary mode you can define the sample frequency.

1. In the **WAVE PARAM** submenu press the **SAMPLE RATE** function key.

An entry field containing the current setting is displayed. The default setting is 100 MHz.



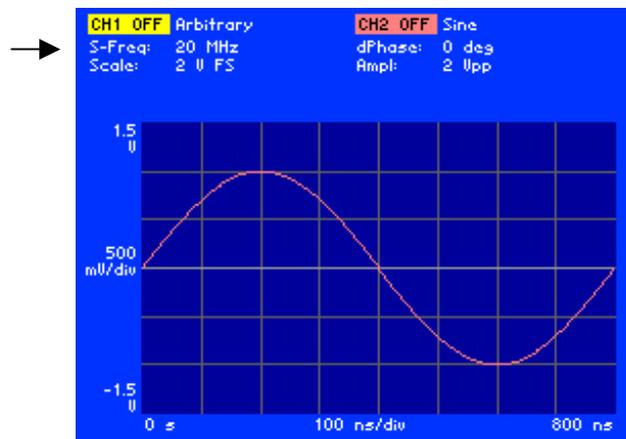
2. Enter a new value (↗ 5-55).

The permissible entry range for the transmission rate is:

$$10 \mu\text{Hz} \leq \text{sample freq} \leq 100 \text{ MHz} \text{ in } 10 \mu\text{Hz steps}$$

Display

The new setting is stored and then displayed in the diagram area. The divisions of the time axis (grid lines) change in accordance with the sample frequency setting.



The currently applicable sample frequency is displayed in the parameter field below the channel name CH1, e.g. "S-Freq: 20 MHz".

6.2.1.5 Modulating a Waveform

What the settings are for

You can use the MOD submenu to enter all the settings for modulating a waveform. The available modulation source is an internal generator which can deliver different standard waveforms.

The available modulation modes are AM, FM, PM, FSK and PSK. The parameters for modulation modes AM, PM and PSK can be separately set for each channel. In contrast, modulation modes FM and FSK affect both channels and cannot be set separately for each channel.

Note: If you wish to review all the modulation settings in channel CH1 (CH2) at a glance, you can arrange for the parameters to be clearly displayed complete with their currently applicable settings (↗ 6-196, 6-197).

Signal and waveform combinations

| | | | WAVEFORM | | | | | | | | | | |
|--------|-----|---------|----------|----------|------|--------|-------------|-------|-------------------|-------|------------------|---------------------------|--|
| | | | Sine | Triangle | Ramp | Square | Exponential | Noise | Square Low Jitter | Pulse | Arbitrary Normal | Arbitrary Sample Accurate | |
| SIGNAL | AM | CARRIER | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | |
| | | MOD | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| | FM | CARRIER | ■ | ■ | ■ | ■ | ■ | | | | | ■ | |
| | | MOD | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| | PM | CARRIER | ■ | ■ | ■ | ■ | ■ | | | | | ■ | |
| | | MOD | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| | FSK | CARRIER | ■ | ■ | ■ | ■ | ■ | | | | | | |
| | PSK | CARRIER | ■ | ■ | ■ | ■ | ■ | | | | | | |

where: CARRIER - Modulation carrier
 MOD - Modulation signal

Modulation modes FSK and PSK do not require a modulation waveform to be specified, since it is always a squarewave function. For such functions it is enough to specify the modulation frequency and the modulation deviation.

 Note

Modulations are only available when frequency coupling is switched on (↗ 6-175).

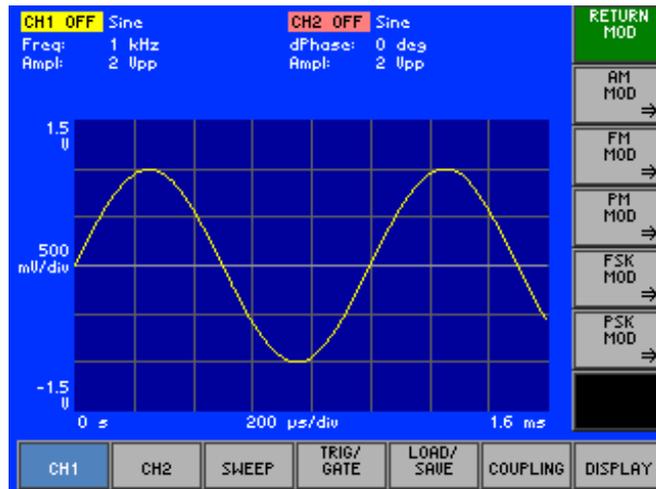
Setting the modulation carrier

1. Select a waveform as a modulation carrier (↗ 6-72).
2. Set the desired carrier frequency (↗ 6-75).

Selecting the MOD submenu

3. In the **CH1** menu press the **MOD** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|--|--|-----------|
| | Exit submenu | |
| | Open submenu: Set amplitude modulation | (↗ 6-114) |
| | Open submenu: Set frequency modulation | (↗ 6-118) |
| | Open submenu: Set phase modulation | (↗ 6-122) |
| | Open submenu: Set frequency shift keying | (↗ 6-126) |
| | Open submenu: Set phase shift keying | (↗ 6-130) |

Note

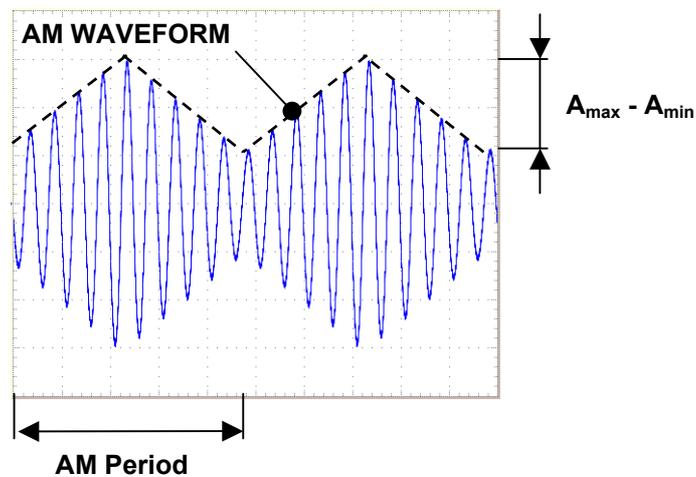
Certain modulations can be executed depending on the waveform selected as the modulation carrier (↗ 6-72). If a particular modulation mode is not available, the corresponding function key is not active.

6.2.1.5.1 Amplitude Modulation (AM)

What the settings are for

In the case of amplitude modulation the information is contained in the amplitude changes to the output signal. The amplitude of the modulation signal is contained within the size of the amplitude change to the output signal. The frequency of the modulation signal is contained within the frequency of the amplitude change to the output signal.

You can use the AM MOD submenu to set the following amplitude modulation parameters:



Selecting the AM MOD submenu

- In the **MOD** submenu press the **AM MOD** function key. The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|--------------------------|--------------------------|-----------|
| RETURN AM MOD | Exit submenu | |
| AM FREQ | Set modulation frequency | (↗ 6-116) |
| AM DEPTH | Set modulation depth | (↗ 6-116) |
| AM WAVEFORM | Select modulation signal | (↗ 6-115) |
| AM ON | Switch modulation on/off | (↗ 6-117) |

Selecting a Modulation Signal

Application

The available modulation source is an internal generator which delivers the following waveforms for amplitude modulation:

- Sine
- Square
- Triangle
- Ramp
- Exponential
- Noise

Selecting the AM waveforms

1. In the  submenu press the  function key.

A selection field containing the specified settings is displayed. The default setting is "Sine".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored.

Setting the Modulation Frequency

Application

In the case of amplitude modulation, the output signal envelope changes as a function of the frequency and amplitude of the modulation signal.

Setting the AM frequency

1. In the  submenu press the  function key.

The entry field for entering the frequency is displayed together with the currently applicable setting. The default setting is "100 Hz".



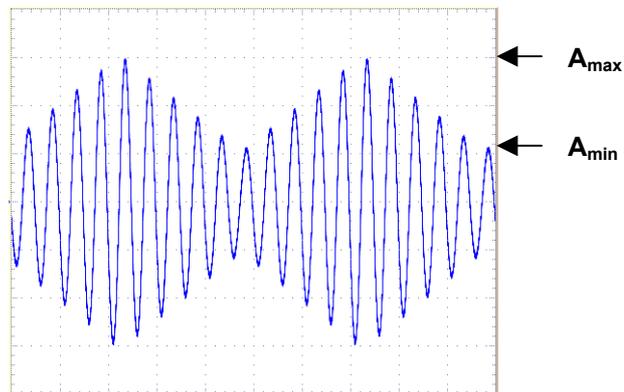
2. Enter a new value (↗ 5-55).

The permissible entry range is:

$$10 \text{ MHz} \leq \text{Frequency} \leq 100 \text{ kHz} \quad \text{in } 10 \text{ } \mu\text{Hz steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-117).

Setting the Modulation Depth



Application

The AM modulation depth m describes the ratio of the maximum to the minimum amplitude A of the modulated signal.

$$m = \frac{A_{\max} - A_{\min}}{A_{\max} + A_{\min}}$$

Setting the modulation depth

1. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "50 %".



2. Enter a new value (↗ 5-55).

The permissible entry range for the modulation depth is.

$$0 \% \leq \text{AM Depth} \leq 100 \% \quad \text{in } 1 \% \text{ steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-117).

Switching AM On/Off

 Note

The amplitude that has been set and is displayed in the R&S AM300 applies to the unmodulated carrier signal. If you switch on the amplitude modulation, the carrier's output voltage is reduced automatically by half (6 dB). This ensures that the max. permissible output voltage of the R&S AM300 is not exceeded even at an amplitude modulation of 100 %.

Application

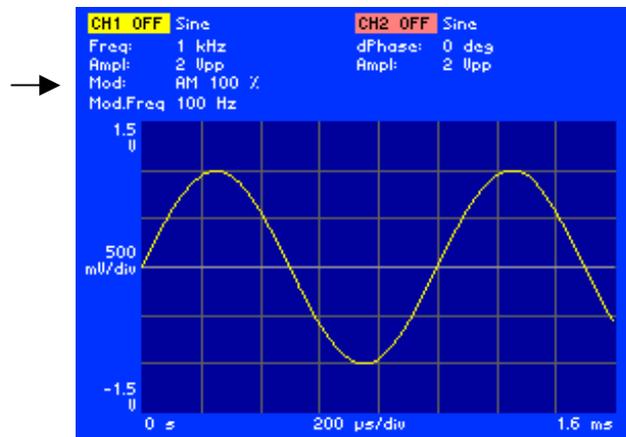
In order to activate AM modulation mode, you need to switch it on in the AM MOD submenu.

Switching AM on

1. In the  submenu press the  function key.

The function key is highlighted.

Display



The currently applicable AM modulation depth and frequency are displayed in the parameter field below the respective channel name, e.g. for CH1: "Mod: AM 100 %, Mod.Freq 100 Hz".

Note: The waveform displayed beside the channel names is the modulation carrier signal, e.g. "Sine, Freq: 1 kHz, Ampl: 2 V_{pp}".

Switching AM off

2. In the  submenu press the  function key.

The function key is **no longer** highlighted. Amplitude modulation is switched off and the display disappears from the parameter field.

 Note

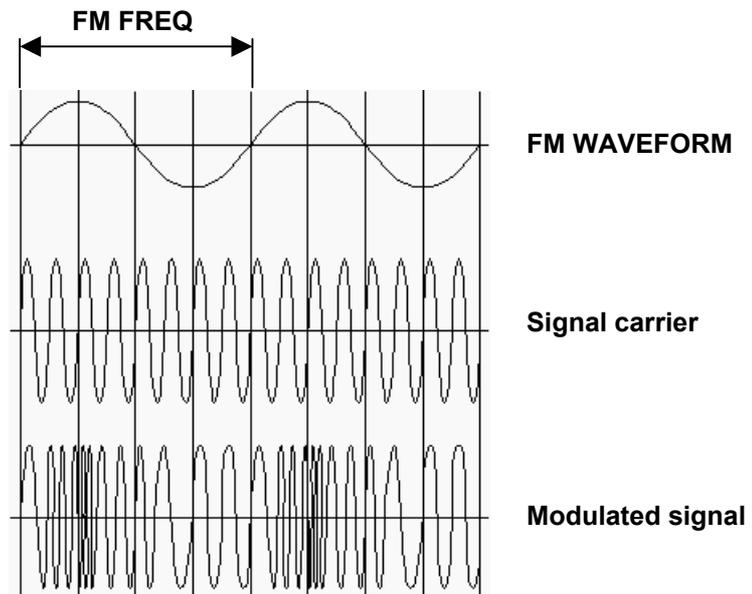
To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (➔ 6-143).

6.2.1.5.2 Frequency Modulation (FM)

What the settings are for

In the case of frequency modulation the information is contained in the frequency changes to the output signal. The amplitude of the output signal stays constant. The amplitude of the modulation signal is contained within the size of the frequency change (frequency deviation) in the output signal. The frequency of the modulation signal is contained in the frequency of the frequency change in the output signal.

You can use the FM MOD submenu to set the FM modulation signal, modulation frequency and frequency deviation.



Selecting the FM MOD submenu

- In the **MOD** submenu press the **FM MOD** function key. The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|--------------------------|--------------------------|-----------|
| RETURN FM MOD | Exit submenu | |
| FM FREQ | Set modulation frequency | (↗ 6-120) |
| FM DEVIATION | Set frequency deviation | (↗ 6-120) |
| FM WAVEFORM | Select modulation signal | (↗ 6-119) |
| FM ON | Switch modulation on/off | (↗ 6-121) |

Selecting a Modulation Signal

Application

The available modulation source is an internal generator which delivers the following waveforms for frequency modulation:

- Sine
- Square
- Triangle
- Ramp
- Exponential
- Noise

Selecting the FM waveforms

1. In the  submenu press the  function key.

A selection field containing the specified settings is displayed. The default setting is "Sine".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored.

Setting the Modulation Frequency

Application

The frequency of the modulation signal is contained in the frequency of the frequency change in the output signal.

Setting the FM frequency

1. In the  submenu press the  function key.

The entry field for entering the frequency is displayed together with the currently applicable setting. The default setting is "100 Hz".



2. Enter a new value (↗ 5-55).

The permissible entry range is:

$$10 \text{ MHz} \leq \text{FM Frequency} \leq 100 \text{ kHz} \quad \text{in } 10 \text{ } \mu\text{Hz steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-121).

Setting the Frequency Deviation

Application

The frequency deviation $\pm \Delta f$ specifies the maximum deviation of the output frequency from the carrier frequency f_0 .

Setting the frequency deviation

1. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "100 Hz".



2. Enter a new value (↗ 5-55).

The permissible entry range for the frequency deviation is subject to the following conditions.

$$0 < f_0 - \Delta f$$

$$f_0 + \Delta f \leq f_{\max}$$

where: f_0 - carrier frequency

Δf - frequency deviation

f_{\max} - maximum carrier frequency (↗ 6-75)

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-121).

Switching FM On/Off

Application

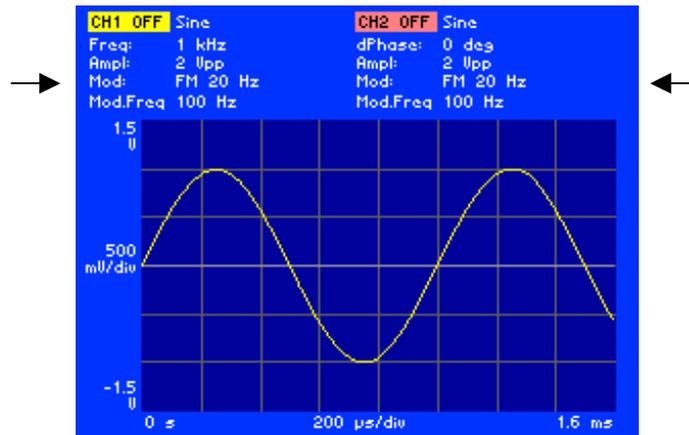
In order to activate FM modulation mode, you need to switch it on in the FM MOD submenu.

Switching FM on

1. In the  submenu press the  function key.

The function key is highlighted.

Display



The FM frequency deviation and modulation frequency are displayed in the parameter field below both channel names CH1 and CH2, e.g. "Mod: FM 20 Hz, Mod.Freq 100 Hz".

Note: The waveform displayed beside the channel names is the modulation carrier signal, e.g. "Sine, Freq: 1 kHz, Ampl: 2 V_{pp}".

Switching FM off

2. In the  submenu press the  function key.

The function key is **no longer** highlighted. Frequency modulation is switched off and the display disappears from the parameter field.

 **Note**

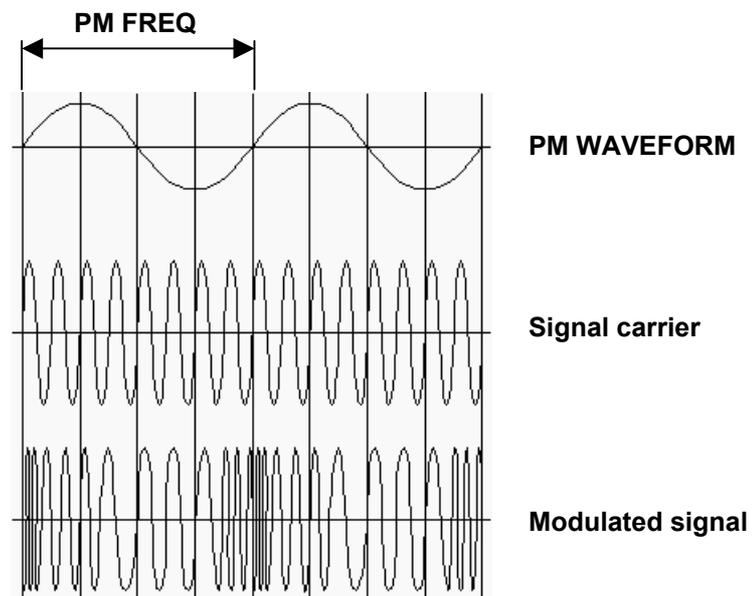
To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (↗ 6-143).

6.2.1.5.3 Phase Modulation (PM)

What the settings are for

In the case of phase modulation the information is contained in the phase changes to the output signal. The amplitude of the output signal stays constant. The amplitude of the modulation signal is contained within the size of the phase change (phase deviation) in the output signal. The frequency of the modulation signal is contained in the frequency of the phase change in the output signal.

You can use the PM MOD submenu to set the PM modulation signal, modulation frequency and phase deviation.



Selecting the PM MOD submenu

- In the **MOD** submenu press the **PM MOD** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|-------------------------|--------------------------|-----------|
| RETURN PM MOD | Exit submenu | |
| PM FREQ | Set modulation frequency | (↗ 6-124) |
| PM PHASE | Set phase deviation | (↗ 6-124) |
| PM WAVEFORM | Select modulation signal | (↗ 6-123) |
| PM ON | Switch modulation on/off | (↗ 6-125) |

Selecting a Modulation Signal

Application

The available modulation source is an internal generator which delivers the following waveforms for phase modulation:

- Sine
- Square
- Triangle
- Ramp
- Exponential
- Noise

Selecting the PM waveforms

1. In the  submenu press the  function key.

A selection field containing the specified settings is displayed. The default setting is "Sine".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored.

Setting the Modulation Frequency

Application

The frequency of the modulation signal is contained in the frequency of the phase change in the output signal.

Setting the PM frequency

1. In the  submenu press the  function key.

The entry field for entering the frequency is displayed together with the currently applicable setting. The default setting is "100 Hz".



2. Enter a new value (↗ 5-55).

The permissible entry range is:

$$10 \text{ MHz} \leq \text{PM Frequency} \leq 100 \text{ kHz} \quad \text{in } 10 \text{ } \mu\text{Hz steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-125).

Setting the Phase Deviation

Application

The phase deviation $\pm\Delta\varphi$ specifies the maximum deviation of the output phase from the reference phase of the unmodulated carrier.

Setting the phase deviation

1. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "0 deg".



2. Enter a new value (↗ 5-55).

The permissible entry range for the phase deviation is:

$$0 \text{ deg} \leq \text{PM Phase} \leq 360 \text{ deg} \quad \text{in } 0.01^\circ \text{ steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-125).

Switching PM On/Off

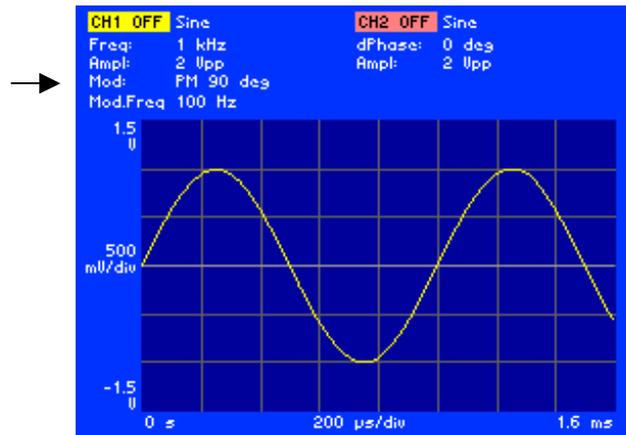
Application

In order to activate PM modulation mode, you need to switch it on in the PM MOD submenu.

Switching PM on

1. In the  submenu press the  function key.
The function key is highlighted.

Display



The PM phase deviation and modulation frequency are displayed in the parameter field below the respective channel name, e.g. for CH1: "Mod: PM 90 deg, Mod.Freq 100 Hz".

Note: The waveform displayed beside the channel names is the modulation carrier signal, e.g. "Sine, Freq: 1 kHz, Ampl: 2 V_{pp}".

Switching PM off

2. In the  submenu press the  function key.
The function key is **no longer** highlighted. Phase modulation is switched off and the display disappears from the parameter field.



Note

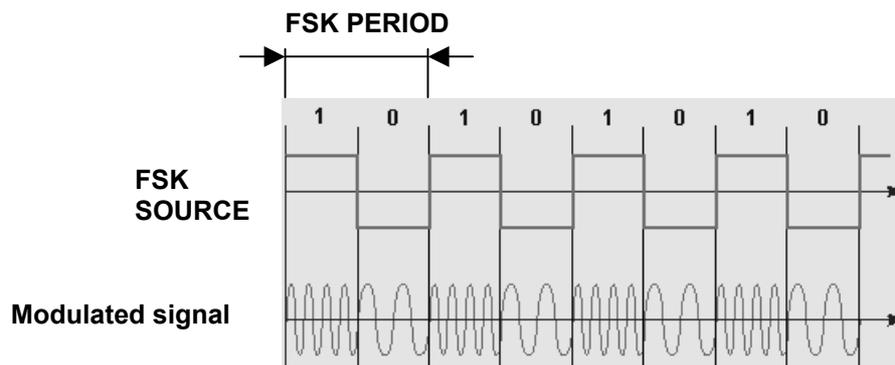
To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (↗ 6-143).

6.2.1.5.4 Frequency Shift Keying (FSK)

What the settings are for

Frequency shift keying is frequency modulation (↗ 6-118) using two frequencies. One frequency represents digital "one" (hopping frequency) and the other represents digital "zero" (carrier frequency).

You can use the FSK MOD submenu to set the FSK modulation signal, modulation frequency and hopping frequency.



Selecting the FSK MOD submenu

- In the **MOD** submenu press the **FSK MOD** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|--------------------------|-----------------------------------|-----------|
| RETURN FSK MOD | Exit submenu | |
| FSK FREQ | Set modulation frequency | (↗ 6-127) |
| FSK PERIOD | Set modulation period | (↗ 6-127) |
| HOPPING FREQ | Set hopping frequency | (↗ 6-128) |
| FSK SOURCE | Select modulation source | (↗ 6-127) |
| POLARITY | Select modulation signal polarity | (↗ 6-128) |
| FSK ON | Switch modulation on/off | (↗ 6-129) |

Selecting the Modulation Source

Application

In the case of frequency shift keying it is not necessary to specify a modulation waveform, since it is always a squarewave function. It is enough to specify the modulation frequency (↗ 6-127) and the frequency deviation (↗ 6-128).

An **internal** or **external** generator can be used as the modulation source (trigger input [26] functions as a modulation signal input).

Selecting the modulation source

1. In the  submenu press the  function key.

A selection field containing the specified settings is displayed. The default setting is "Internal".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored.

Note

If "External" is set as the modulation source, the modulation frequency is entered via the external generator.

Setting the Modulation Frequency

Application

The waveform which the internal generator delivers as the digital modulation signal is in the form of a symmetrical squarewave. You can enter the modulation frequency directly as a frequency value or indirectly via the period.

Setting the FSK frequency

1. In the  submenu press the  function key.

The entry field containing the currently applicable setting is displayed. The default setting is "1 Hz".



2. Enter a new value (↗ 5-55).

The permissible entry range is:

$$101 \mu\text{Hz} \leq \text{FSK Frequency} \leq 2 \text{ MHz} \quad \text{in } 1 \mu\text{Hz steps}$$

Setting the FSK period

1. In the  submenu press the  function key.
The entry field containing the currently applicable setting is displayed. The default setting is "1 s".



2. Enter a new value (↗ 5-55).
The permissible entry range is:

$$500 \text{ ns} \leq \text{FSK Period} \leq 9901 \text{ s} \quad \text{in } 10 \text{ ns steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-129).

Setting the Hopping Frequency

Application

In the case of frequency shift keying, the frequency of the output signal changes abruptly in step with the digital modulation signal. The carrier signal delivers one frequency. You can define the second frequency.

Setting the hopping frequency

1. In the  submenu press the  function key.
An entry field containing the currently applicable setting is displayed. The default setting is "100 Hz".



2. Enter a new value (↗ 5-55).
The permissible entry range for the hopping frequency is:

$$10 \text{ MHz} \leq \text{Hopping Frequency} \leq f_{\text{max}} \quad \text{in } 10 \text{ MHz steps}$$

where: f_{max} - maximum carrier frequency (↗ 6-75)

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-129).

Setting the Modulation Signal Polarity

Application

You can use the polarity to choose whether the modulation signal is displayed as normal (**High**) or inverted (**Low**). In the case of inversion the waveform is logically inverted.

Setting the polarity

1. In the  submenu press the  function key.
A selection field containing the specified settings is displayed. The default setting is "High".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

Switching FSK On/Off

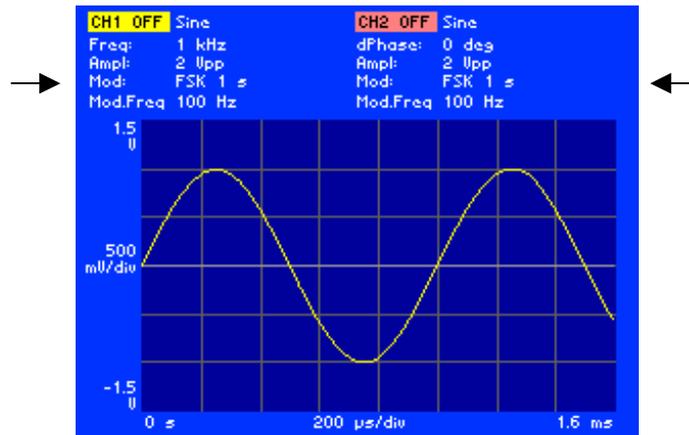
Application

In order to activate FSK modulation mode, you need to switch it on in the FSK MOD submenu.

Switching FSK on

1. In the **FSK MOD** submenu press the **FSK ON** function key.
The function key is highlighted.

Display



The FSK hopping frequency and modulation frequency are displayed in the parameter field below the respective channel names CH1 and CH2, e.g. "Mod: FSK 1 s, Mod.Freq 100 Hz".

Note: The waveform displayed beside the channel names is the modulation carrier signal, e.g. "Sine, Freq: 1 kHz, Ampl: 2 V_{pp}".

Switching FSK off

2. In the **FSK MOD** submenu press the **FSK ON** function key.

The function key is **no longer** highlighted. Frequency shift keying is switched off and the display disappears from the parameter field.

 **Note**

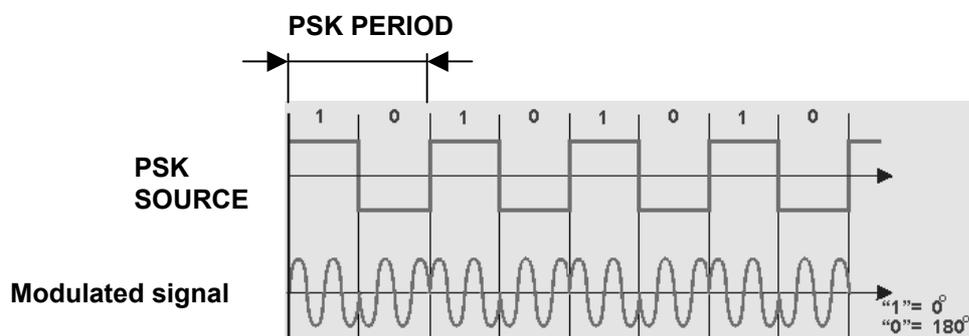
To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (↗ 6-143).

6.2.1.5.5 Phase Shift Keying (PSK)

What the settings are for

Phase shift keying is a phase modulation (↗ 6-122) for digital signals. With this method the signal has a constant frequency and a constant amplitude. The phase position of the output signal changes abruptly in step with the digital modulation signal. In this method the digital value "0" is assigned to one phase position, e.g. 0 degrees, and digital "1" is assigned to the other phase position, e.g. 180 degrees.

You can use the FSK MOD submenu to set the PSK modulation signal, modulation frequency and phase shift.



Selecting the PSK MOD submenu

- In the **MOD** submenu press the **FSK MOD** function key. The submenu is opened and the function keys [13] are assigned the appropriate function.

| | | |
|--------------------------|-----------------------------------|-----------|
| RETURN FSK MOD | Exit submenu | |
| PSK FREQ | Set modulation frequency | (↗ 6-131) |
| PSK PERIOD | Set modulation period | (↗ 6-131) |
| PSK PHASE | Set phase shift | (↗ 6-132) |
| PSK SOURCE | Select modulation source | (↗ 6-131) |
| POLARITY | Select modulation signal polarity | (↗ 6-132) |
| PSK ON | Switch modulation on/off | (↗ 6-133) |

Selecting the Modulation Source

Application

Phase shift keying does not require a modulation waveform to be specified, since it is always a squarewave function. It is enough to specify the modulation frequency and the modulation deviation (↗ 6-131) and the phase deviation (↗ 6-132).

An **internal** or **external** generator can be used as the modulation source (trigger input [26] functions as a modulation signal input).

Selecting the modulation source

1. In the  submenu press the  function key.

A selection field containing the specified settings is displayed. The default setting is "Internal".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored.

Note

If "External" is set as the modulation source, the modulation frequency is entered via the external generator.

Setting the Modulation Frequency

Application

The waveform which the internal generator delivers as the digital modulation signal is in the form of a symmetrical squarewave. You can enter the modulation frequency directly as a frequency value or indirectly via the period.

Setting the PSK frequency

1. In the  submenu press the  function key.

The entry field containing the currently applicable setting is displayed. The default setting is "1 Hz".



2. Enter a new value (↗ 5-55).

The permissible entry range is:

$$101 \mu\text{Hz} \leq \text{PSK Frequency} \leq 2 \text{ MHz} \quad \text{in } 1 \mu\text{Hz steps}$$

Setting the PSK period

1. In the  submenu press the  function key.
The entry field containing the currently applicable setting is displayed. The default setting is "1 s".



2. Enter a new value (↗ 5-55).
The permissible entry range is:

$$500 \text{ ns} \leq \text{PSK Period} \leq 9901 \text{ s} \quad \text{in } 100 \text{ ns steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-133).

Setting the Phase Shift

Application

In phase shift keying the phase of the output signal changes abruptly in step with the digital modulation signal. In this method the carrier signal delivers one frequency (with a particular phase). You can define the phase shift.

Setting the phase shift

1. In the  submenu press the  function key.
An entry field containing the currently applicable setting is displayed. The default setting is "0 deg".



2. Enter a new value (↗ 5-55).
The permissible entry range for the phase shift is:

$$0 \text{ deg} \leq \text{PSK Phase} \leq 360 \text{ deg} \quad \text{in } 0.01^\circ \text{ steps}$$

The new setting is stored and then displayed in the parameter field if modulation is switched on (↗ 6-133).

Setting the Modulation Signal Polarity

Application

You can use the polarity to choose whether the modulation signal is displayed as normal (**High**) or inverted (**Low**). In the case of inversion the waveform is logically inverted.

Setting the polarity

1. In the  submenu press the  function key.
A selection field containing the specified settings is displayed. The default setting is "High".



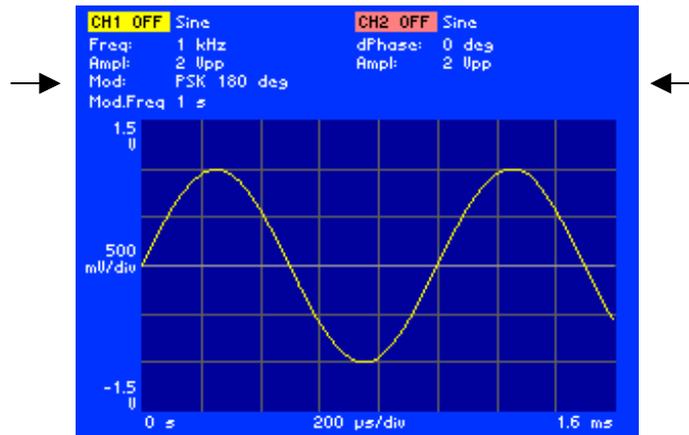
2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

6.2.1.5.5.1 Switching PSK On/Off

Application In order to activate PSK modulation mode, you need to switch it on in the PSK MOD submenu.

Switching PSK on

1. In the  submenu press the  function key.
The function key is highlighted.

Display

The PSK phase shift and modulation frequency are displayed in the parameter field below the respective channel names CH1 and CH2, e.g. "Mod: PSK 180 deg, Mod.Freq 1 μs".

Note: The waveform displayed beside the channel names is the modulation carrier signal, e.g. "Sine, Freq: 1 kHz, Ampl: 2 V_{pp}".

Switching PSK off

2. In the  submenu press the  function key.

The function key is **no longer** highlighted. Phase shift keying is switched off and the display disappears from the parameter field.

 **Note**

To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (➔ 6-143).

6.2.1.6 Configuring the Signal Output

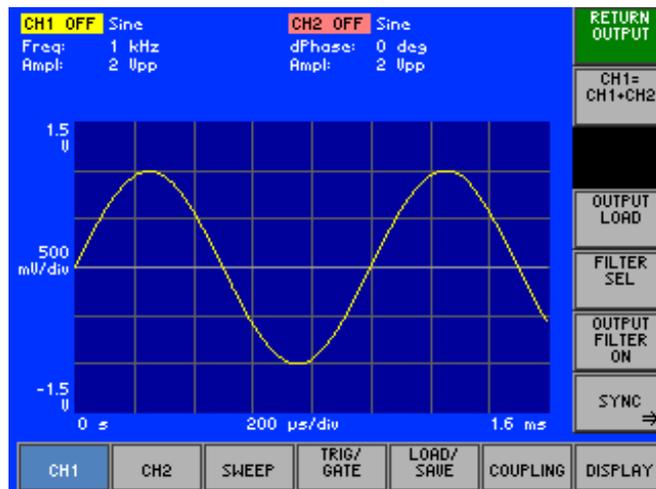
What the settings are for

You can use the OUTPUT submenu to adapt signal output CH1 (CH2) to different tasks in your applications. You can deliver the sum of both output signals on channel CH1, specify a particular output load, activate output filters and configure synchronization signals.

Selecting the OUTPUT submenu

- In the **CH1** menu press the **OUTPUT** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|-------------------------|---|-----------|
| RETURN OUTPUT | Exit submenu | |
| CH1=CH1+CH2 | Switch channel summing on/off | (↗ 6-135) |
| OUTPUT LOAD | Enter the terminating impedance | (↗ 6-136) |
| FILTER SEL | Select anti-aliasing filter | (↗ 6-137) |
| OUTPUT FILTER ON | Switch output filter on/off | (↗ 6-138) |
| SYNC ⇒ | Open submenu: Synchronize output from channel CH1 (CH2) | (↗ 6-139) |



Note

Function key **CH1=CH1+CH2** is available in channel CH1 only

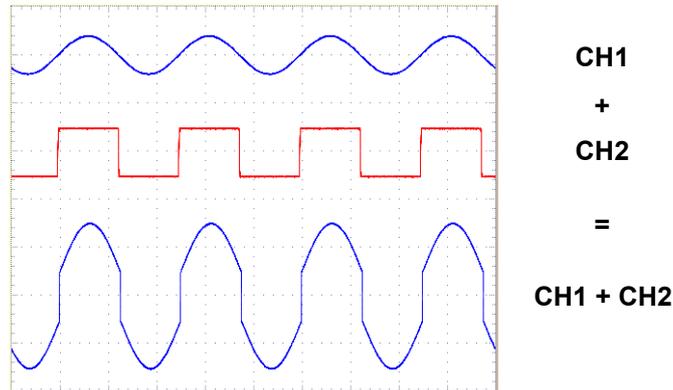
6.2.1.6.1 Switching Channel Summing On/Off

**Note**

Function key  is available in channel CH1 only

Application

The function $CH1 = CH1 + CH2$ can be used to form the output signal CH1 by summing both channels CH1 + CH2.

**Switching channel summing on/off**

1. In the  submenu press the  function key.

The function key is highlighted. After switching on, the new output signal $CH1 = CH1 + CH2$ is delivered to the output.

2. In the  submenu press the  function key.

The function key is **no longer** highlighted. The summing of the two channels $CH1 + CH2$ is switched off and the normal output signal is once again delivered to the output.

**Note**

The total voltage of both channels must not exceed the permissible voltage for a single channel (↗ 6-81).

To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (↗ 6-143).

6.2.1.6.2 Entering the Terminating Impedance

Application

In order to adapt the signal amplitude display to the connected terminating impedance, the value of the load being delivered to the output can be entered. The R&S AM300 uses this value to calculate the voltage present at the output. The corrected voltage value is displayed.

The upper limit and lower limit values are also recalculated internally.

Entering the output load

1. In the  menu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "50 Ω".



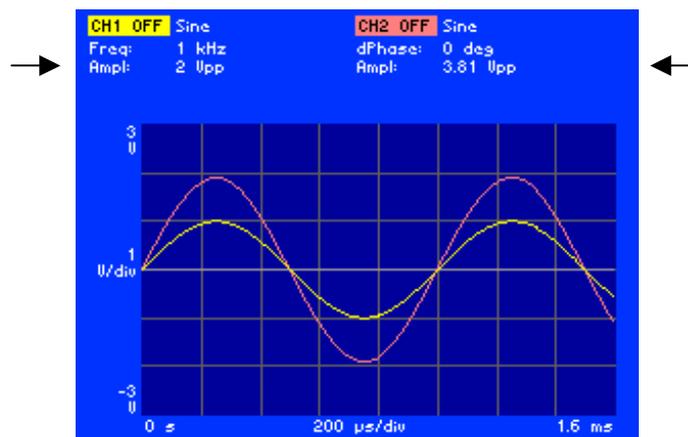
2. Enter a new value (↗ 5-55).

The permissible entry range for the output load is:

$$1 \Omega \leq \text{Output Load} \leq 1 \text{ M}\Omega \quad \text{in } 1 \Omega \text{ steps}$$

The new setting is stored and the corrected voltage value is displayed.

Display



The currently applicable output voltage for the output load concerned is displayed in the parameter field below both channel names CH1 and CH2, e.g.: for CH1 at 50 Ω "Ampl: 2 V_{pp}"
for CH2 at 1 kΩ "Ampl: 3.81 V_{pp}".

Note: The output situation of both channels was the same: "Ampl: 2 V_{pp} at 50 Ω". The terminating impedance on channel CH2 was then switched to 1 kΩ.

 Note

It is only possible to enter the signal amplitude in dBm if 50 Ω has been selected as the terminating impedance (↗ 6-136).

To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (↗ 6-143).

6.2.1.6.3 Setting the Anti-Aliasing Filter

Application

You can set different anti-aliasing filters for suppressing interference signals in your currently applicable waveform:

- **Auto**
- **Cauer 35 MHz**
- **Bessel 37 MHz**
- **Bessel 75 MHz**
- **External**

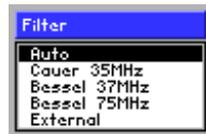
In the "Auto" setting the Cauer filter (for optimum suppression of image signals) is automatically switched on for the **Sine** waveform. In the case of the other waveforms, in which there is optimum settling, a Bessel filter is automatically switched on.

The "External" setting enables an external filter to be connected to connectors [15, 29] and/or [16, 15] for the appropriate channel of the R&S AM300, which is optimized for particular applications.

Selecting the anti-aliasing filter

1. In the  submenu press the  function key.

A selection field containing specified settings is displayed. The default setting is "Auto".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored.



Note

To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (➔ 6-143).

6.2.1.6.4 Setting the Output Filter

Application You can switch on a Cauer filter (35 MHz) at the output, for optimum suppression of signal distortions:

- **Auto**
- **ON**
- **OFF**

In the "Auto" setting the output filter is automatically switched on for the **Sine** waveform at frequencies of 10 MHz or above.

Switching the output filter on/off

1. In the  submenu press the  function key.

A selection field containing specified settings is displayed. The default setting is "Auto".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored. After switching on, the function key is highlighted.

Note

To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (↗ 6-143).

6.2.1.6.5 Setting Synchronized Outputs

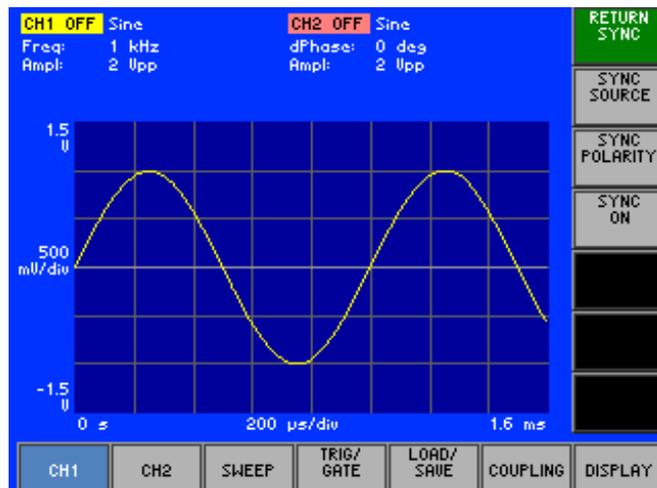
What the settings are for

In order that signals generated on the R&S AM300 can be synchronized with external circuits, there are two Sync outputs [27, 28] for channels CH1 and CH2 on the rear panel of the instrument. Different signals are delivered to the outputs as a function of the selected setting.

Selecting the Sync submenu

- In the **OUTPUT** submenu press the **SYNC** function key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|----------------------|--|-----------|
| RETURN SYNC | Exit submenu | |
| SYNC SOURCE | Select synchronization source | (↗ 6-140) |
| SYNC POLARITY | Select synchronization output polarity | (↗ 6-142) |
| SYNC ON | Switch synchronized output on/off | (↗ 6-142) |

Selecting the Synchronization Source

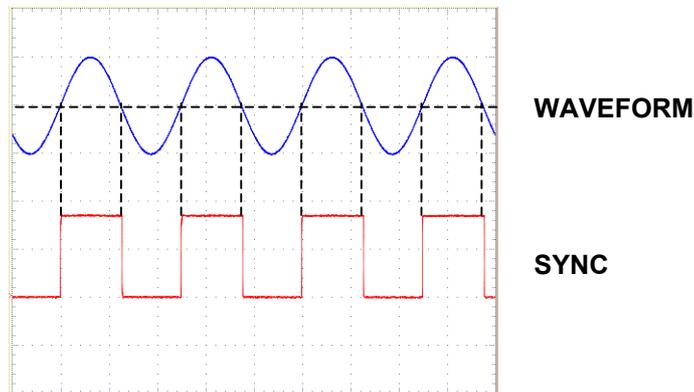
Application

The following synchronization signal sources are available:

- **Comparator**

The outputs Sync1 and Sync2 are fed by analog comparators. Since each channel has an analog comparator, the synchronization signals for channel CH1 and channel CH2 can be different. The switching threshold is fixed at the zero crossing. The comparator signals deliver relatively jitter-free output signals across the whole frequency range. In situations where frequencies are low, it may be advantageous to ignore the comparator and instead take the feed from the synchronization outputs of the MSB for the main phase accumulator (↗ below, Main accumulator).

All standard waveforms except Noise can generate a synchronization signal. For the Sine waveform the synchronization signal has a duty cycle of 50 %. For all other waveforms the duty cycle of the synchronization signal is the same as that of the output signal.

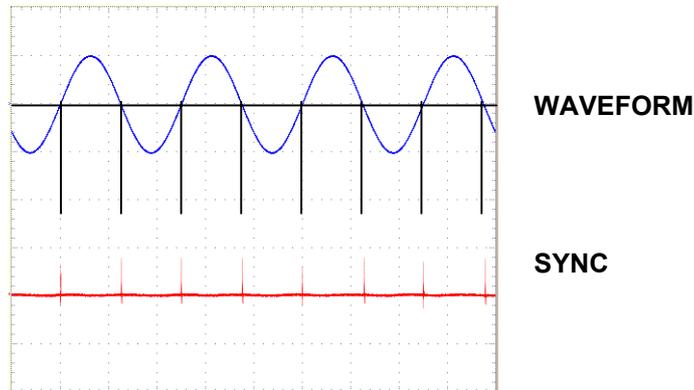


- **Main accumulator**

It is also possible to use the MSB of the main phase accumulator in each channel as the source for the synchronization outputs. As in the case of the comparators, the switching threshold is at the zero crossing, i.e. at 0 degrees and 180 degrees. Since the start phase is added on only after the phase accumulator, the former makes itself felt as a phase difference between the output signal and the synchronization signal.

At higher frequencies the jitter on the synchronization signal increases sharply, making this method suitable only for the lower frequency range .

All standard waveforms except Noise and Pulse can generate a synchronization signal. For the Sine waveform the synchronization signal has a duty cycle of 1:1. For all other waveforms the duty cycle of the synchronization signal is the same as that of the output signal.

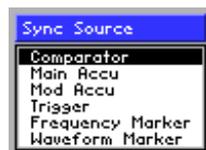


- **Mod accumulator**
Another source for the synchronization outputs can be the MSB of the phase accumulator on the modulation generator. As with the main phase accumulator, the switching threshold is located at 0 degrees and 180 degrees. Since there is only one modulation generator, only one synchronization signal can be generated. The signal at the synchronization output is a squarewave signal with a fixed duty cycle of 1:1.
- **Trigger**
The synchronization outputs can be set so that the trigger signal (↗ 6-157) is fed to one or both of the synchronization outputs. The value set for trigger delay does not delay the synchronization signal relative to the trigger signal.
- **Frequency marker**
The Sweep menu can be used to set a frequency marker (↗ 6-152). If a frequency sweep is to be carried out at the position of the frequency marker, a synchronization signal is generated. The synchronization output is "high" as long as the currently applicable frequency is higher than the set marker frequency.
- **Waveform marker**
When creating an arbitrary function (with the aid of PC software) a marker can be inserted at any point. If the **Arbitrary** waveform is generated in the R&S AM300 at the position of the waveform marker, a synchronization signal is generated. The synchronization output is "high" as long as the currently applicable frequency is higher than the set waveform frequency.

Selecting the synchronization source

1. In the  submenu press the  function key.

A selection field containing specified settings is displayed. The default setting is "Comparator".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.
The new setting is stored.

Selecting the Synchronization Output Polarity

Application

You can change the polarity of the synchronization output to suit the measurement task.

- **Normal**
The synchronization signal is delivered in its original state.
- **Inverted**
The delivered synchronization signal is logically inverted.

Selecting the polarity

1. In the  submenu press the  function key.

A selection field containing specified settings is displayed. The default setting is "Normal".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored and the synchronization signal is delivered using the currently applicable polarity.

Switching the Synchronization Output On/Off

Application

The synchronization output can be switched on and off.

Switching the synchronization output on/off

1. In the  submenu press the  function key.

The function key is highlighted. After switching on, the signal is delivered from the active synchronization source.

2. In the  submenu press the  function key.

The function key is **no longer** highlighted and there is no signal present at the synchronization output.

6.2.1.7 Switching the Signal Output On/Off

Application

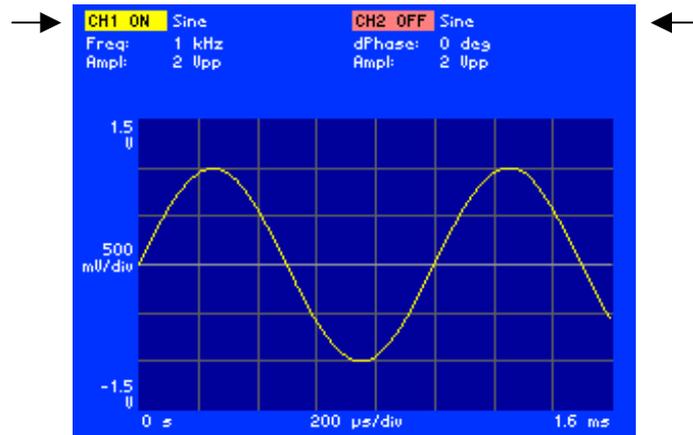
To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch channel CH1 on.

Switching on channel CH1

1. In the **CH1** menu press the **CH1 ON** function key.

The function key is highlighted and the new setting is stored. After switching on, the configured output signal is present at the output [8].

Display



The currently applicable status is displayed in the parameter field beside the channel names, e.g. "CH1 ON", "CH2 OFF".

Switching off channel CH1

2. In the **CH1** menu press the **CH1 ON** function key.

The function key is **no longer** highlighted. There is no signal at the output.

6.2.2 Configuring Output Signal CH2 (Menu CH2)

What the settings are for

The MAIN CH2 menu (and MAIN CH1 menu) can be used to enter all the possible settings for delivering a configurable standard waveform or a user-defined (arbitrary) waveform to output CH2 (or output CH1 respectively).

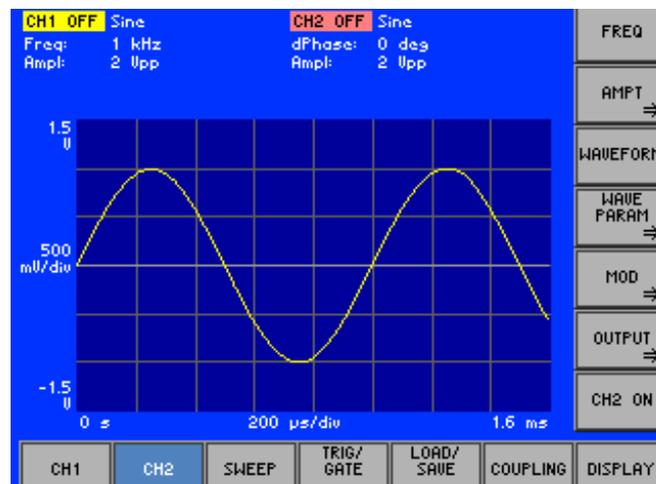
The screen displays a period of the set signal. The channels are colour coded.

Note: If you wish to review all the modulation settings in channel CH2 at a glance, you can arrange for the parameters to be clearly displayed complete with their currently applicable settings (↗ 6-195).

Selecting menu CH2

- Select the **CH2** menu with the aid of the ◀ or ▶ cursor key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|--------------|---|-----------|
| FREQ | Set the frequency of the current waveform | (↗ 6-75) |
| AMPT → | Open submenu: Set the amplitude of the current waveform | (↗ 6-77) |
| WAVEFORM | Select waveform | (↗ 6-72) |
| WAVE PARAM → | Open submenu: Set the function parameters of the current waveform | (↗ 6-96) |
| MOD → | Open submenu: Modulate waveform | (↗ 6-112) |
| OUTPUT → | Open submenu: Configure signal output | (↗ 6-134) |
| CH2 ON | Switch on output channel CH2 | (↗ 6-143) |

Note

Since not every function can be set independently for both channels (CH1 and CH2), channel CH1 has priority. Any dependencies which apply to each function are specified as necessary, along with their consequences. The structure of the channel menu is identical for CH1 and CH2.

6.2.3 Sweep Settings (SWEEP Menu)

 **Note**

The SWEEP operating mode cannot be combined with the BURST operating mode or with a modulation operating mode. When the SWEEP operating mode is switched on, both the other operating modes are automatically deactivated.

What the settings are for

In the SWEEP operating mode the output frequency is changed stepwise in 1024 steps from a predefined starting frequency to a predefined stopping frequency using a predefined sweep time. The time characteristic (linear or logarithmic) can be selected. You can configure the R&S AM300 so that it changes the frequency continuously or delivers an individual frequency sweep (one-time frequency change from the starting frequency to the stopping frequency) when an external or manual trigger occurs.

Note: If you wish to review all the sweep settings at a glance, you can arrange for the parameters to be clearly displayed complete with their currently applicable settings (➤ 6-199).

Waveforms for the frequency sweep

| | | WAVEFORM | | | | | | | | | |
|-------|--|----------|----------|------|--------|-------------|-------|-------------------|-------|------------------|---------------------------|
| | | Sine | Triangle | Ramp | Square | Exponential | Noise | Square Low Jitter | Pulse | Arbitrary Normal | Arbitrary Sample Accurate |
| SWEEP | | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |

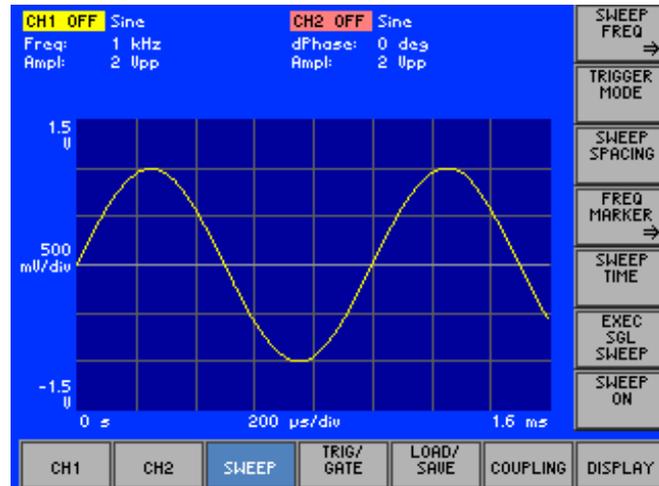
 **Note**

A sweep using the **Noise** waveform is actually possible, but it is of no use.

Selecting the SWEEP menu

1. Select a waveform for the frequency sweep (↗ 6-72).
2. Select the **SWEEP** menu with the aid of the ◀ or ▶ **cursor key**.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|---|---|-----------|
|  | Open submenu: Set the sweep frequency range | (↗ 6-147) |
|  | Select trigger mode | (↗ 6-150) |
|  | Select sweep scaling | (↗ 6-151) |
|  | Open submenu: Set frequency marker | (↗ 6-152) |
|  | Set sweep time | (↗ 6-151) |
|  | Start once-only sweep | (↗ 6-150) |
|  | Switch SWEEP operating mode on/off | (↗ 6-154) |



Note

The  function key is only available if the “Manual” trigger mode has been switched on (↗ 6-150).

6.2.3.1 Setting the Sweep Frequency Range

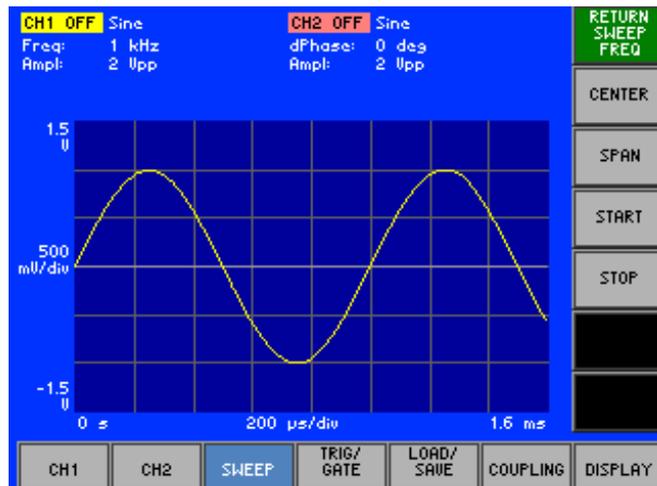
What the settings are for

Selecting the SWEEP FREQ submenu

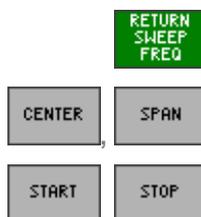
Use the FREQ submenu to define the frequency range through which the output signal is to be swept.

- In the **SWEEP** menu press the **SWEEP FREQ** function key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment



Exit submenu

1st method: Set frequency range (↗ 6-148)
For entering the center frequency (CENTER) and frequency range (SPAN)

2nd method: Set frequency range (↗ 6-149)
For entering the starting (START) and stopping frequency (STOP)

6.2.3.1.1 Setting the Center Frequency and Frequency Range

Application

You have two possible ways of setting the sweep frequency range. In this method you enter a center frequency (CENTER) and define a frequency range (SPAN).

Setting the center frequency

1. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "60 kHz".



2. Enter a new value (↗ 5-55).

The permissible entry range for the frequency range, e.g. for the **Sine** waveform, is:

$$15 \mu\text{Hz} \leq \text{Center} \leq 25 \text{ MHz} \quad \text{in } 10 \mu\text{Hz steps}$$

Setting the frequency display range

3. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "80 kHz".



4. Enter a new value (↗ 5-55).

The permissible entry range for the frequency range, e.g. for the **Sine** waveform, is:

$$10 \mu\text{Hz} \leq \text{Span} \leq 25 \text{ MHz} \quad \text{in } 10 \mu\text{Hz steps}$$

The new setting is stored and then displayed in the parameter field, if frequency sweeping is switched on (↗ 6-154).

Note

The upper frequency limit depends on the waveform selected (↗ 6-75).

6.2.3.1.2 Setting the Starting and Stopping Frequencies

Application

You have two possible ways of setting the sweep frequency range. In this method you enter a starting (START) and stopping frequency (STOP).

Setting the starting frequency

1. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "20 kHz".



2. Enter a new value (↗ 5-55).

The permissible entry range for the starting frequency is dependent on the waveform and for the **Sine** waveform, for example, is:

$$100 \text{ MHz} \leq \text{Start} \leq 35 \text{ MHz} \quad \text{in } 10 \text{ } \mu\text{Hz steps}$$

Setting the stopping frequency

3. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "100 kHz".



4. Enter a new value (↗ 5-55).

The permissible entry range for the stopping frequency is dependent on the waveform and for the **Sine** waveform, for example, is:

$$100 \text{ MHz} \leq \text{Span} \leq 35 \text{ MHz} \quad \text{in } 10 \text{ } \mu\text{Hz steps}$$

The new setting is stored and then displayed in the parameter field, if frequency sweeping is switched on (↗ 6-154).

Note

The upper frequency limit depends on the waveform selected (↗ 6-75).

6.2.3.2 Selecting the Trigger Mode

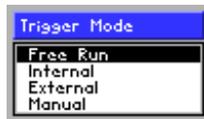
 **Note** The "Select trigger mode" setting can also be entered in the TRIG/GATE menu (↗ 6-155).

Application You can use the trigger mode function to set the trigger for the Sweep operating mode. A number of different choices are available:

- **Free Run**
No triggering takes place. Sweep cycles take place continuously and their duration is defined by the sweep time.
- **Internal**
The internal trigger generator is selected as the trigger source (↗ 6-160).
- **External**
Triggering occurs with the aid of a TTL signal at the trigger input [26]. If a TTL signal with the selected edge occurs, a sweep cycle is output at the generator output [8, 9]. The generator then waits for another trigger signal. Whilst the generator is waiting, the starting frequency is output.
- **Manual**
When you press the function key "EXEC SGL SWEEP" a sweep cycle is delivered to the output. The generator then waits for further manual trigger pulses when the starting frequency occurs.

Setting trigger mode

1. In the  menu press the  function key.
A selection field containing specified settings is displayed. The default setting is "Free Run".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.
The new setting is stored.

Execute once-only sweep

In Manual sweep mode:

- In the  menu press the  function key.
If the SWEEP operating mode is switched on (↗ 6-154), a once-only sweep is executed. The R&S AM300 then waits for further manual trigger pulses when the starting frequency occurs. You may repeat this procedure as often as you wish.

6.2.3.3 Selecting the Sweep Scaling

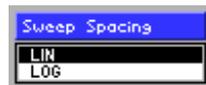
Application

The time characteristic of a frequency sweep can be selected. In so doing you can decide whether the intervals between the frequency values that are successively set are displayed in linear (**LIN**) or logarithmic (**LOG**) fashion.

Setting the sweep scaling

1. In the **SWEEP** menu press the **SWEEP SPACING** function key.

A selection field containing specified settings is displayed. The default setting is "LIN".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored.

6.2.3.4 Setting the Sweep Time

Application

The sweep time is the time during which the R&S AM300 traverses the defined frequency range (SPAN, ↗ 6-148).

Setting the sweep time

1. In the **SWEEP** menu press the **SWEEP TIME** function key.

An entry field containing the currently applicable setting is displayed. The default setting is "1 ms".



2. Enter a new value (↗ 5-55).
The permissible entry range for the sweep time is:

$$1 \text{ ms} \leq \text{Sweep Time} \leq 999 \text{ s} \quad \text{in } 10 \mu\text{s steps}$$

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

The new setting is stored and then displayed in the parameter field, if frequency sweeping is switched on (↗ 6-154).

6.2.3.5 Setting the Frequency Marker

What the settings are for

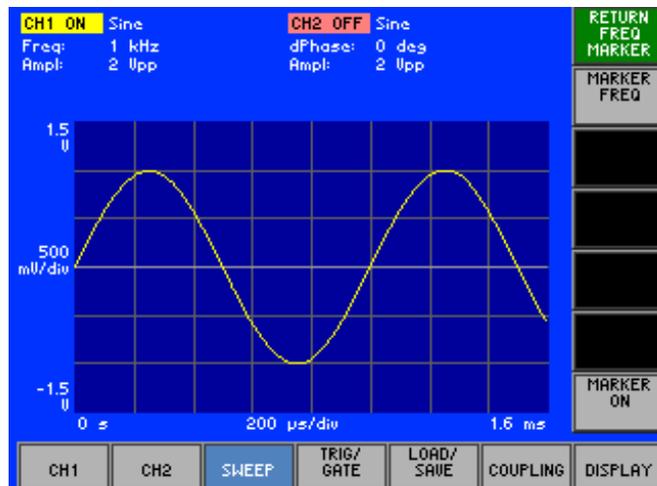
The R&S AM300 has two synchronization outputs [27, 28], on which synchronization signals can be delivered. The frequency marker can be used as the source for the synchronization signal (↗ 6-140). The synchronization output changes its status during the sweep procedure when the marker frequency is exceeded.

You can use the MARKER FREQ submenu to define the marker frequency and switch on the frequency marker.

Selecting the MARKER FREQ submenu

- In the **SWEEP** menu press the **FREQ MARKER** function key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|---|--------------------------------|-----------|
|  | Exit submenu | |
|  | Set marker frequency | (↗ 6-153) |
|  | Switch frequency marker on/off | (↗ 6-153) |

6.2.3.5.1 Setting the Marker Frequency

Application

Use the marker frequency to define the frequency value at which synchronization output B changes its level from "low" to "high" during the sweep procedure.

Setting the marker frequency

1. In the  menu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is the center frequency of the sweep procedure (↗ 6-148).



2. Enter a new value (↗ 5-55).
The permissible entry range for the marker frequency is the same as the value range for the frequency setting of the sweep procedure (↗ 6-147).
3. Press the **ENTER** key [5] to close the input field.
The new setting is stored.

6.2.3.5.2 Switching the Frequency Marker On/Off

Application

To be able to control the trigger procedure via synchronization output B [28], you need to switch on the frequency marker.

Switching the frequency marker on/off

1. In the  submenu press the  function key.

The function key is highlighted. After switching on, the trigger signal is present on synchronization output B.

2. In the  submenu press the  function key.

The function key is **no longer** highlighted. The trigger signal on synchronization output B is switched off.

6.2.3.6 Switching SWEEP Operating Mode On/Off

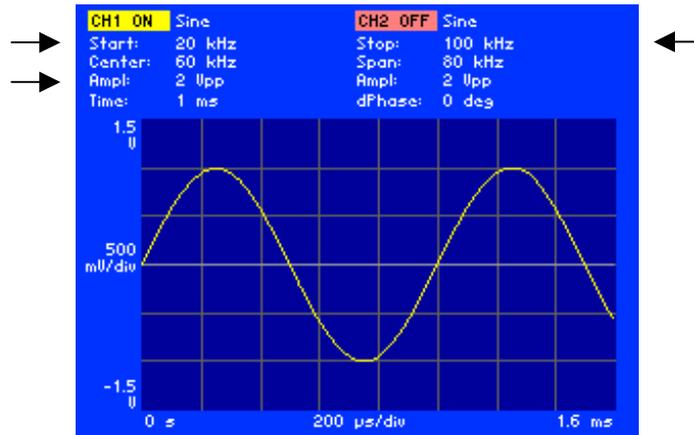
Application To start frequency sweeping in the current trigger mode (7 6-150), you need to switch on the Sweep operating mode.

Switching on Sweep mode

1. In the **SWEEP** submenu press the **SWEEP ON** function key.

The function key is highlighted. After switching on, the sweep signal is present on the RF output.

Display



The currently applicable sweep parameters are displayed in the parameter field below the channel names, e.g. "Start: 20 kHz, Stop 100 kHz, Center: 60 kHz, Span 80 kHz, Time 1 ms".

Switching off Sweep mode

2. In the **SWEEP** submenu press the **SWEEP ON** function key.

The function key is **no longer** highlighted. The currently set sweep mode is switched off and the display disappears from the parameter field.

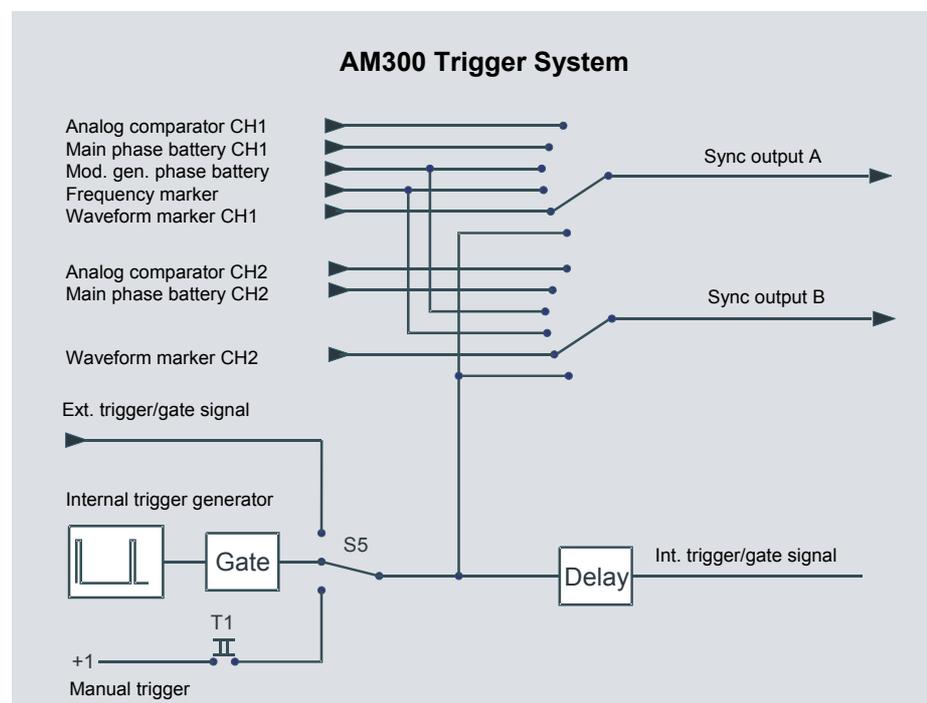
6.2.4 Trigger Settings (TRIG/GATE Menu)

What the settings are for

You can use the TRIG/GATE menu in order to enter settings which control the sequence in which signals are delivered to the output. The trigger sources you can use are the signal from the internal trigger generator, an external trigger signal or a trigger signal given by means of a keystroke.

The trigger signal uses a delay line that can be set in order to control a gate which defines how the waveforms are output. You can choose from a number of different ways in which the gate will affect the signals.

So that signals generated on the R&S AM300 can be synchronized with external circuits, there are two Sync outputs available (↗ 6-139).

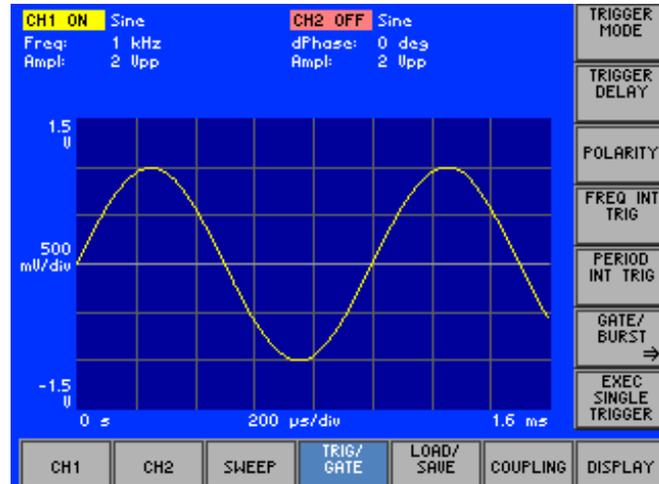


Note: If you wish to review all the trigger settings at a glance, you can arrange for the parameters to be clearly displayed complete with their currently applicable settings (↗ 6-198).

Selecting the TRIG/GATE menu

- Select the **TRIG/GATE** menu with the aid of the ◀ or ▶ cursor key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|---------------------|---|-----------|
| TRIGGER MODE | Select trigger mode | (↗ 6-157) |
| TRIGGER DELAY | Set trigger delay | (↗ 6-159) |
| POLARITY | Select active trigger edge | (↗ 6-159) |
| FREQ INT TRIG | Set internal trigger generator frequency | (↗ 6-160) |
| PERIOD INT TRIG | Set internal trigger generator period | (↗ 6-160) |
| GATE/BURST → | Open submenu: Set Gate/Burst operating mode | (↗ 6-161) |
| EXEC SINGLE TRIGGER | Execute once-only triggering | (↗ 6-157) |

6.2.4.1 Selecting Trigger Mode

 **Note** The "Select trigger mode" setting can also be entered in the SWEEP menu (↗ 6-150).

Application Use the "trigger mode" function to set the Trigger operating mode. This setting is used to set the trigger for the Sweep/Burst operating mode.

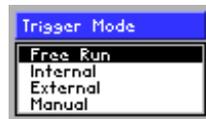
The trigger control affects the output of all waveforms. You can choose from the following settings:

- **Free Run**
No triggering takes place and the signals are output continuously.
- **Internal**
The internal trigger generator is selected as the trigger source (↗ Figure, 6-158).
- **External**
A signal at the external trigger input [26] is selected as the trigger source (↗ Figure, 6-158).
- **Manual**
A once-only trigger event is executed by means of a keystroke.

Setting trigger mode

1. In the  menu press the  function key.

A selection field containing specified settings is displayed. The default setting is "Free Run".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.
The new setting is stored.

Delivering a trigger signal to the Sync output

1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Switch the appropriate Sync output on (↗ 6-142).

Execute once-only triggering

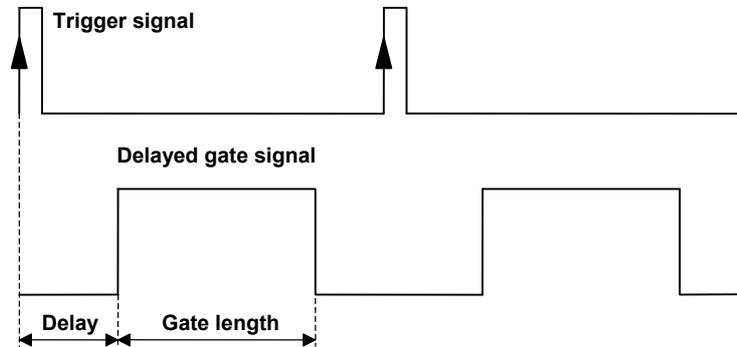
In manual Trigger mode:

- In the  menu press the  function key.

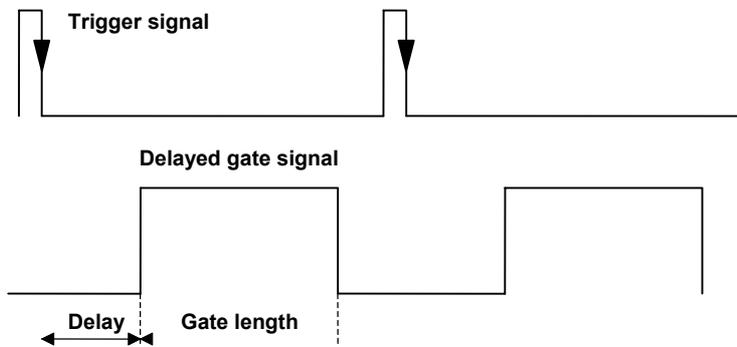
A once-only trigger event is executed. The R&S AM300S AM300 then waits for further manual trigger pulses. You may repeat this procedure as often as you wish.

6.2.4.1.1 Method of the Internal Trigger Generator

Triggering at a low-high edge of the trigger signal

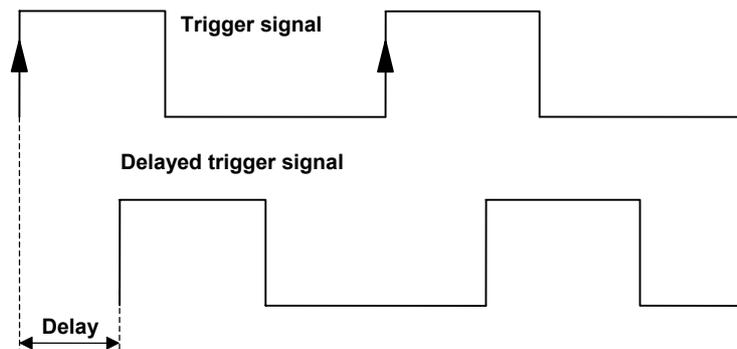


Triggering at a high-low edge of the trigger signal

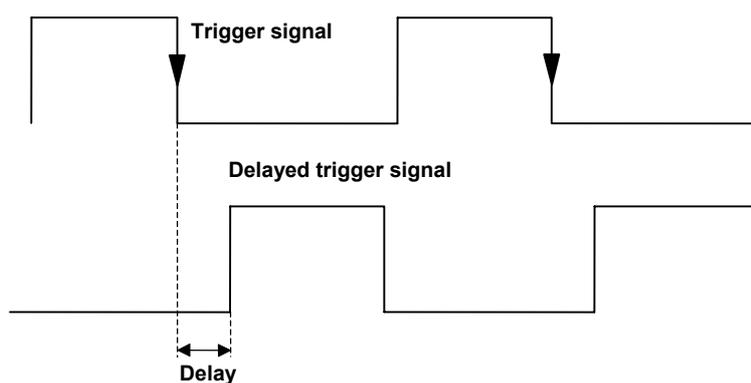


6.2.4.1.2 Method of the External Trigger Generator

Triggering at a low-high edge of the trigger signal



Triggering at a high-low edge of the trigger signal



6.2.4.2 Setting the Trigger Delay

Application

In order to compensate for skews in the signals, you can set a delay between the occurrence of the trigger event and the opening of the gate (↗ Figure, 6-158).

Setting the trigger delay

1. In the **TRIG/ GATE** menu press the **TRIGGER DELAY** function key.

An entry field containing the currently applicable setting is displayed. The default setting is "0 s".



2. Enter a new value (↗ 5-55).
The permissible entry range for the trigger delay is:
0 s ≤ Trigger Delay ≤ 9999 s in 10 ns steps
3. Press the **ENTER key** [5] to close the entry field.
The new setting is stored.

Delivering a trigger signal to the Sync output

1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Select a trigger mode (↗ 6-150).
3. Switch the appropriate Sync output on (↗ 6-142).

6.2.4.3 Selecting the Active Trigger Edge

Application

You can use the polarity to choose whether triggering is to be executed on the low-high edge (**high**) or on the high-low edge (**low**) of the trigger pulse. In the case of inversion the trigger signal is logically inverted.

Setting the polarity

1. In the **TRIG/ GATE** menu press the **POLARITY** function key.

A selection field containing the currently applicable setting is displayed. The default setting is "High".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.
The new setting is stored.

Delivering a trigger signal to the Sync output

1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Select a trigger mode (↗ 6-150).
3. Switch the appropriate Sync output on (↗ 6-142).

6.2.4.4 Setting the Internal Trigger Generator Frequency

Application You can enter the trigger frequency directly as a frequency value or indirectly via the period.

Setting the trigger frequency

1. In the **TRIG/ GATE** menu press the **FREQ INT TRIG** function key.

An entry field containing the currently applicable setting is displayed. The default setting is "1 kHz".



2. Enter a new value (↗ 5-55).
The permissible entry range is:

$$101 \mu\text{Hz} \leq \text{Trigger Freq.} \leq 2 \text{ MHz} \quad \text{in } 1 \mu\text{Hz steps}$$

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

Setting the trigger period

1. In the **TRIG/ GATE** menu press the **PERIOD INT TRIG** function key.

The entry field containing the currently applicable setting is displayed. The default setting is "1 ms".



2. Enter a new value (↗ 5-55).
The permissible entry range is:

$$500 \text{ ns} \leq \text{Trigger Period} \leq 9901 \text{ s} \quad \text{in } 10 \text{ ns steps}$$

The new setting is stored.

Delivering a trigger signal to the Sync output

1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Select the "Internal" setting as the trigger mode (↗ 6-150).
3. Switch the appropriate Sync output on (↗ 6-142).

6.2.4.5 Setting Gate/Burst Operating Mode

What the settings are for

In Gate/Burst mode you can control the signal generation sequence. It is controlled with the aid of a gate which can have its function, length and polarity set. Three gate functions are available.

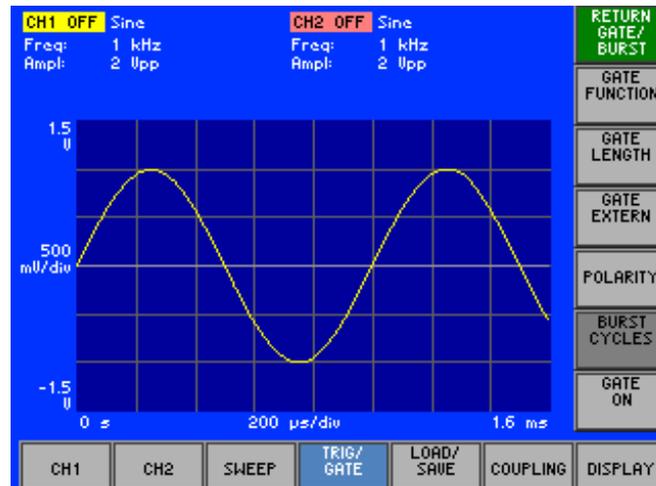
Waveforms for Burst mode

| | | WAVEFORM | | | | | | | | | |
|------------|--|----------|----------|------|--------|-------------|-------|-------------------|-------|------------------|---------------------------|
| | | Sine | Triangle | Ramp | Square | Exponential | Noise | Square Low Jitter | Pulse | Arbitrary Normal | Arbitrary Sample Accurate |
| Burst Mode | | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | |

Selecting the GATE/BURST submenu

1. Select a waveform for the Gate/Burst mode (↗ 6-72).
2. In the **TRIG/ GATE** menu press the **GATE/ BURST** function key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|---------------------------|--|-----------|
| RETURN GATE/ BURST | Exit submenu | |
| GATE FUNCTION | Select gate function | (↗ 6-163) |
| GATE LENGTH | Set gate length | (↗ 6-166) |
| GATE EXTERN | Control gate via external trigger signal | (↗ 6-166) |
| POLARITY | Select gate polarity | (↗ 6-167) |
| BURST CYCLES | Set number of burst signal periods | (↗ 6-168) |
| GATE ON | Switch Gate/Burst mode on/off | (↗ 6-168) |

Note

The **GATE LENGTH** and **GATE EXTERN** function keys are only available if the "Burst" gate function is switched off (↗ 6-163).

The **GATE LENGTH** function key is only available if the **GATE EXTERN** function key is not active (↗ 6-166).

The **BURST CYCLES** function key is only available if the "Burst" gate function is switched on (↗ 6-163).

6.2.4.5.1 Selecting the Gate Function

Application

You can use the gate function to control the waveform output when using the trigger event. You have a number of choices available (↗ Figures, 6-164 and 6-165):

- **Block End**
Waveform output begins with the rising edge and continues after the gate is closed until the last signal period is completely finished. If the waveform is phase shifted (↗ 6-98), the start and end are shifted accordingly.
- **Sample & Hold**
The waveform is generated only so long as the gate is open. After this the last value is retained. The next time the gate opens the waveform continues from the same point. If the waveform is phase shifted (↗ 6-98), the start is shifted accordingly.
- **Burst**
A defined number of complete signal periods is output. If the waveform is phase shifted (↗ 6-98), the start is shifted accordingly.

Selecting the gate function

1. In the  submenu press the  function key.

A selection field containing specified settings is displayed. The default setting is "Block End".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

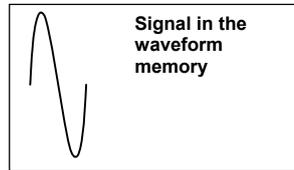
The new setting is stored.

Delivering a trigger signal to the Sync output

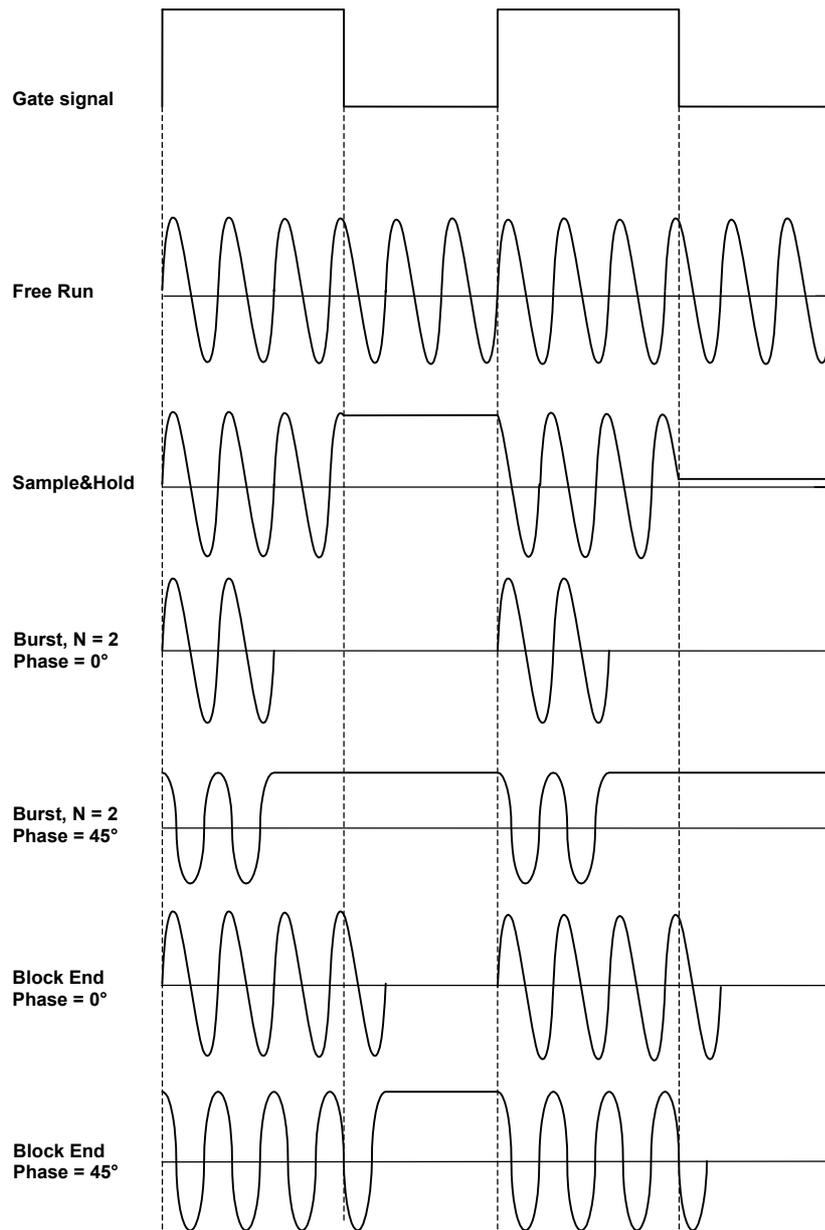
1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Select a trigger mode (↗ 6-150).
3. Switch the appropriate Sync output on (↗ 6-142).

Method at Periodical Signals

Initial situation

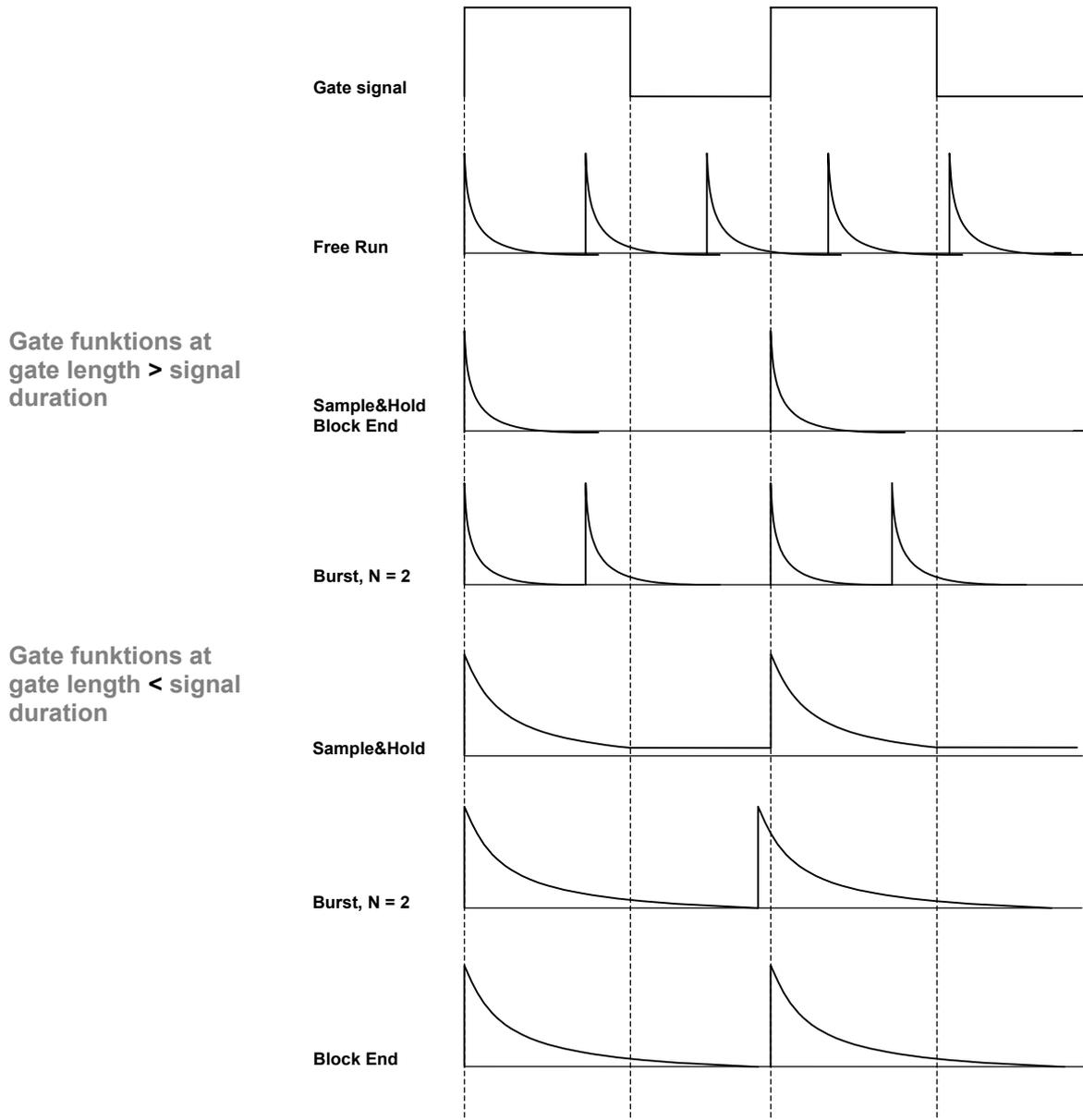
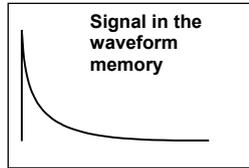


Gate functions



Method at Non-Periodical Signals

Initial situation



6.2.4.5.2 Setting the Gate Length

 Note

The  and  function keys are only available if the "Burst" gate function is switched off (↗ 6-163).

The  function key is only available if the  function key is not active (↗ below).

Application

In order to control the timing of the waveform output, you can set the gate opening time relative to the trigger event (↗ Figures, 6-158).

Setting the gate length

1. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed. The default setting is "100 ns".



2. Enter a new value (↗ 5-55).

The permissible entry range is:

$$100 \text{ ns} \leq \text{Gate Length} \leq 9999 \text{ s} \quad \text{in } 10 \text{ ns steps}$$

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

The new setting is stored.

Delivering a trigger signal to the Sync output

1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Select a trigger mode (↗ 6-150).
3. Switch the appropriate Sync output on (↗ 6-142).

6.2.4.5.3 Controlling the Gate via an External Trigger Signal

 Note

The  function key is only available if the "Burst" gate function is switched off (↗ 6-163).

Application

If an external trigger signal is present on the input connector [26], you can set the gate to match the time sequence of the external trigger signal.

Switch external gate control on/off

1. In the  submenu press the  function key.

The function key is highlighted. After switching on, the external trigger signal controls the gate opening.

2. In the  submenu press the  function key.

The function key is **no longer** highlighted and the external gate control is switched off.

Delivering a trigger signal to the Sync output

1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Select the "External" setting as the trigger mode (↗ 6-150).
3. Switch the appropriate Sync output on (↗ 6-142).

6.2.4.5.4 Selecting the Gate Polarity

Application

You can change the polarity of the gate signal to suit the application.

- **High**
The high state flags the active status of the gate signal. The polarity setting affects both the internally generated gate signal and the external gate signal alike.
- **Low**
The gate signal is logically inverted.

Selecting the polarity

1. In the  submenu press the  function key.

A selection field containing specified settings is displayed. The default setting is "High".



2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

The new setting is stored and the synchronization signal is delivered using the set polarity.

Delivering a trigger signal to the Sync output

1. Select the "Trigger" setting as the synchronization source (↗ 6-140).
2. Select a trigger mode (↗ 6-150).
3. Switch the appropriate Sync output on (↗ 6-142).

6.2.4.5.5 Configuring Burst Mode

 **Note** The  function key is only available if the "Burst" gate function is switched on (➤ 6-163).

Application You can enter the number of signal periods for a burst and start Burst mode (➤ Figures, 6-164 and 6-165).

Setting the burst periods

- In the  submenu press the  function key.
An entry field containing the currently applicable setting is displayed. The default setting is "1".



- Enter a new value (➤ 5-55).
The permissible entry range for the burst period is:

$$1 \leq \text{Burst Cycles} \leq 65535$$

- Press the **ENTER** key [5] to close the entry field.
The new setting is stored.

Switching Burst mode on/off

- In the  submenu press the  function key.
The function key is highlighted. After switching on, a burst is generated using the set number of signal periods.
- In the  submenu press the  function key.
The function key is **no longer** highlighted and Burst mode is switched off.

Delivering a trigger signal to the Sync output

- Select the "Trigger" setting as the synchronization source (➤ 6-140).
- Switch the appropriate Sync output on (➤ 6-142).

6.2.5 Loading User-Defined Waveforms (LOAD/SAVE Menu)

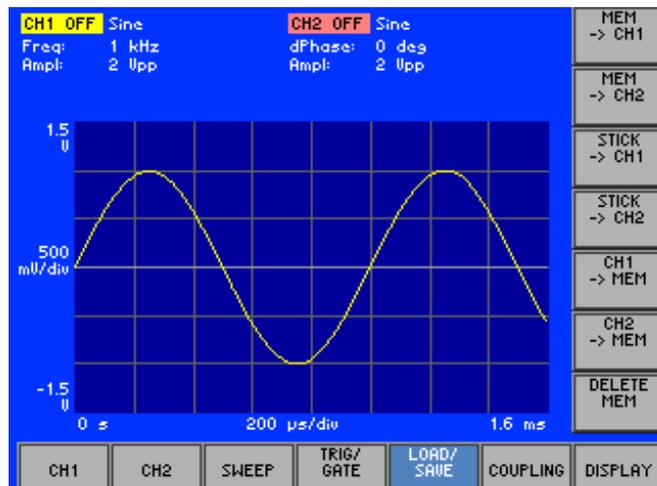
What the settings are for

You can use the LOAD/SAVE menu to load user-defined waveforms from the internal flash memory or an external USB stick into one of the channels CH1 and CH2. You can also store user-defined waveforms from channels CH1 and CH2 in the internal flash memory and delete stored waveforms from the memory.

Selecting the LOAD/SAVE menu

- Select the **LOAD/SAVE** menu with the aid of the **◀** or **▶** cursor key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|-----------------|---|-----------|
| MEM -> CH1 | Load waveform from the internal flash memory into channel CH1 | (↗ 6-170) |
| MEM -> CH2 | Load waveform from the internal flash memory into channel CH2 | (↗ 6-170) |
| STICK -> CH1 | Load waveform from the external USB stick into channel CH1 | (↗ 6-171) |
| STICK -> CH2 | Load waveform from the external USB stick into channel CH2 | (↗ 6-171) |
| CH1 -> MEM | Store waveform from channel CH1 in the internal flash memory | (↗ 6-172) |
| CH2 -> MEM | Store waveform from channel CH2 in the internal flash memory | (↗ 6-172) |
| DELETE MEM | Delete waveform from internal flash memory | (↗ 6-173) |

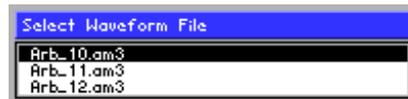
6.2.5.1 Loading a Waveform from the Internal Flash Memory into Channels

Application

Before you can set the **Arbitrary** waveform in one of the channels, you first need to load a user-defined waveform. The waveform can be stored in the internal flash memory or on an external USB stick (➤ 6-171).

Loading a waveform from the internal flash memory into channel CH1 or CH2

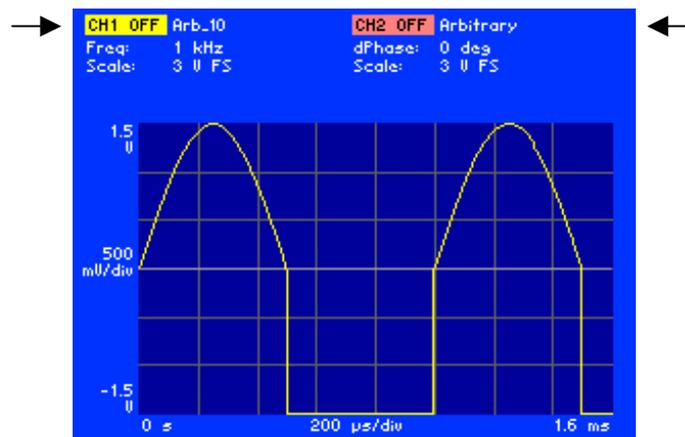
- In the **LOAD/SAVE** menu press the **MEM → CH1** or **MEM → CH2** function key.
A selection field containing specified files is displayed.



- Use the **rotary knob** [11] to select a file.
- Press the **ENTER key** [5] to close the selection field.

The user-defined waveform is loaded into channel CH1 or CH2. If you then select the **Arbitrary** waveform in channel CH1 or CH2 (➤ 6-72), the user-defined waveform is displayed.

Display



The currently set waveform is displayed beside the channel name CH1 or CH2 in the parameter field. A user-defined waveform is displayed together with its file name, e.g. for CH1 "Arb_10".

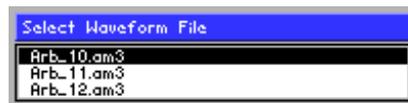
6.2.5.2 Loading a Waveform from the External USB Stick into Channels

Application

Before you can set the **Arbitrary** waveform in one of the channels, you first need to load a user-defined waveform. The waveform can be stored in the internal flash memory (➔ 6-170) or on an external USB stick.

Loading a waveform from the USB stick into channel CH1 or CH2

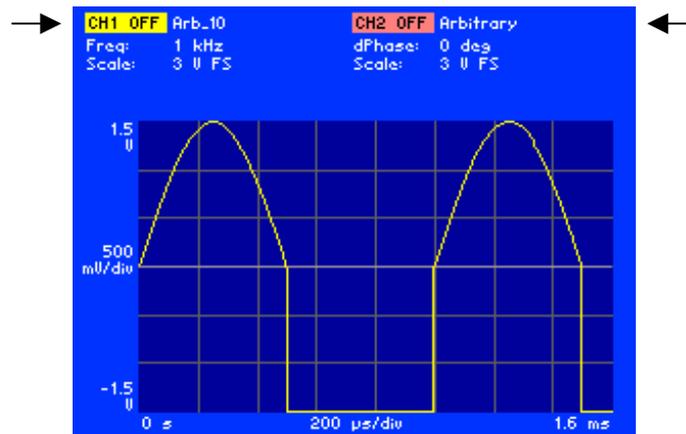
1. Plug the USB stick into the USB connector [20] on the rear panel.
2. In the **LOAD/SAVE** menu press the **STICK → CH1** or **STICK → CH2** function key.
A selection field containing specified files is displayed.



3. Use the **rotary knob** [11] to select a file.
4. Press the **ENTER** key [5] to close the selection field.

The user-defined waveform is loaded into channel CH1 or CH2. If you then select the **Arbitrary** waveform in channel CH1 or CH2 (➔ 6-72), the user-defined waveform is displayed.

Display



The currently set waveform is displayed beside the channel name CH1 or CH2 in the parameter field. A user-defined waveform is displayed together with its file name, e.g. for CH1 "Arb_10".

6.2.5.3 Storing a Waveform from the USB Stick in the Flash Memory

Application You can load user-defined waveforms from the USB stick into the internal flash memory. To do this you first need to load a waveform from the USB stick into one of the channels and then store the waveform from the channel concerned in the internal flash memory.

Loading a waveform 1. Load a user-defined waveform from the external USB stick into one of the channels (➔ 6-171).

Storing a waveform from CH1 or CH2 in the flash memory

2. In the  menu press the  or  **function key**.

An entry field for entering a file name is displayed. The default setting is the file name of the loaded waveform in the respective channel, e.g.:



3. Enter a new file name from the **numerical keys** [12] or from an external keyboard (➔ 3-42).

Note: Do you want to overwrite a file already is exists, the following message is displayed „The file already is exists. Do you want to overwrite this file?“.

4. Press the **ENTER key** [5] to store the waveform.

The user-defined waveform in channel CH1 or CH2 is stored in the internal flash memory and can be reloaded (➔ 6-170).

Note

If no user-defined waveform is loaded in channel CH1 (CH2), the message "No Arbitrary Waveform loaded in CH1 (CH2)" is displayed. Press the **ENTER key** [5] to acknowledge the message.

If the internal flash memory is full, the message "Insuficient memory space" is displayed. Press the **ENTER key** [5] to acknowledge the message. Delete a waveform from the internal flash memory and repeat the storage procedure.

The waveforms generated with the software Waveform Composer (R&S AM300-K2) are encoded. In order to read the waveform files (*.am3) with the R&S AM300, the instruments needs to be registered on a PC with a key-code. The key code is part of the optional software package R&S AM300-K2. Additional hints to create and load waveforms can be found in the software manual R&S AM300-K2 which is supplied with the CD-ROM.

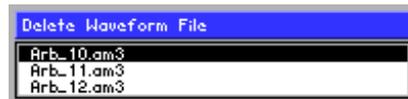
6.2.5.4 Deleting a Waveform from the Internal Flash Memory

Application

The size of the internal flash memory is limited. The R&S AM300 therefore allows you to delete files (user-defined waveforms) from the internal flash memory.

Deleting a waveform from the internal flash memory

1. In the  menu press the  function key.
A selection field containing specified files is displayed.



2. Use the **rotary knob** [11] to select a file.
3. Press the **ENTER key** [5] to close the selection field.

The following message is displayed:



4. Press the **ENTER key** [5] to delete the file.

Note: If you would rather not delete the user-defined waveform, press the **ESC/CANCEL key** [4].

6.2.6 Setting Dependences between the Channels (COUPLING Menu)

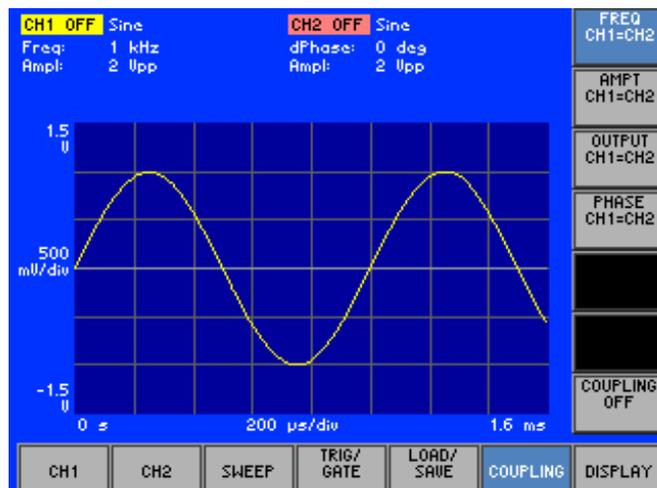
What the settings are for

You can use the COUPLING menu to couple channel CH2 to certain settings that apply to channel CH1. The settings which can be coupled are the channel parameters affecting frequency, phase, amplitude and output.

Selecting the COUPLING menu

- Select the **COUPLING** menu with the aid of the **◀** or **▶** cursor key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|-------------------|---|-----------|
| FREQ CH1=CH2 | Switch frequency coupling on/off | (↗ 6-175) |
| AMPT CH1=CH2 | Switch amplitude coupling on/off | (↗ 6-175) |
| OUTPUT CH1=CH2 | Switch output coupling on/off | (↗ 6-175) |
| PHASE CH1=CH2 | Switch phase coupling on/off | (↗ 6-175) |
| COUPLING OFF | Switch off all coupling in channels CH1 and CH2 | (↗ 6-175) |

6.2.6.1 Switching Coupling On/Off

Note

The frequency coupling of channels CH1 and CH2 is part of the factory instrument setting and is necessary in order to use the R&S AM300 for executing modulation (↗ 6-112) and frequency sweeping (↗ 6-145).

Application

If you want certain settings that are valid for channel CH1 also to apply to channel CH2, you can create coupling between both channels. Parameters that can be coupled are:

- **Frequency** (↗ 6-75):

FREQ

- **Amplitude** (↗ 6-77):

U_{pp}, U₊, U₋, U_{inf}, U₀, U_p, SCALING, DC OFFSET

- **Output** (↗ 6-134):

CH1=CH1+CH2, FILTER SEL, OUTPUT FILTER ON, CH1 ON

- **Phase** (↗ 6-98):

START PHASE

Switching a particular coupling on/off

1. In the **COUPLING** menu press one of these **function keys**:

FREQ CH1=CH2
AMPT CH1=CH2
OUTPUT CH1=CH2
PHASE CH1=CH2

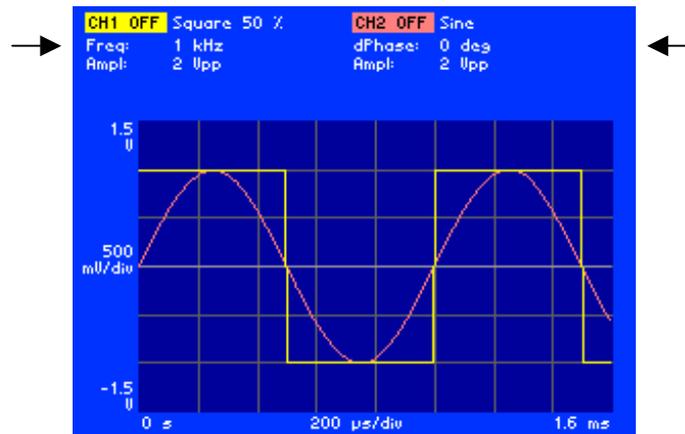
The function key concerned is highlighted and the appropriate settings in channel CH1 also apply to channel CH2.

2. In the **COUPLING** menu press one of these **function keys**:

FREQ CH1=CH2
AMPT CH1=CH2
OUTPUT CH1=CH2
PHASE CH1=CH2

The function key concerned is **no longer** highlighted and the coupling concerned is switched off. The respective settings in channel CH1 are still active in channel CH2. However, you can once more set the parameters individually in each channel.

Display in the case
of frequency
coupling



In the case of frequency coupling the currently applicable output frequency is displayed below the channel name CH1 in the parameter field, e.g. "Freq: 1 kHz", and the currently applicable start phase is displayed below the channel name CH2, e.g. "dPhase: 0 deg".

When frequency coupling is switched off, the currently applicable output frequency of the channel is again displayed below the channel name CH2.

Dependences in the
case of frequency
coupling

When channel frequency coupling is switched on and off, the R&S AM300 is reconfigured. This leads to differences in the availability of certain functions .

Frequency coupling switched **on** (default setting):

- **Square Low Jitter** waveform available only in both channels at the same time
- **Pulse** waveform can be set in both channels, but must have the same pulse width

Frequency coupling switched **off**:

- Different frequencies can be set in the channels. Note that there is no rigid phase coupling
- Modulation mode and Sweep mode are not available
- Different pulse widths may be set for the **Pulse** waveform
- "Sample Accurate" Arbitrary mode is available in CH1 only
- **Square Low Jitter** waveform is available in CH1 only, but may be combined with other waveforms in CH2

Switching all
coupling off

- In the **COUPLING** submenu press the **COUPLING OFF** function key.

Every coupling in channels CH1 and CH2 is switched off including frequency coupling. The respective settings in channel CH1 are still active in channel CH2. However, you can once more set the parameters individually in each channel.

6.2.7 Screen Settings (DISPLAY Menu)

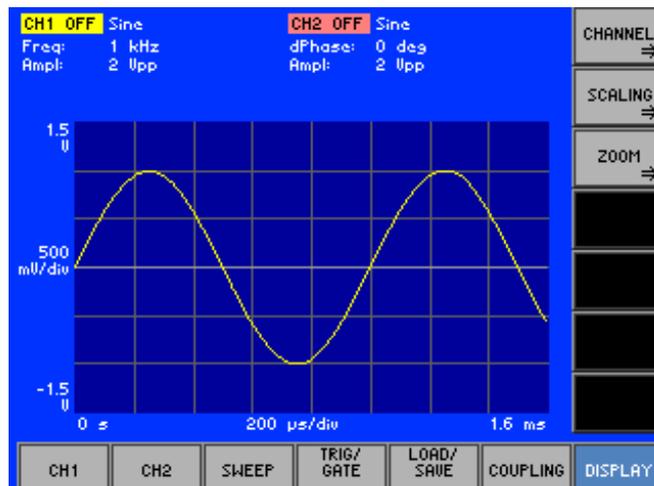
What the settings are for

You can use the DISPLAY menu to select different settings for the appearance of waveforms on the screen. You can change the display of the currently set waveforms, the scaling of the diagram area and the size of the screen window.

Selecting the DISPLAY menu

- Select the **DISPLAY** menu with the aid of the ◀ or ▶ cursor key.

The menu name is highlighted and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|---|---|-----------|
|  | Open submenu: Display waveforms | (↗ 6-178) |
|  | Open Submenu: Scaling of diagram area | (↗ 6-181) |
|  | Open submenu: Zoom the screen window | (↗ 6-186) |

6.2.7.1 Displaying Waveforms

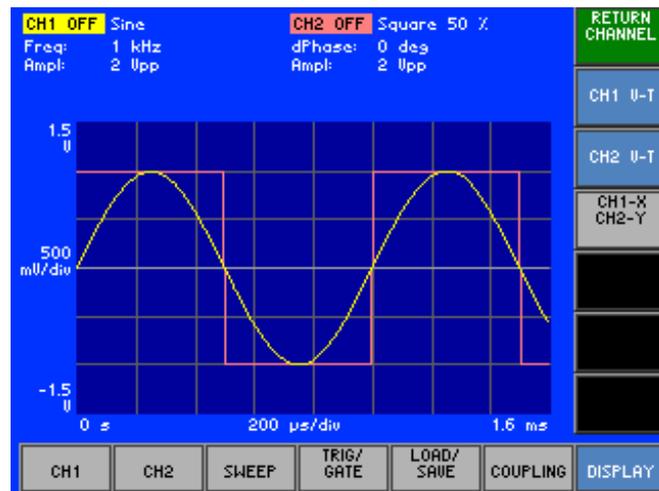
What the settings are for

You can use the CHANNEL submenu to set which of the channels CH1 and/or CH2 must be displayed. In addition the amplitude values of the waveforms from CH1 and CH2 can be displayed orthogonally in a diagram.

Selecting the CHANNEL submenu

- In the **DISPLAY** menu press the **CHANNEL** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|-----------------------|--|-----------|
| RETURN CHANNEL | Exit submenu | |
| CH1 U-T | Switch channel CH1 display on/off | (↗ 6-179) |
| CH2 U-T | Switch channel CH2 display on/off | (↗ 6-179) |
| CH1-X CH2-Y | Switch on display of voltage values from CH1 and CH2 | (↗ 6-180) |

6.2.7.1.1 Displaying Channels CH1 and/or CH2

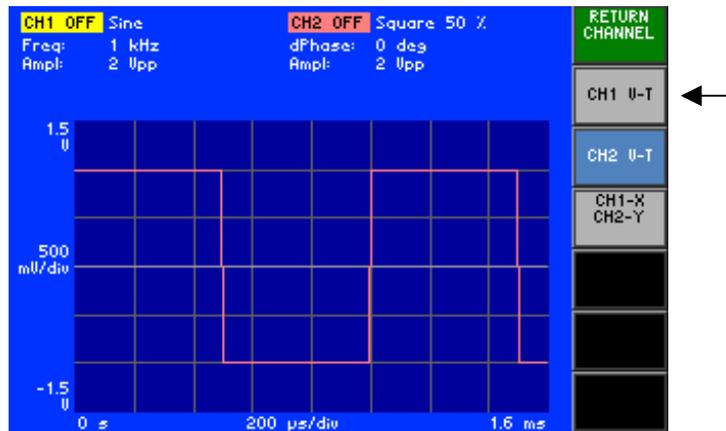
Application

The currently set waveforms for channels CH1 and CH2 can be displayed individually or together as a voltage/time function. After switching on the R&S AM300, channel display is switched on.

Switching off the display of channels CH1 or CH2

- In the CHANNEL submenu press the CH1 U-T or CH2 U-T function key.

The function key is no longer highlighted and the waveform of the channel concerned is hidden, e.g. CH1:

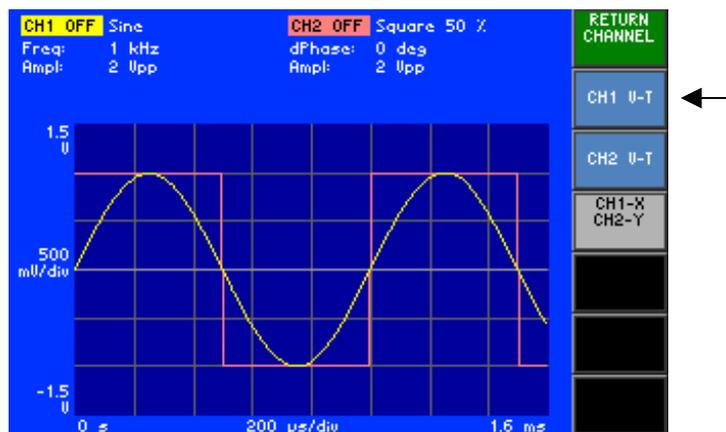


Note: Only one waveform at a time (CH1 or CH2) can be hidden.

Switching on the display of channels CH1 and/or CH2

- In the CHANNEL submenu press the CH1 U-T and/or CH2 U-T function key.

The function key concerned is highlighted and the waveform of the channel is displayed, e.g. CH1:



6.2.7.1.2 Displaying Channel Amplitude Values Orthogonally

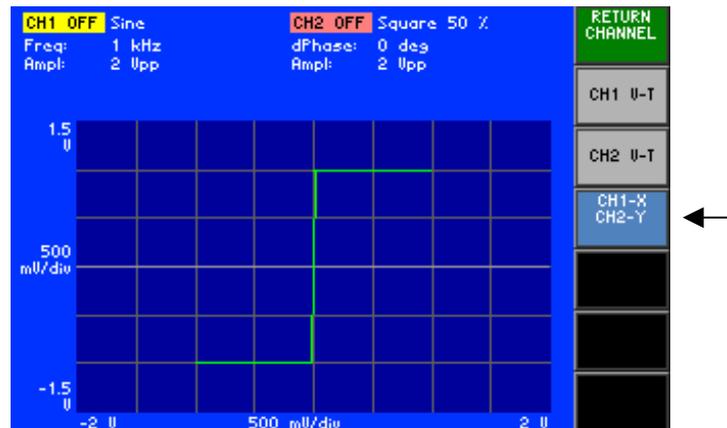
Application

You can arrange to display the amplitude values of the waveforms from CH1 and CH2 in a diagram as a voltage/voltage function plotted against the X and Y axes.

Switching on the orthogonal display of CH1 and CH2 amplitude values

1. In the CHANNEL → submenu press the CH1-X CH2-Y function key.

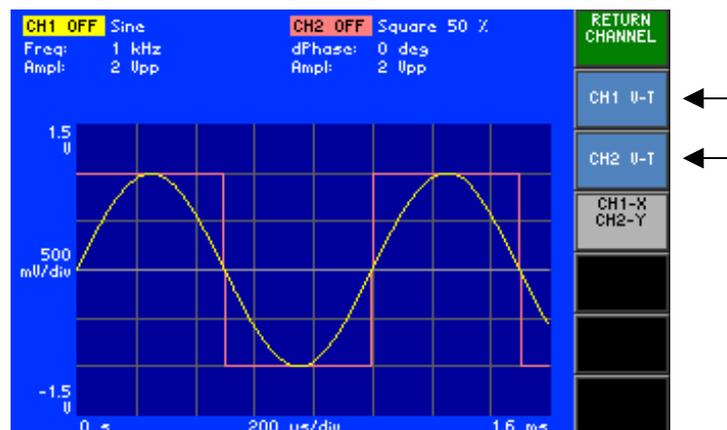
The function key is highlighted and amplitude values of the CH1 and CH2 waveforms are displayed as a voltage/voltage function.



Switching off the orthogonal display

2. In the CHANNEL → submenu press the CH1 U-T and/or CH2 U-T function key.

The "CH1 X CH2 Y" function key is **no longer** highlighted and the waveform of the selected channel is displayed as a voltage/time function, e.g. CH1 and CH2:



6.2.7.2 Scaling the Diagram Area

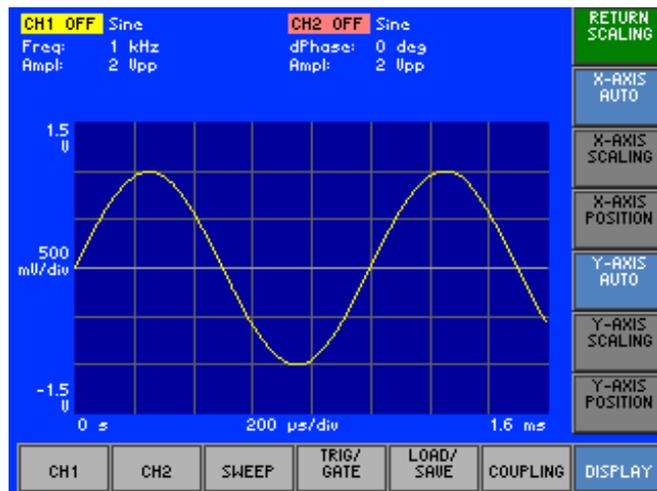
What the settings are for

You can use the SCALING submenu to scale the X and Y axes in the diagram area manually or automatically. You can also shift the origin of the coordinates in the diagram area.

Selecting the SCALING menu

- In the **DISPLAY** menu press the **SCALING** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|-----------------------|------------------------------|-----------|
| RETURN SCALING | Exit submenu | |
| X-AXIS AUTO | Scale X axis automatically | (↗ 6-182) |
| X-AXIS SCALING | Scale X axis manually | (↗ 6-182) |
| X-AXIS POSITION | Set starting value of X axis | (↗ 6-182) |
| Y-AXIS AUTO | Scale Y axis automatically | (↗ 6-184) |
| Y-AXIS SCALING | Scale Y axis manually | (↗ 6-184) |
| Y-AXIS POSITION | Set starting value of Y axis | (↗ 6-184) |

Note

The **X-AXIS SCALING** and **X-AXIS POSITION** function keys are only available if the AUTO function is switched off (↗ 6-182).

The **Y-AXIS AUTO** and **Y-AXIS POSITION** function keys are only available if the AUTO function is switched off (↗ 6-182).

6.2.7.2.1 Scaling the X Axis



Note

The **X-AXIS SCALING** and **X-AXIS POSITION** function keys are only available if the AUTO function is switched off (↗ below).

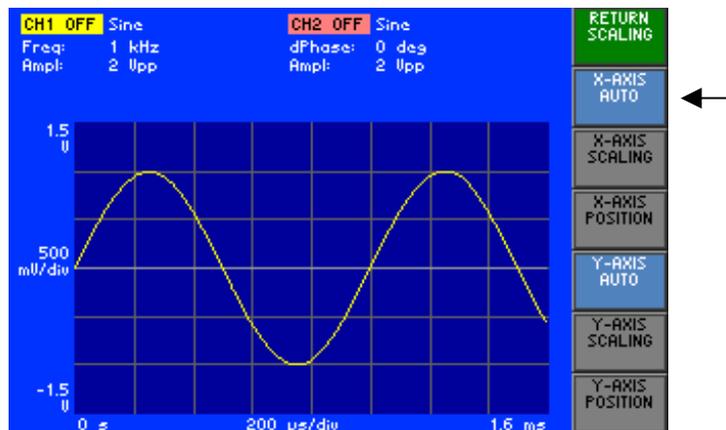
Application

You can reduce or increase the scaling of the X axis and set the X axis starting value. In so doing you define the visible time range.

In the AUTO function the R&S AM300 sets the X axis automatically. In the case of periodic waveforms a period is then displayed across the whole diagram area. After switching on the R&S AM300, the AUTO function is active.

Scaling the X axis automatically

- In the **SCALING** submenu press the **X-AXIS AUTO** function key.
The function key is highlighted and the X axis is automatically scaled.



Switching the AUTO function off

- In the **SCALING** submenu press the **X-AXIS AUTO** function key.
The function key is **no longer** highlighted. The AUTO function is switched off and the function keys for manually scaling the X axis are available.

Scaling the X axis manually

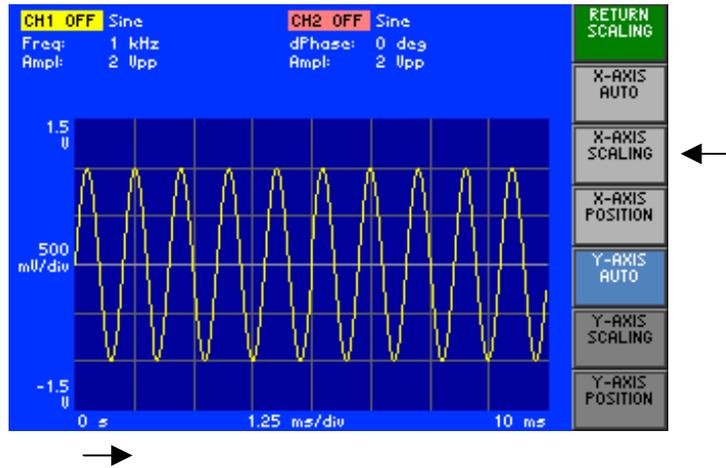
- In the **SCALING** submenu press the **X-AXIS SCALING** function key.
An entry field containing the currently applicable setting is displayed.



- Enter a new value (↗ 5-55).
The permissible entry range is:

$$8 \text{ ns} \leq \text{T-Axis Scaling} \leq 100000 \text{ s} \quad \text{in 1 ns steps}$$

The X axis is re-scaled. The new time range defines the right and left limits of the diagram area. The scale value of the vertical grid lines is recalculated and displayed, e.g. T-Axis Scaling = 10 ms:



Setting the starting value of the X axis

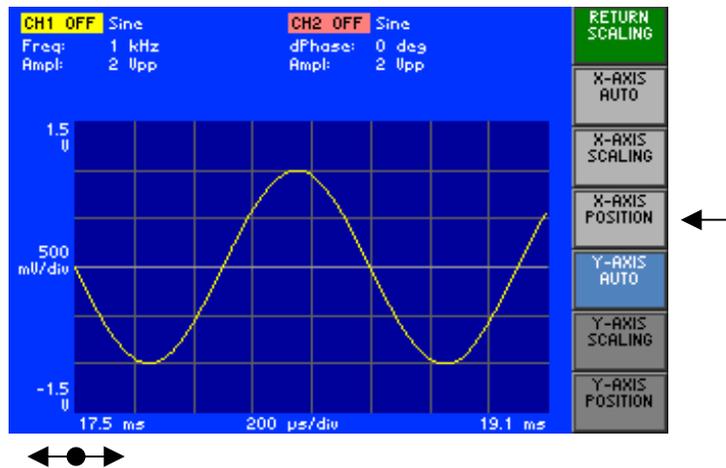
- In the **SCALING** submenu press the **X-AXIS POSITION** function key.
An entry field containing the currently applicable setting is displayed.



- Enter a new value (↗ 5-55).
The permissible entry range is:

$$-200000 \text{ s} \leq \text{T-Axis Position} \leq +200000 \text{ s in 1 ns steps}$$

The visible time range is shifted. The new starting value defines the left limit of the display diagram. The final value of the X axis is recalculated and displayed, e.g. T-Axis Position = 17.5 ms:



Note

You can use the AUTO function to shift the X axis back into a defined display range (↗ 6-182).

6.2.7.2.2 Scaling the Y Axis

 Note

The  and  function keys are only available if the AUTO function is switched off (↗ below).

Application

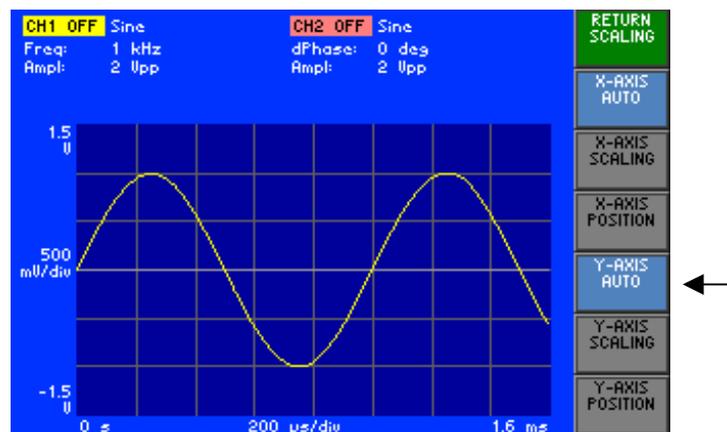
The level range is divided by a line of symmetry (0 V). Above this line the values are displayed as positive and below this line the values are displayed as negative. You can reduce or increase the Y axis scaling and shift the Y axis line of symmetry. In so doing you define the visible level range.

In the AUTO function the R&S AM300 sets the Y axis automatically. The maximum amplitude of the waveform (U_{pp}) is then displayed across the whole diagram area. After switching on the R&S AM300, the AUTO function is active.

Scaling the Y axis automatically

1. In the  submenu press the  function key.

The function key is highlighted and the Y axis is scaled automatically.



Switching the AUTO function off

2. In the  submenu press the  function key.

The function key is **no longer** highlighted. The AUTO function is switched off and the function keys for manually scaling the Y axis are available.

Scaling the Y axis manually

1. In the  submenu press the  function key.

An entry field containing the currently applicable setting is displayed .

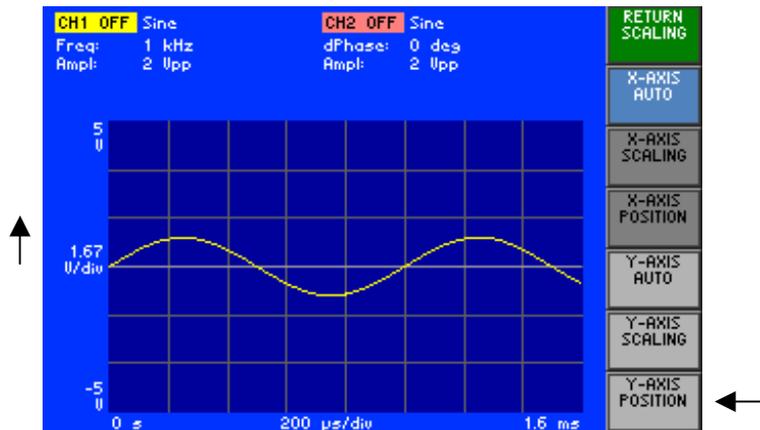


2. Enter a new value (↗ 5-55).

The permissible entry range is:

$$100 \text{ mV} \leq \text{Y-Axis Scaling} \leq 30 \text{ V} \quad \text{in } 100 \text{ mV steps}$$

The Y axis is re-scaled. The new level range defines the upper and lower limits of the display diagram. The line of symmetry (0 V) stays in the middle. The scale value of the horizontal grid lines is recalculated and displayed, e.g. Y-Axis Scaling = 10 V:



Setting the starting value of the Y axis

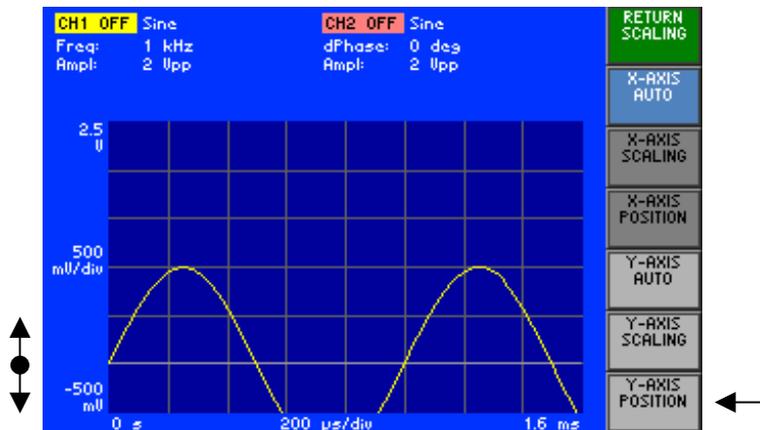
1. In the **SCALING** submenu press the **Y-AXIS POSITION** function key.
An entry field containing the currently applicable setting is displayed .



2. Enter a new value (↗ 5-55).
The permissible entry range is:

$$-60 \text{ V} \leq \text{Y-Axis Position} \leq +60 \text{ V} \quad \text{in } 100 \text{ mV steps}$$

The visible level range (and line of symmetry) are shifted. The new starting value defines the lower limit of the display diagram. The final value of the Y axis is recalculated and displayed, e.g.
Y-Axis Position = 1 V:



Note

You can use the AUTO function to shift the Y axis back into a defined display range (↗ 6-184).

6.2.7.3 Zooming the Screen Window

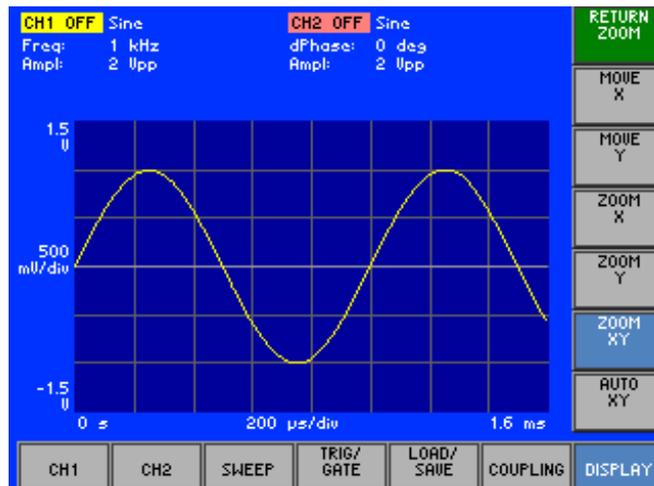
What the settings are for

Selecting the ZOOM menu

You can use the ZOOM submenu to move the current screen window within the diagram area and zoom in and out.

- In the **DISPLAY** menu press the **ZOOM** function key.

The submenu is opened and the function keys [13] are assigned the appropriate function.



Function key assignment

| | | |
|--------------------|--|-----------|
| RETURN ZOOM | Exit submenu | |
| MOVE X | Move screen window in X direction | (↗ 6-187) |
| MOVE Y | Move screen window in Y direction | (↗ 6-187) |
| ZOOM X | Zoom screen window in/out in X direction | (↗ 6-188) |
| ZOOM Y | Zoom screen window in/out in Y direction | (↗ 6-188) |
| ZOOM XY | Zoom screen window in/out in X/Y direction | (↗ 6-188) |
| AUTO XY | Automatically scale X/Y axis | (↗ 6-187) |

6.2.7.3.1 Moving the Screen Window

Application

If you wish to view a particular part of a waveform, you can move the current screen window in the X/Y direction and then zoom in or out (➤ 6-188).

The maximum display range is:

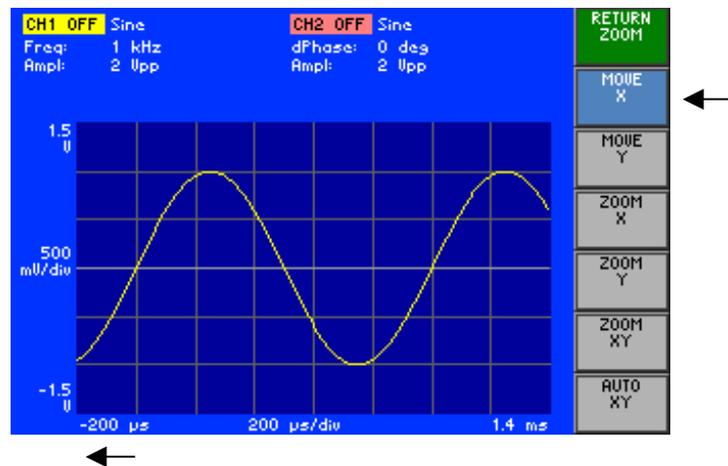
in the X direction: 100000 s

in the Y direction: ± 15 V

Moving in the X direction

1. In the **ZOOM** ➤ menu press the **MOVE X** function key.
2. Turn the **rotary knob** [11] to the **left** or **right**.

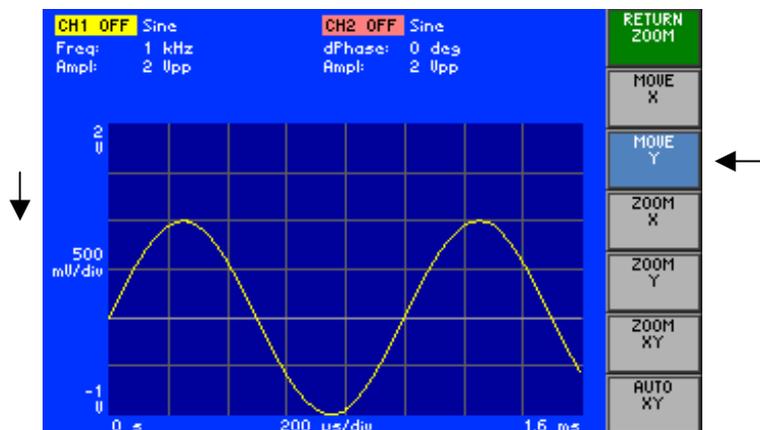
The screen window moves to the **left** or **right** for the space of two grid lines, e.g. to the left:



Moving in the Y direction

1. In the **ZOOM** ➤ menu press the **MOVE Y** function key.
2. Turn the **rotary knob** [11] to the **left** or **right**.

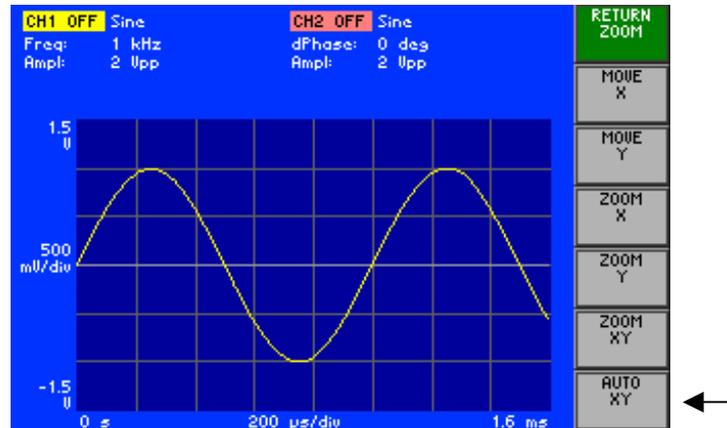
The screen window moves **down** or **up** for the space of one grid lines, e.g. down:



Resetting the diagram area

- In the **ZOOM** menu press the **AUTO XY** function key.

The function keys are **no longer** highlighted and the X/Y axis is automatically scaled.



6.2.7.3.2 Zooming the Screen Window In/Out

Application

If you wish to view a particular part of a waveform, you can move the current screen window in the X/Y direction (↗ 6-187) and then zoom in or out.

The maximum zoom range is:

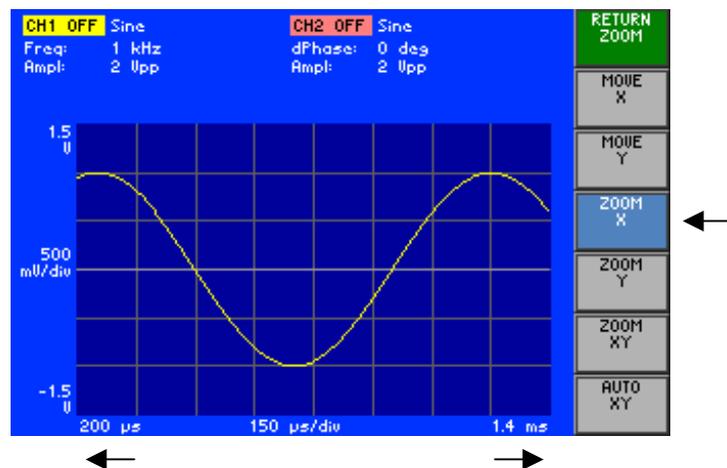
in the X direction: $800 \mu\text{s} \leq \text{X Axis} \leq 100000 \text{ s}$

in the Y direction: $\pm 50 \text{ mV} \leq \text{Y Axis} \leq \pm 15 \text{ V}$

Zooming in/out in the X direction only

- In the **ZOOM** menu press the **ZOOM X** function key.
- Turn the **rotary knob** [11] to the **left** or **right**.

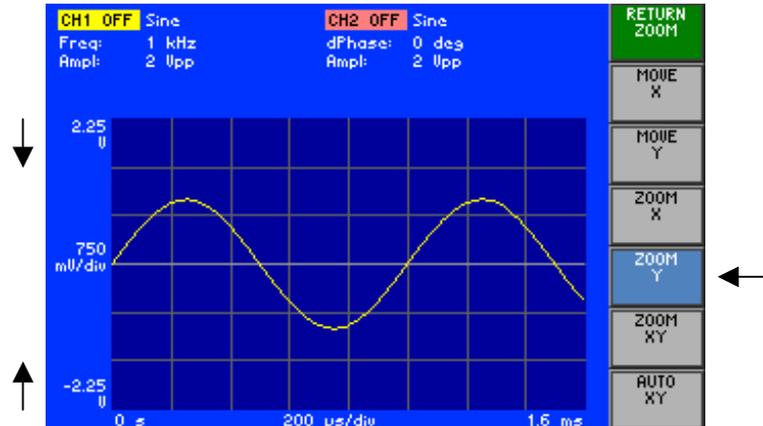
The screen window zooms symmetrically **in** or **out** in the **X** direction by 150 %, e.g. zooming out:



Zooming in/out in the Y direction only

1. In the **ZOOM** menu press the **ZOOM Y** function key.
2. Turn the rotary knob [11] to the left or right.

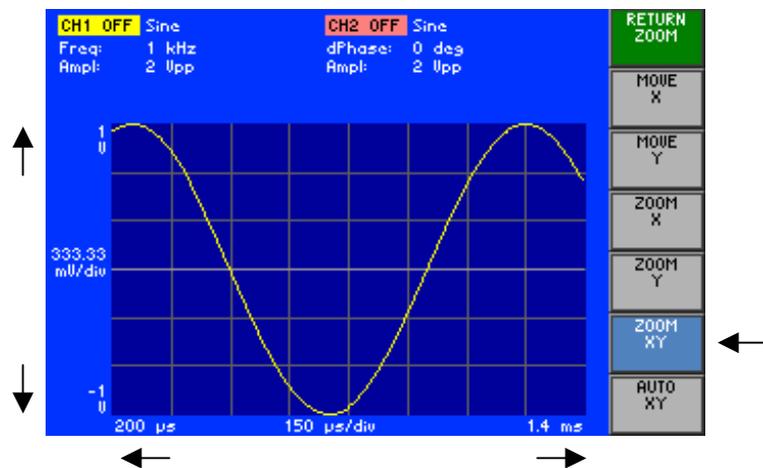
The screen window zooms symmetrically in or out in the Y direction by 150 %, e.g. zooming in:



Zooming in/out in the X/Y direction

1. In the **ZOOM** menu press the **ZOOM XY** function key.
2. Turn the rotary knob [11] to the left or right.

The screen window zooms symmetrically in or out in the X/Y direction by 150 %, e.g. zooming out:



Resetting the diagram area

- In the **ZOOM** menu press the **AUTO XY** function key.

The function keys are **no longer** highlighted and the X/Y axis is automatically scaled (↗ 6-188).

6.3 SYSTEM Functions (SYS Key)

Introduction

The R&S AM300 has system and service functions as well as generator 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 AM300 and the system settings configured. Furthermore, the R&S AM300 switched over from remote control to local mode.

Switching over the user interface

When the R&S AM300 has been switched on and the selftest has run without detecting any faults, the arbitrary and function generator's user interface is activated.

1. Press the **SYS key** [3].

The curve 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 [13]. 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 arbitrary and function generator's user interface is activated again.

Press the **ESC/CANCEL key** [4].

The **old** settings are retained and the arbitrary and function generator's user interface is activated again.

Menus for system and service functions

| | | |
|---------|--|-----------|
| PRESET | Selects and calls the instrument's default setting | (↗ 6-191) |
| STATUS | Displays the current instrument settings | (↗ 6-200) |
| FILE | Saves and loads user-defined settings | (↗ 6-200) |
| CONFIG | System settings | (↗ 6-204) |
| SERVICE | Service functions | (↗ 6-214) |
| INFO | System information | (↗ 6-215) |

6.3.1 Instrument Default Setting (Menu PRESET)

What the settings are for

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

Selecting the PRESET menu

1. Press the **SYS key** [3].
2. Select the menu  with the ◀ or ▶ **cursor key** [6].

The menu name is highlighted and the appropriate functions are assigned to the function keys [13].



Function key assignment



Calls an instrument default setting

(↗ 6-192)



Selects an instrument default setting

(↗ 6-192)

6.3.1.1 Selecting and Calling the Instrument Default Setting

Use

When you switch on the R&S AM300, those settings that were valid when the R&S AM300 was last switched off are restored.

The R&S AM300 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 (↗ 6-201).
2. Select the menu  with the ◀ or ▶ **cursor key** [6].

A table containing the available settings is displayed. The current setting is marked with the sign x.

| Factory x | |
|-----------|------------------------------|
| SAVE1 | Factory |
| SAVE2 | Factory |
| SAVE3 | Factory |
| SAVE4 | Factory |
| SAVE5 | user saved ; 11/26/03 11:57A |
| SAVE6 | Factory |
| SAVE7 | Factory |
| SAVE8 | Factory |

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).

| FACTORY x | |
|-----------|------------------------------|
| SAVE 1 | Factory |
| SAVE 2 | Factory |
| SAVE 3 | Factory |
| SAVE 4 | Factory |
| SAVE 5 | user saved ; 11/26/03 11:57A |
| SAVE 6 | Factory |
| SAVE 7 | Factory |
| SAVE 8 | Factory |
| SAVE 9 | Factory |
| SAVE10 | Factory |
| SAVE11 | Factory |

4. Press the **function key** .

The setting is defined to be the instrument default setting and is marked with the sign x.

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

The current instrument default setting is loaded and the SYS menu is leaved. The arbitrary and function generator's user interface is activated again.

Activating the instrument default setting

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)

What the settings are for

Selecting the 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 signal generators parameters and the current settings are listed in a table.



Explanation of parameters

| | | |
|-----------|---|-----------|
| CH 1 | Display of waveform settings in channel CH1 | (↗ 6-194) |
| CH 2 | Display of waveform settings in channel CH2 | (↗ 6-195) |
| MOD 1 | Display of modulation settings in channel CH1 | (↗ 6-196) |
| MOD 2 | Display of modulation settings in channel CH2 | (↗ 6-197) |
| TRIG/GATE | Display of trigger settings | (↗ 6-198) |
| SWEEP | Display of sweep settings | (↗ 6-199) |

6.3.2.1 Waveform Settings in Channel CH1

Application

If you wish to see all the waveform settings for channel CH1 at a glance, you can have the parameters clearly displayed for you together with their current settings.

Displaying waveform settings

- In the **STATUS** menu press the **CH 1** function key.

All the parameters are listed in a table showing their current settings.

| Waveform | Square |
|----------------|-----------|
| Frequency | 1 kHz |
| Pulse Width | 200.00 µs |
| Period | 1.000 ns |
| Start Phase | 0.00 deg |
| Symmetry | 100.0 |
| Rect Duty | 50.0 |
| Range Hold | OFF |
| Upp | 2.000 V |
| DC Offset | 0 nV |
| Output Load | 50 Ohm |
| Upper Limit | 5.000 V |
| Lower Limit | -5.000 V |
| Filter | Auto |
| Output Filter | Auto |
| Arbitrary Mode | Normal |
| Sample Rate | 100 MHz |
| Sample Count | 16 |
| Signal Output | OFF |

Meaning of the parameters

| | | |
|-------------------|---|-----------|
| Waveform | Waveform | (↗ 6-72) |
| Frequency | Signal frequency | (↗ 6-75) |
| Pulse Width | Pulse length (for Pulse waveform) | (↗ 6-108) |
| Period | Pulse period (for Pulse waveform) | (↗ 6-108) |
| Start Phase | Start phase | (↗ 6-98) |
| (Phase Deviation) | Phase deviation of the waveforms in the channels (for CH2 only) | |
| Symmetry | Symmetry (for Triangle waveform) | (↗ 6-102) |
| Rect Duty | Duty cycle (for Square waveform) | (↗ 6-104) |
| DC Offset | DC component | (↗ 6-81) |
| Output Load | Terminating impedance entered | (↗ 6-136) |
| Upper Limit | Upper limit of output voltage | (↗ 6-83) |
| Lower Limit | Lower limit of output voltage | (↗ 6-83) |
| Filter | Anti-aliasing filter | (↗ 6-137) |
| Output Filter | Status of the output filter | (↗ 6-138) |
| Arbitrary Mode | Arbitrary mode (for Arbitrary waveform) | (↗ 6-110) |
| Sample Rate | Sample frequency (for Arbitrary waveform) | (↗ 6-110) |
| Sample Count | Number of samples (for Arbitrary waveform) | |
| Signal Output | Status of the signal output | (↗ 6-143) |

6.3.2.2 Waveform Settings in Channel CH2

Application

If you wish to see all the waveform settings for channel CH2 at a glance, you can have the parameters clearly displayed for you together with their current settings.

Displaying waveform settings

- In the **STATUS** menu press the **CH 2** function key.

All the parameters are listed in a table showing their current settings.

| SYS-Menu | | CH 1 |
|-----------------|----------------|---------------|
| Waveform | Range | CH 2 |
| Frequency | 1 kHz | MOD 1 |
| Pulse Width | 200.00 μ s | MOD 2 |
| Period | 1.000 ns | TRIG/ GATE |
| Start Phase | 0.00 deg | SWEEP |
| Phase Deviation | 0.00 deg | |
| Symmetry | 50.0 | |
| Rect Duty | 50.0 | |
| Range Hold | OFF | |
| Upp | 2.000 V | |
| DC Offset | 0.000 V | |
| Output Load | 50 Ohm | |
| Upper Limit | 5.000 V | |
| Lower Limit | -5.000 V | |
| Filter | Auto | |
| Output Filter | Auto | |
| Arbitrary Mode | Normal | |
| Sample Rate | 100 MHz | |
| Sample Count | 16 | |
| Signal Output | OFF | |
| PRESET | STATUS | FILE |
| | | CONFIG |
| | | SERVICE |
| | | INFO |

Meaning of the parameters

(∇ Waveform Settings in Channel CH1, 6-194)

6.3.2.3 Modulation Settings in Channel CH1

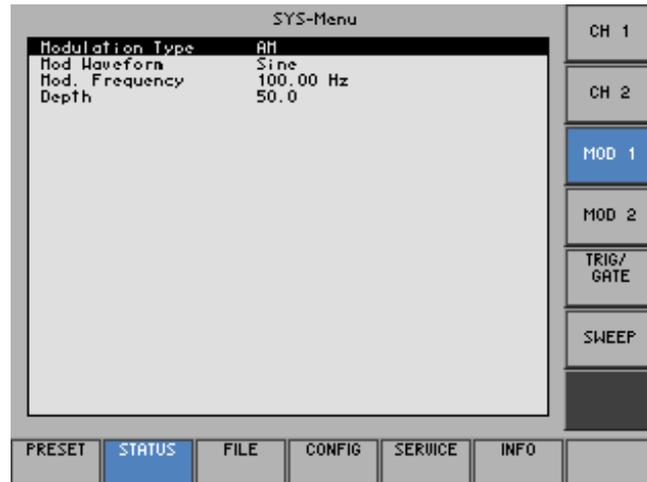
Application

If you wish to see all the modulation settings for channel CH1 at a glance, you can have the parameters clearly displayed for you together with their current settings.

Displaying modulation settings

- In the **STATUS** menu press the **MOD 1** function key.

All the parameters are listed in a table showing their current settings.



Meaning of the parameters

| | | |
|------------------------|---|------------------|
| Modulation Type | Modulation mode | (↗ 6-112) |
| Mod. Waveform | Modulation signal as a function of modulation mode | (↗ 6-112) |
| Mod. Frequency | Modulation frequency as a function of modulation mode | (↗ 6-112) |
| Depth | Modulation depth (for AM) | (↗ 6-116) |
| Deviation | Frequency deviation (for FM) | (↗ 6-120) |
| Phase | Phase deviation (for PM) | (↗ 6-124) |
| Shift | Frequency/phase deviation (for FSK/PSK) | (↗ 6-128, 6-132) |

6.3.2.4 Modulation Settings in Channel CH2

Application

If you wish to see all the modulation settings for channel CH2 at a glance, you can have the parameters clearly displayed for you together with their current settings.

Displaying modulation settings

- In the **STATUS** menu press the **MOD 2** function key.

All the parameters are listed in a table showing their current settings.



Meaning of the parameters

(↗ Modulation Settings in Channel CH1, 6-196)

6.3.2.5 Trigger Settings

Application

If you wish to see all the trigger settings at a glance, you can have the parameters clearly displayed for you together with their current settings.

Displaying trigger settings

- In the **STATUS** menu press the **TRIG/GATE** function key.

All the parameters are listed in a table showing their current settings.



Meaning of the parameters

| | | |
|---------------------------|---|-----------|
| Trigger Source | Trigger mode | (↗ 6-157) |
| Trigger Polarity | Trigger edge | (↗ 6-159) |
| Trigger Delay | Trigger delay | (↗ 6-159) |
| Int. Trigger Per. | Period of internal trigger generator | (↗ 6-160) |
| Int. Trigger Freq. | Frequency of internal trigger generator | (↗ 6-160) |
| Gate Function | Gate function | (↗ 6-163) |
| Gate Source | Gate via external trigger signal (for "Burst" trigger mode) | (↗ 6-166) |
| Gate Length | Gate length (for "Burst" trigger mode) | (↗ 6-166) |
| Burst Cycles | Burst periods (for "Burst" trigger mode) | (↗ 6-168) |
| Sync 1 State | Status of synchronization output A | (↗ 6-142) |
| Sync 1 Source | Source of synchronization output A | (↗ 6-140) |
| Sync 1 Polarity | Polarity of synchronization output A | (↗ 6-142) |
| Sync 2 State | Status of synchronization output B | (↗ 6-142) |
| Sync 2 Source | Source of synchronization output B | (↗ 6-140) |
| Sync 2 Polarity | Polarity of synchronization output B | (↗ 6-142) |

6.3.2.6 Sweep Settings

Application

If you wish to see all the sweep settings at a glance, you can have the parameters clearly displayed for you together with their current settings.

Displaying sweep settings

- In the **STATUS** menu press the **SWEEP** function key.

All the parameters are listed in a table showing their current settings.



Meaning of the parameters

| | | |
|-------------------------|--------------------------------|-----------|
| Sweep State | Status of the sweep | (↗ 6-154) |
| Start Frequency | Starting frequency | (↗ 6-149) |
| Stop Frequency | Stopping frequency | (↗ 6-149) |
| Center Frequency | Center frequency | (↗ 6-148) |
| Span Frequency | Frequency range | (↗ 6-148) |
| Marker State | Status of the frequency marker | (↗ 6-153) |
| Marker Frequency | Marker frequency | (↗ 6-153) |
| Sweep Spacing | Sweep scaling | (↗ 6-151) |
| Sweep Time | Sweep time | (↗ 6-151) |

6.3.3 User-Defined Settings (FILE Menu)

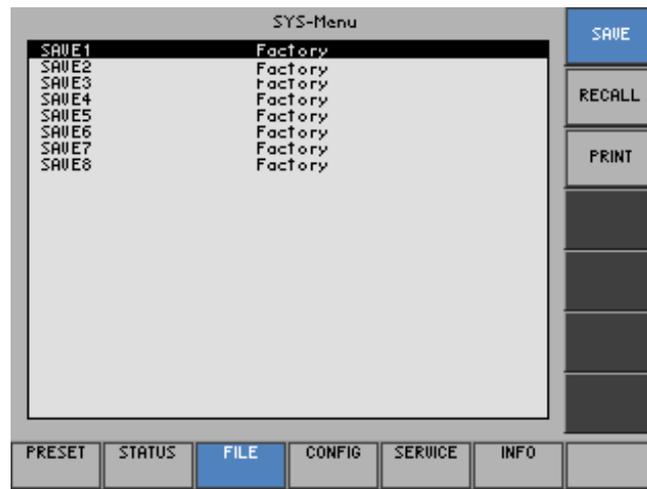
What the settings are for

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 [13].



Function key assignment

| | | |
|---|------------------------------|-----------|
|  | Saves a user-defined setting | (↗ 6-201) |
|  | Loads a user-defined setting | (↗ 6-201) |
|  | Prints out a screenshot | (↗ 6-203) |

6.3.3.1 Saving and Loading User-Defined Settings

Use

When you switch on the R&S AM300, those settings that were valid when the R&S AM300 was last switched off are restored.

The R&S AM300 also lets you save and load user-defined settings.

You can save 8 different settings (SAVE 1 to 8). When the R&S AM300 is delivered, the factory settings (Factory) are loaded in the SAVE memory locations.

Saving user-defined settings

1. Set up the R&S AM300 for the measurement you want to perform (➤ 6-71).

2. Press the **SAVE** function key in the **FILE** menu.

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

| | |
|--------|---------|
| SAVE 1 | Factory |
| SAVE 2 | Factory |
| SAVE 3 | Factory |
| SAVE 4 | Factory |
| SAVE 5 | Factory |
| SAVE 6 | Factory |
| SAVE 7 | Factory |
| SAVE 8 | Factory |

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".

| | |
|--------|------------|
| SAVE 5 | user saved |
|--------|------------|

5. Enter a new file name from the **numerical keys** [12] or from an external keyboard (➤ 3-42).

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.

| | |
|-------|------------------------------|
| SAVE1 | Factory |
| SAVE2 | Factory |
| SAVE3 | Factory |
| SAVE4 | Factory |
| SAVE5 | user saved ; 11/26/03 11:57A |
| SAVE6 | Factory |
| SAVE7 | Factory |
| SAVE8 | Factory |

Loading user-defined settings

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

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

| | |
|-------|-----------------------------|
| SAVE1 | Factory |
| SAVE2 | Factory |
| SAVE3 | Factory |
| SAVE4 | Factory |
| SAVE5 | user saved ;11/26/03 11:57A |
| SAVE6 | Factory |
| SAVE7 | Factory |
| SAVE8 | Factory |

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

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

| | |
|-------|-----------------------------|
| SAVE1 | Factory |
| SAVE2 | Factory |
| SAVE3 | Factory |
| SAVE4 | Factory |
| SAVE5 | user saved ;11/26/03 11:57A |
| SAVE6 | Factory |
| SAVE7 | Factory |
| SAVE8 | Factory |

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

The setting you have selected is loaded and the following message is displayed:



4. Confirm with the **ENTER** key [5].

 **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 (↗ 6-192).

At the waveform **Arbitrary** the setting parameter are saved only. You have to load the waveform again (↗ 6-170).

6.3.3.2 Printing out a Screenshot

Use The R&S AM300 prints out 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 is required.

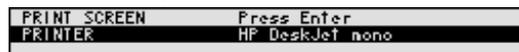
Selecting the printer

1. Connect a printer to the **USB connector** [20].

2. Press the **PRINT** function key in the **FILE** menu.

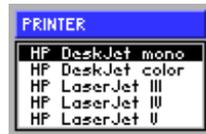
A table containing the available parameters is displayed.

3. Select the **PRINTER** parameter with the **▲** or **▼** cursor key [7].



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

A selection field containing the available settings is displayed. The default setting is "HP Deskjet mono".



5. Select a setting with the **rotary knob** [11].

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

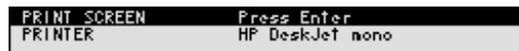
The setting is saved and the printer driver is loaded.

Printing out a screenshot

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

A table containing the available parameters is displayed.

2. Select the **PRINT SCREEN** parameter with the **▲** or **▼** cursor key [7].



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

The following Message is displayed.



A current screenshot and an overview of the principal current instrument settings (↖ 6-193) is printed out.

6.3.4 System Settings (CONFIG Menu)

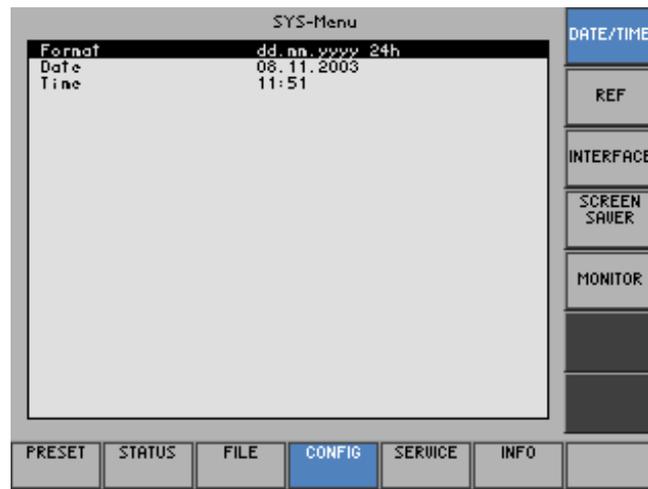
What the settings are for

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

Selecting 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 [13].



Function key assignment

| | | |
|---|--|-----------|
|  | Sets the date and time | (↗ 6-205) |
|  | Selects an internal or external reference source | (↗ 6-207) |
|  | Configures the instrument interfaces | (↗ 6-209) |
|  | Sets the screen saver mode | (↗ 6-211) |
|  | Selects an internal or external monitor | (↗ 6-213) |

6.3.4.1 Setting the Date and Time of Day

Use

When you save a setting (➤ 6-201), it is time-stamped using the time provided by the internal real-time clock.

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 **DATE/TIME** 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].

| Format | dd.mm.yyyy | 24h |
|--------|------------|-----|
| Date | 08.11.2003 | |
| Time | 11:51 | |

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

| Format |
|----------------|
| dd.mm.yyyy 24h |
| mm/dd/yyyy 12h |

4. Select a setting with the **rotary knob** [11].
5. Press the **ENTER** key [5] to close the selection field.
 The setting is saved and the display format updated.

Setting
the date

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].

| Format | dd.mm.yyyy 24h |
|--------|----------------|
| Date | 08.11.2003 |
| Time | 11:51 |

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

| | |
|------|------------|
| Date | 08.11.2003 |
|------|------------|

4. Enter a new value (↵ 5-55).
5. Press the **ENTER** key [5].
The setting is saved and displayed.

Setting
the time

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].

| Format | dd.mm.yyyy 24h |
|--------|----------------|
| Date | 08.11.2003 |
| Time | 11:51 |

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

| | |
|------|-------|
| Time | 12:03 |
|------|-------|

4. Enter a new value (↵ 5-55).
5. Press the **ENTER** key [5].
The setting is saved and displayed.

6.3.4.2 Selecting an Internal or External Reference Source

Use

The R&S AM300 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 10 MHz Out rear-panel connector [18] to synchronize other devices to the R&S AM300 reference frequency, for example.

When the “Reference external” setting is activated, the 10 MHz In connector [17] is used as the input for an external frequency standard. All the R&S AM300’s internal oscillators are synchronized to this external reference frequency (also 10 MHz).

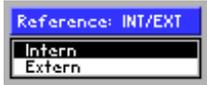
Selecting the reference source

1. When required, connect the external reference source to the EXT REF IN connector [17].
2. Press the  function key in the  menu.
The current reference source setting is displayed.
3. Select the **Reference: INT/EXT** parameter with the **▲** or **▼** cursor key [7].



```
Reference: INT/EXT  intern
External Reference  10 MHz
```

4. Press the **ENTER** key [5].
A selection field containing the available settings is displayed. The default setting is “internal”.



```
Reference: INT/EXT
Intern
Extern
```

5. Select a reference source with **rotary knob** [11].
6. Press the **ENTER** key [5].
The setting is saved and the R&S AM300 frequency standard is taken from a new source.

Note

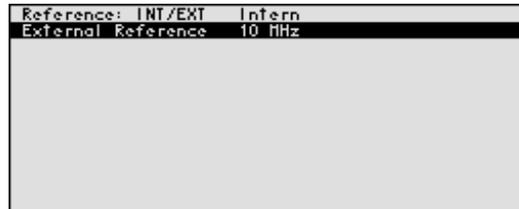
If there is no reference signal when you switch over to an external reference, the message PLL UNLOCK is output after a short delay to indicate that there is no sync.

Selecting the external reference source

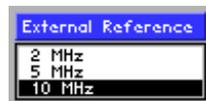
1. Press the  function key in the  menu.

The current reference source setting is displayed.

2. Select the **External Reference** parameter with the \blacktriangle or \blacktriangledown cursor key [7].



3. Press the **ENTER** key [5].
A selection field containing the available settings is displayed. The default setting is "10 MHz".



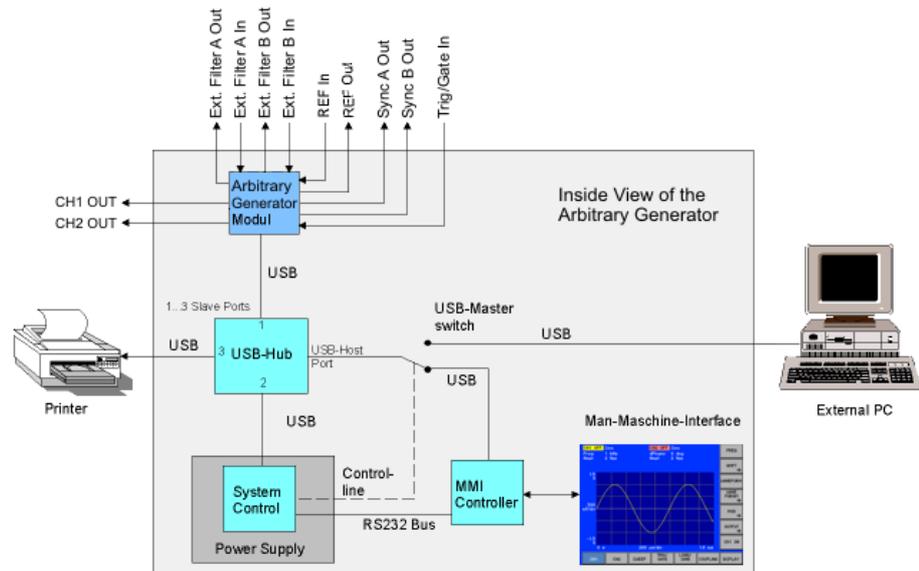
4. Select a reference source with **rotary knob** [11].
5. Press the **ENTER** key [5].
The setting is saved and the R&S AM300 frequency standard is taken from a new source.

6.3.4.3 Configuring the Instrument Interfaces

Use

The R&S AM300 can be remote-controlled via the existing USB host interface [19]. The R&S AM300 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 AM300 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 AM300 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 AM300 can be switched to "local mode" at any time. The PC and the R&S AM300 are thus physically disconnected. Reactivate the AUTO setting to switch the R&S AM300 again to "remote control".

- **Instrument**

The INSTRUMENT setting is required if the R&S AM300 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 AM300 automatically switches to "remote control".

Setting the
USB master selector

- **Extern**

If EXTERNAL is set, the USB master switch is in the “remote control” mode and the R&S AM300 can only be controlled via a PC.

When you press the SYS key [3], the R&S AM300 can be switched again to “local mode” at any time, for example for changing settings. Reactivate the EXTERNAL setting to switch the R&S AM300 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** [11].
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 AM300 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 AM300 has a screen-saver function that turns off the screen [14] 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 **▲** or **▼** cursor key [7].



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

A selection field containing the available settings is displayed. The default setting is "5 min".



4. Select a setting with **rotary knob** [11].
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 **SCREEN SAVER** function key in the **CONFIG** menu .

A table listing the available parameters is displayed.

2. Select the **REMOTE** 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 “picture”.



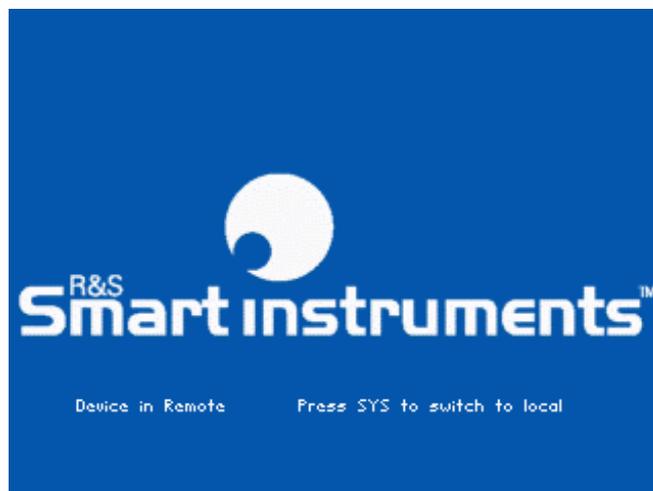
4. Select a setting with **rotary knob** [11].

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 AM300 is in remote-control mode.

With the “picture” setting, the following message is displayed on the screen with the R&S AM300 in remote-control mode:



Note

With remote control, the local control mode of the R&S AM300 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.

Selecting the monitor

- **intern**
Screen display is via the built-in colour TFT display.
 - **extern**
Screen display is via the connected monitor.
1. If required, connect a monitor to the MON connector [24].
 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** [11].
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)

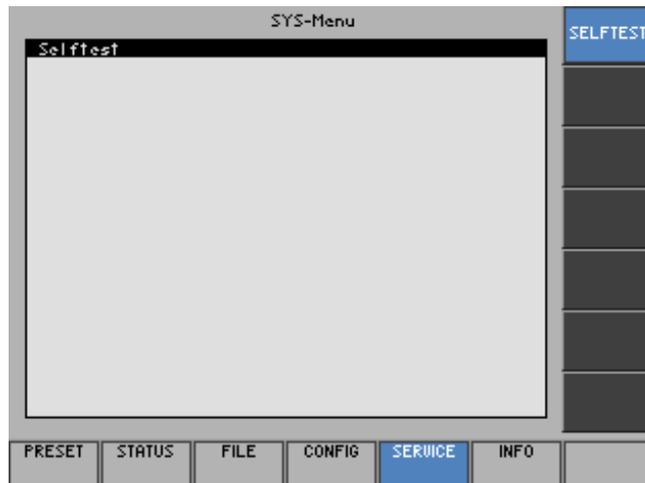
What the settings are for

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 signal generation with the R&S AM300.

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 [13].



Function key assignment



Performs a selftest

(↗ 6-214)

6.3.5.1 Performing Selftests

Use

The R&S AM300 can perform a module selftest. If there is a fault, the R&S AM300 itself is capable of localizing the defective module.

Starting selftests

- Press the **SELFTEST** function key in the **SERVICE** menu.

The selftest starts. All modules are checked one after the other and the result, "passed" or "failed", is output.

6.3.6 System Informations (INFO Menu)

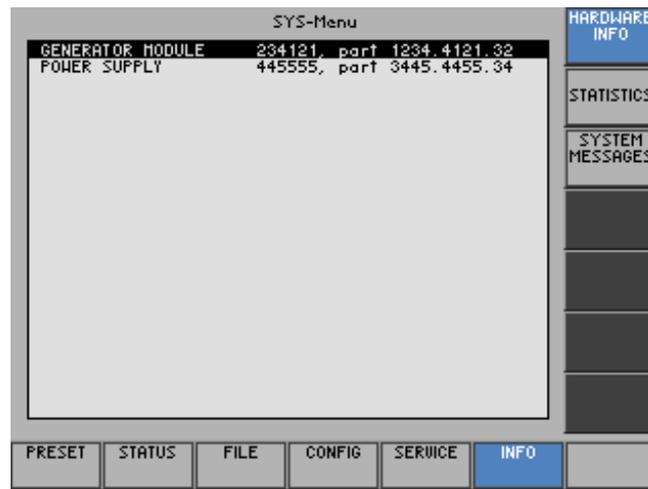
What the settings are for

Selecting the INFO menu

You can obtain information such as module data, instrument statistics and system messages from the INFO menu.

1. Press the **SYS key** [3].
2. Select the  **menu** with the **◀** or **▶** **cursor key** [6].

The menu name is highlighted and the appropriate functions are assigned the function keys [13].



Function key assignment

| | | |
|---|--------------------------------|-----------|
|  | Displays module data | (↗ 6-216) |
|  | Displays instrument statistics | (↗ 6-216) |
|  | Displays system messages | (↗ 6-217) |

6.3.6.1 Displaying Module Data

Use You can display the serial number of the modules installed in the R&S AM300.

Calling module data

- Press the **HARDWARE INFO** function key in the **INFO** menu.

A table listing the current modules and the serial number is displayed.

| | |
|------------------|---------------------------|
| GENERATOR MODULE | 234121, part 1234.4121.32 |
| POWER SUPPLY | 445555, part 3445.4455.34 |

6.3.6.2 Displaying Instrument Statistics

Use You can display the following R&S AM300 statistics:

- Model** - model designation
- Serial no.** - serial number
- FW version** - firmware version
- Operation time** - operating hours
- Power ON cycles** - on/off cycles

Displaying instrument statistics

- Press the **STATISTICS** function key in the **INFO** menu.

A table listing the current data is displayed.

| | |
|-----------------|---------------------------|
| Model | AM300 |
| Serial no. | 443445, part 4555.4344.44 |
| FW version | MM1 0.38 from 09.10.2003 |
| Operation time | 78 h |
| Power ON cycles | 234 |

6.3.6.3 Displaying System Messages

Use

You can display the most recent R&S AM300 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 **SYSTEM MESSAGES** function key in the **INFO** menu.

A table listing the current system messages is displayed.

2. Select a system message with the **▲** or **▼** cursor key [7].

```

Delete 5 Messages
05.04.04 10:36 AM ERROR 0x8E00: Parameter 0x0000
05.04.04 10:35 AM ERROR 0x8E00: Parameter 0x0000
05.04.04 10:31 AM ERROR 0x8E00: Parameter 0x0000
03.03.04 17:55 AM ERROR 0x8E00: Parameter 0x0000
03.03.04 17:54 AM ERROR 0x8E00: Parameter 0x0000
  
```

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.

```

MESSAGE
Date: 05.04.04
Time: 10:35
Message: AM ERROR 0x8E00
Parameter 0x00000010 and 0x0000
  
```

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 ▲ or ▼ cursor key [7].



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

The field for the input of the password is displayed.



4. Enter the right password and confirm with the **ENTER** key [5].

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 [5].
The deleting of the error messages is broken off.

7 Remote Control/PC Software R&S AM300-K1

**Note**

The latest remote control commands and software drivers for the USB-interface of the R&S AM300 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 AM300-K1 allows convenient operation of the R&S AM300 by remote control via a PC. All functions of the arbitrary and function generator are supported.

With PC software R&S AM300-K2 "Waveform Composer" (order number 1147.2013.02), user-defined (arbitrary) waveforms can be imported at the push of a button. Waveform Composer is used to set and manage arbitrary waveforms.

Remote control using the keyboard and the mouse

All functions and parameters can be set with the keyboard and the mouse using menus, toolbars or short keys.

Large display on the PC monitor

The current waveforms as well as parameters and status fields are displayed clearly 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 AM300 is installed. The R&S AM300 must not be connected at this time. Secondly the drivers are installed; at this time the instrument has to be connected.

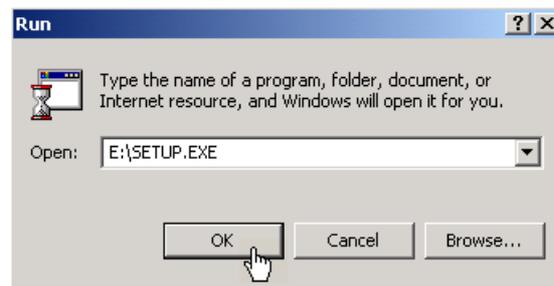
7.2.1.1 Installing the Program

 **Note**

The <Back> button enables the user to go back one step during installation. Installation can be interrupted by pressing <Cancel>.

Installation steps for Windows™ 2000

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.



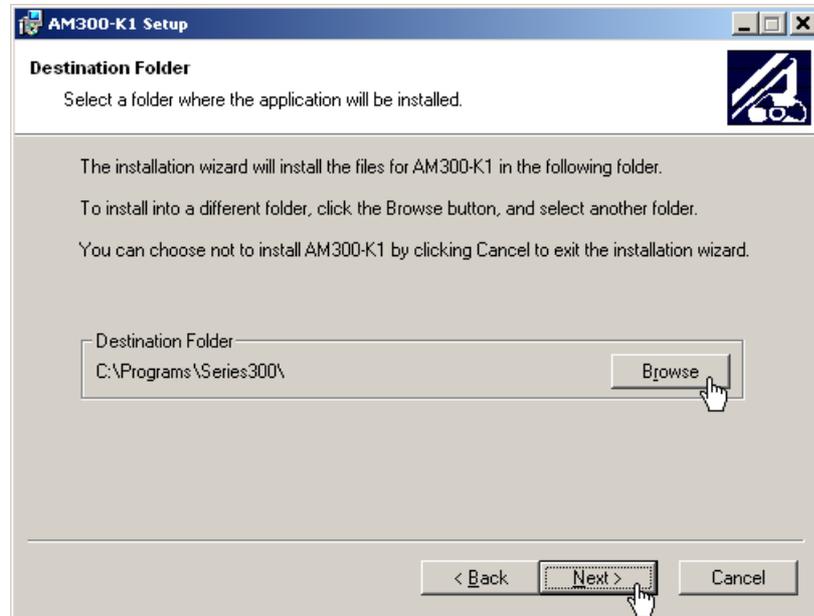
The installation is prepared and the installation wizard appears.

2. Click <Next> to continue the installation.

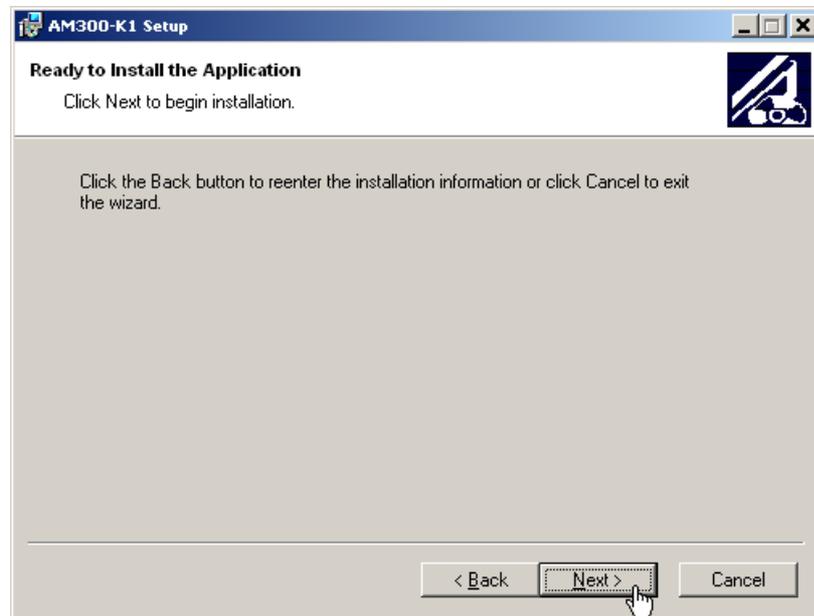


3. Click **<Browse>** to assign a new directory if you wish to install the program in a directory other than that suggested. Please ensure that all programs from the Smart Instruments series (R&S AM300-K1, AM300-K1 or SM300-K1) are installed in the same directory.

Click **<Next>** to continue the installation.



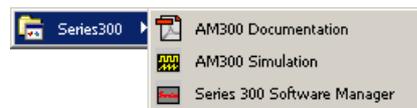
4. Click **<Next>** to continue the installation. Installation begins and the data are transferred to the PC. Please wait a moment.



5. Click **<Finish>** to successfully complete the installation.



All new settings are now effective and the following appears in the Windows™ **Start\Programs\Rohde & Schwarz\Series300** start-up menu:

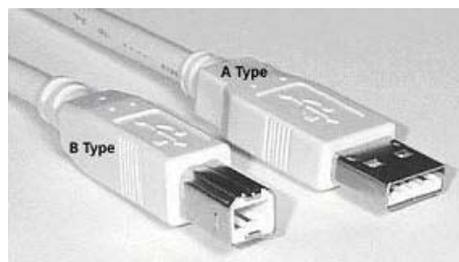


6. Install the device driver now (↗ next section).

7.2.1.2 Installing the Device Drivers

Connecting R&S AM300 to the PC

R&S AM300 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 AM300 (↗ 2-37).



The CD ROM must be in the installation drive in order to install the driver.

1. Switch on the R&S AM300 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 AM300 is installed for the first time.

Installing device
drivers for
Windows™ 2000

If the R&S AM300 is not automatically recognized, check that the USB master switch of the R&S AM300 is at **AUTO** (↗ 6-209).

3. Click **<Next>** to continue the installation.



4. Select **Search for a suitable driver for my device** and click **<Next>** to continue the installation.

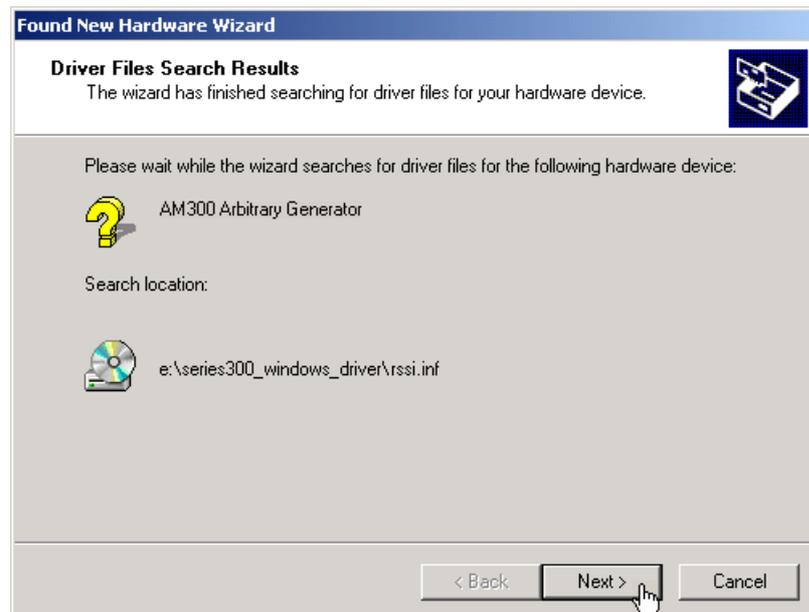


5. Select **CD-ROM drives** and click **<Next>** to continue the installation.



The search results for the driver data are now displayed.

6. Click **<Next>** to continue the installation.



7. Click **<Finish>** to complete the installation.



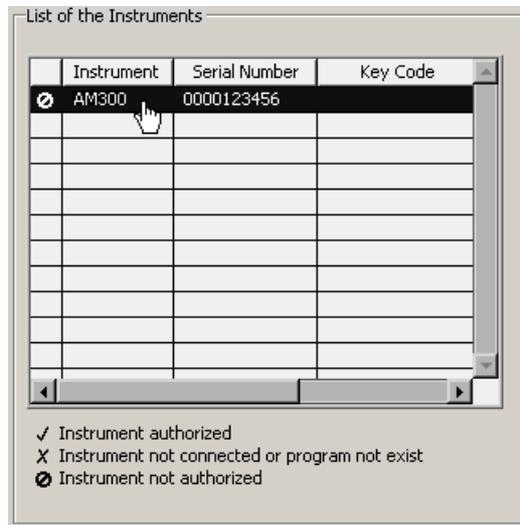
This is followed by the installation of the device driver for the **Rohde & Schwarz Power Supply**. Windows generally "remembers" all the necessary information when installing the arbitrary and function generator R&S AM300 and installs the Rohde & Schwarz Power Supply without a query. However, depending on the system, the installation assistant might be activated.



In this case, repeat instructions 3. to 7. to successfully complete the installation.

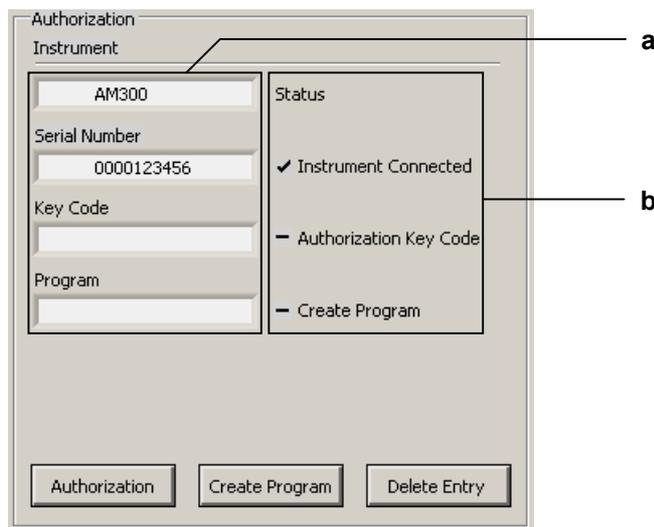
Entering the key code

- In I click on the instrument for which you wish to enter the key code. This requires that the R&S AM300 is recognized as “connected” (☑).



In II the authorization information is displayed:

- Current instrument information
- Instrument status

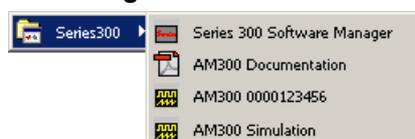


Creating the program version for specific instrument

- Click <Create Program>. A program version for specific instrument is created and is displayed in II with the status (✓). The program number is made up of the instrument designation (AM300) and the serial number (0000xxxxxx).



- In II click <Exit> to close the service program. After correctly creating the program version, the option AM300 0000xxxxxx is available in the Windows™ start-up menu Start\Programs\Rohde & Schwarz\Series300.



7.3 Starting the Remote Control

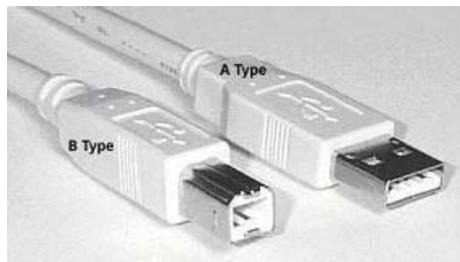
7.3.1 Connecting the Instrument to the PC

**Note**

PC software AM300-K1 must be installed before you can connect the R&S AM300 to the PC (➤ 7-219).

Introduction

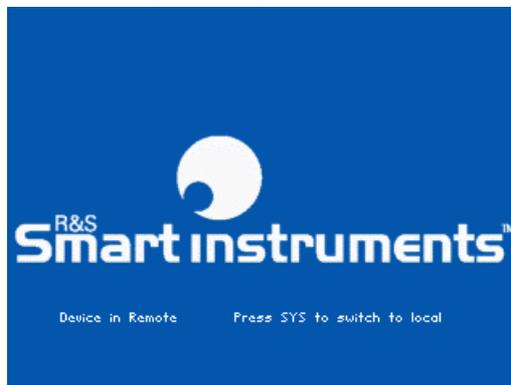
R&S AM300 is connected to the PC via the USB interface. The connection cable has two plug types. Plug A is connected to the computer (➤ computer manual) and plug B is connected to the R&S AM300 (➤ 2-37).

**Prepare remote control**

1. Switch on the R&S AM300 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 AM300:



If the R&S AM300 is not automatically recognized, please check that the USB master switch of the R&S AM300 is at position **AUTO** (➤ 6-209).

**Note**

In remote control mode, control of the R&S AM300 is deactivated and can only be reactivated by pressing the SYS key on the front panel of the instrument. Switching from remote to local control takes approximately 8 seconds.

7.3.2 Starting the Program

Note

Remote control of an arbitrary and function generator can only be executed with the appropriate device-specific program version.

Starting the program

1. In the Windows™ start-up directory click on:
Start\Programs\Rohde & Schwarz\Series300\AM300 0000xxxxxx

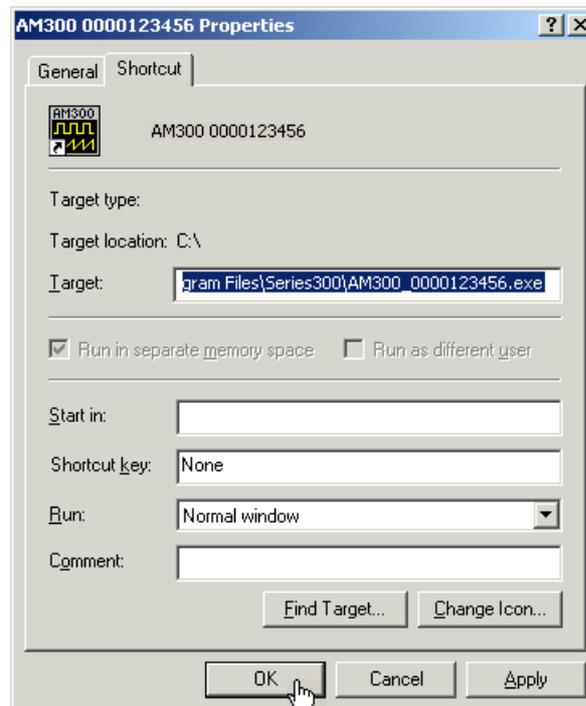


If the link is not available

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\AM300 0000xxxxxx
Click **Properties**.



Click **<OK>** to create a link between the program and start-up directory.



Start the program again (↗ above, instruction 1.)

Loading the current instrument settings

A new session opens automatically when you start the program. The current R&S AM300 settings are loaded. After loading, you may start using the R&S AM300 remote control.

Note

If the message **Device not connected** appears on the program interface, check the connection to the instrument (↗ 7-228).

7.4 Getting Started

Task

In this example, the waveform **Square** with a frequency of **250 Hz**, an amplitude of **V_{pp} = 2 V** and a duty cycle of **50 %** is applied to the CH1 output [8].

Resetting the R&S AM300

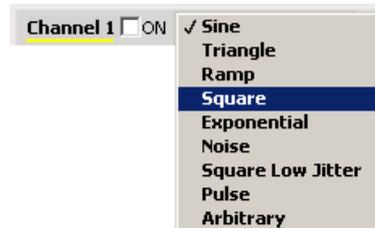
1. Start the PC software (AM300 0000123456.EXE) on your PC.



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 (➔ 6-68).

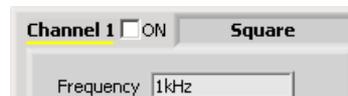
Selecting the waveform Square

2. In the main function display CH1, click on the **Sine** button and select the waveform **Square**.

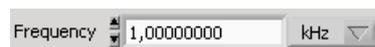


Setting the signal frequency 250 Hz

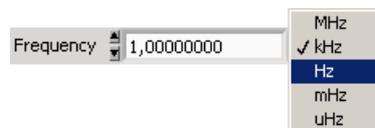
3. Click on the **Frequency** display.



Functions are displayed with parameters in the setting area.



4. Set the measuring unit **<Hz>** for the **Frequency** input window by clicking the mouse.



5. Push the **<Tab>** button on the keyboard. The **Frequency** input window is active. Enter the value **<250>** with the numeric keys. Complete the input with the **<Enter>** button.



Switching on the output

6. In the main function display CH1, click the **<On>** check box.



7.5 Control Concept

7.5.1 PC Monitor Display

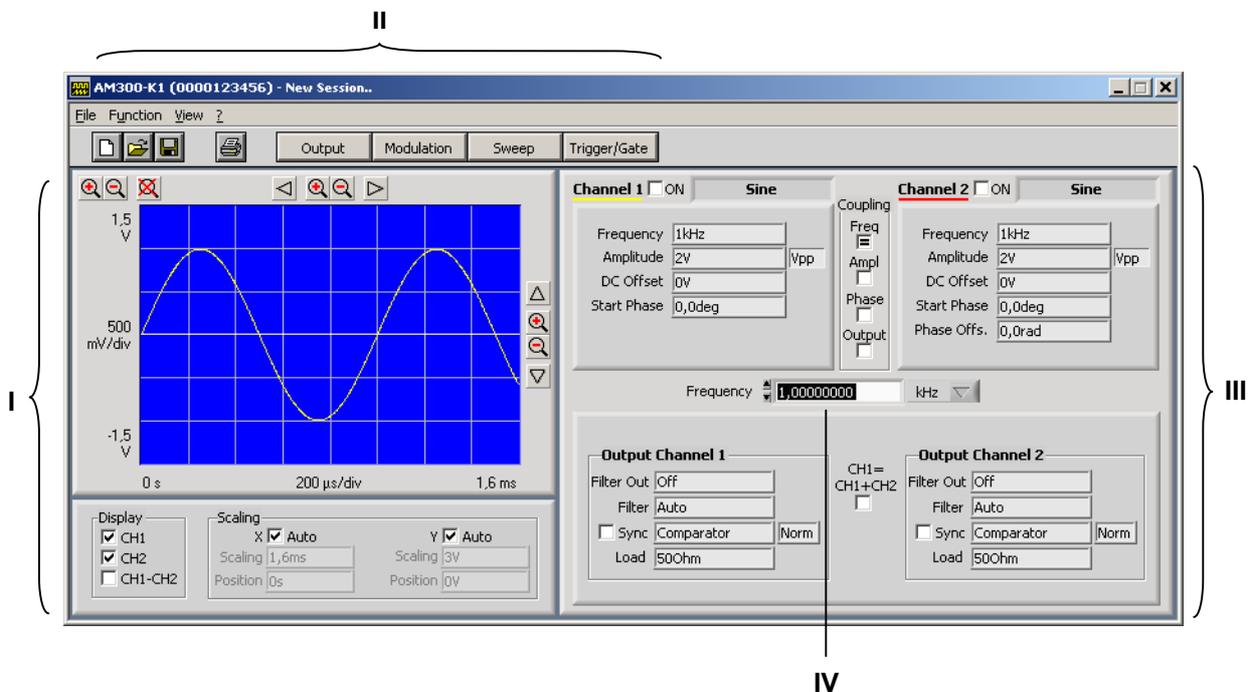
Introduction

The PC monitor provides continuous information about the current settings of the R&S AM300. The display format for the settings 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:

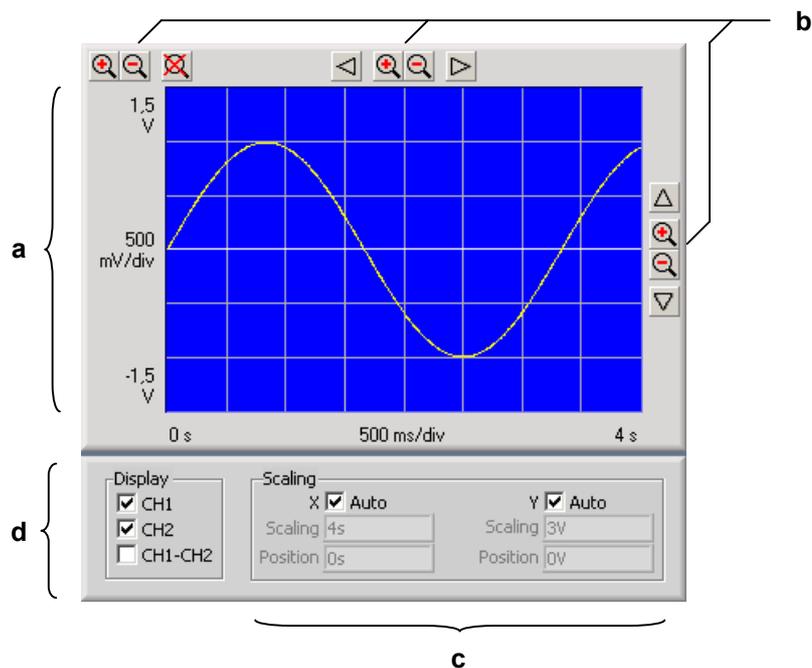
- I Diagram
- II Menus
- III Functions
- IV Settings



7.5.1.1 Diagram

Diagram displays The diagram area contains:

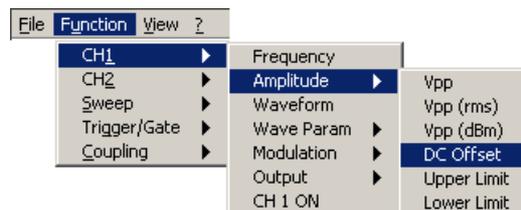
- Graph diagram with scale (a)
- Settings to zoom the image cutout (b)
- Settings to scale the diagram area (c)
- Settings to display the waveforms (d)



7.5.1.2 Menus

Calling up and displaying menus

Different pull-down menus can be accessed in the menu area.



In addition, Windows™-typical menu items can be called up via a toolbar (icons).



Menus for setting the measuring parameters and functions are also available as a toolbar and can be selected directly.



Note

The ► arrow after a menu option in the pull-down menu indicates that a submenu will appear after opening.

7.5.1.3 Functions

Main functions display

The **main functions** of the channels CH1 and CH2 of the R&S AM300 are always displayed in the top part of the function display

Inserting specific functions

In the lower part of the function display, different function displays, e.g. **Trigger/Gate**.

Note: If a selection is not highlighted, it has currently no function (current setting).

7.5.2 Setting the Parameters

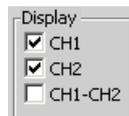
General

Parameters can be set in different ways:

- Clicking the button



- Activating the check boxes



- Entering the parameters in the setting area (in the middle of the function area)

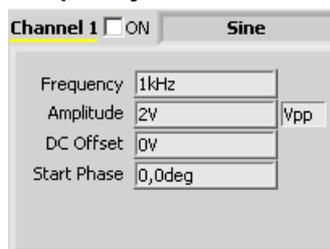


The keyboard and mouse can be used for the settings.

Entering the parameters in the setting area

Parameters are selected and entered in the setting area only.

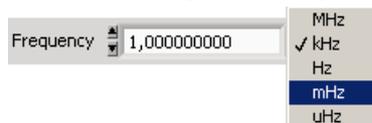
- Click in that display where the parameters have to be changed, e.g. **Frequency**.



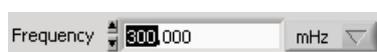
Functions are displayed with parameters in the setting area.



- Select the assigned settings in the selection field e.g. **mHz**.



And/or enter numeric parameters in the input field, e.g. **300**.



7.6 Overview of all Menus and Functions (Shortcuts)

7.6.1 File

| | | | |
|-------------------|--------|-------------------------|---|
| New Session | Ctrl+N | Begin new session |  |
| Open Session | Ctrl+O | Open saved session | |
| Save Session | Ctrl+S | Save current session | |
| Save Session as.. | Ctrl+A | Save current session as | |
| Page Setup... | | Page setup for printing | |
| Print Window | Ctrl+P | Print current window |  |
| Exit | Ctrl+Q | Exit program | |

7.6.2 View

Pull down menu

| | | |
|-------|--------|------------------|
| Color | Ctrl+L | Set screen color |
|-------|--------|------------------|

7.6.3 ? Help

Pull down menu

| | | |
|---------|--------|---|
| Help | | Start help function |
| Info | Ctrl+I | Display program information |
| Service | | Display module data and perform selftests |

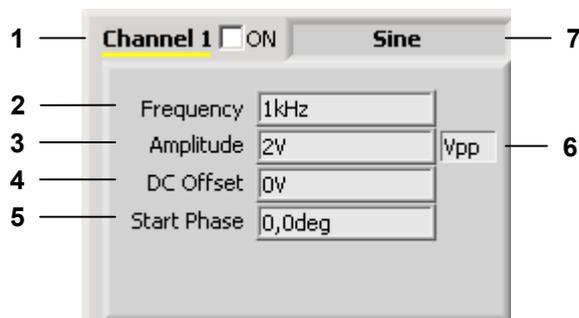
7.6.4 Function

 **Note** Instrument functions are accurately described in chapter 6 of the R&S AM300 manual.

| | |
|-----------------------|---|
| CH1 ▶ | Configuring the output signal CH1 |
| CH2 ▶ | Configuring the output signal CH2 |
| Sweep ▶ | Sweep settings |
| Trigger/Gate ▶ | Trigger settings |
| Coupling ▶ | Setting the dependence between the channels |

7.6.4.1 CH1 (CH2)

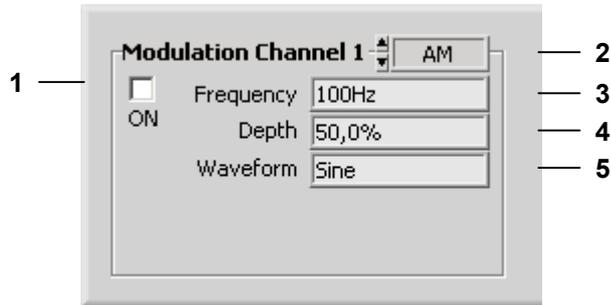
Main function display (always visible)



Pull down menu

| | | |
|---------------------|---|-------|
| Frequency | Set the frequency of the current waveform | (2) |
| Amplitude ▶ | Open submenu: Set the amplitude of the current waveform, e.g. Sine | |
| Vpp | Set signal amplitude as peak-to-peak value | (6) |
| Vpp (rms) | Set signal amplitude as rms value | (6) |
| Vpp (dBm) | Set signal amplitude in dBm | (6) |
| DC Offset | Set DC component | (4) |
| Upper Limit | Set upper limit for output voltage | |
| Lower Limit | Set lower limit for output voltage | |
| Waveform | Select waveform | (7) |
| Wave Param ▶ | Open submenu: Set function parameters of the current waveform, e.g. Sine | |
| Start Phase | Set start phase | (5) |
| CH 1 ON | Switch on output channel 1 | (1) |

Function display
(insert with toolbar
button Modulation)



Pull down menu

| | | | |
|-------------------|-----------------------------------|--|-------|
| Modulation ▶ | Open submenu: | | |
| | Modulate waveform | | |
| A Mod Param AM ▶ | Open submenu: | | (2) |
| | Set amplitude modulation | | |
| AM Frequency | Set modulation frequency | | (3) |
| AM Depth | Set modulation depth | | (4) |
| AM Waveform | Select modulation signal | | (5) |
| Modulation ON | Switch modulation on/off | | (1) |
| A Mod Param FM ▶ | Open submenu: | | (2) |
| | Set frequency modulation | | |
| FM Frequency | Set modulation frequency | | |
| FM Deviation | Set frequency deviation | | |
| FM Waveform | Select modulation signal | | |
| Modulation ON | Switch modulation on/off | | |
| A Mod Param PM ▶ | Open submenu: | | (2) |
| | Set phase modulation | | |
| PM Frequency | Set modulation frequency | | |
| PM Phase | Set phase deviation | | |
| PM Waveform | Select modulation signal | | |
| Modulation ON | Switch modulation on/off | | |
| A Mod Param FSK ▶ | Open submenu: | | (2) |
| | Set frequency shift keying | | |
| FSK Frequency | Set modulation frequency | | |
| FSK Period | Set modulation period | | |
| Hopping Frequency | Set hopping frequency | | |
| FSK Source | Select modulation source | | |
| Polarity | Select modulation signal polarity | | |
| Modulation ON | Switch modulation on/off | | |

Overview of all Menus and Functions (Shortcuts)

R&S AM300

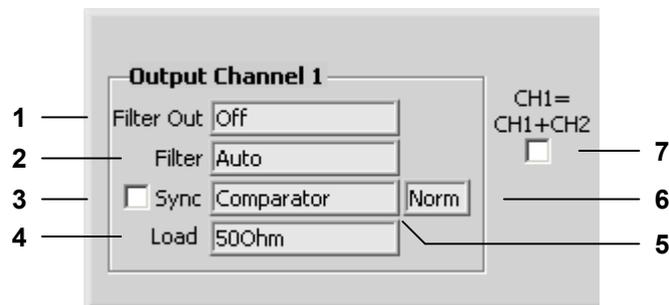
A Mod Param PSK ▶

Open submenu:

Set phase shift keying

| | |
|---------------|-----------------------------------|
| PSK Frequency | Set modulation frequency |
| PSK Rate | Set modulation period |
| PSK Phase | Set phase shift |
| PSK Source | Select modulation source |
| Polarity | Select modulation signal polarity |
| Modulation ON | Switch modulation on/off |

Function display
(insert with toolbar
button Output)



Pull down menu

Output ▶

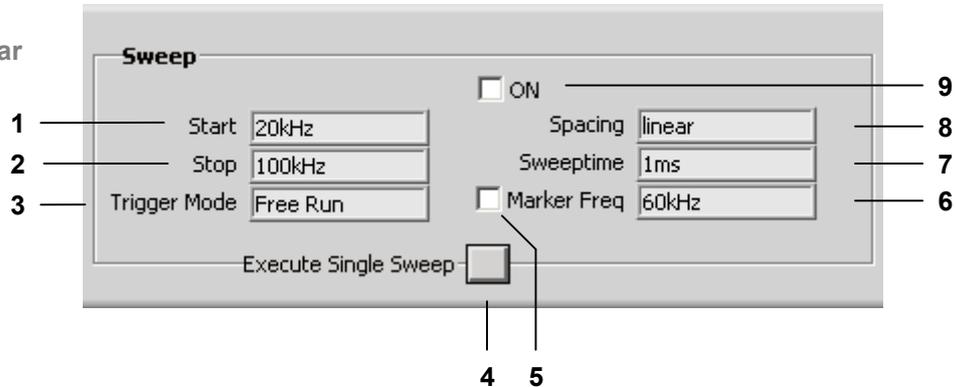
Open submenu:

Configure signal output

| | | |
|----------------|---|-------|
| Out Addition | Switch channel summing on/off | (7) |
| Output Load | Enter the terminating impedance | (4) |
| Filter | Select anti-aliasing filter | (2) |
| Output lowpass | Switch output filter on/off | (1) |
| Sync ▶ | Open submenu: Synchronize output from channel CH1 (CH2) | |
| Sync Source | Select synchronization source | (5) |
| Sync Polarity | Select synchronization output polarity | (6) |
| Sync On | Switch synchronized output on/off | (3) |

7.6.4.2 Sweep

Function display
(insert with toolbar
button Sweep)

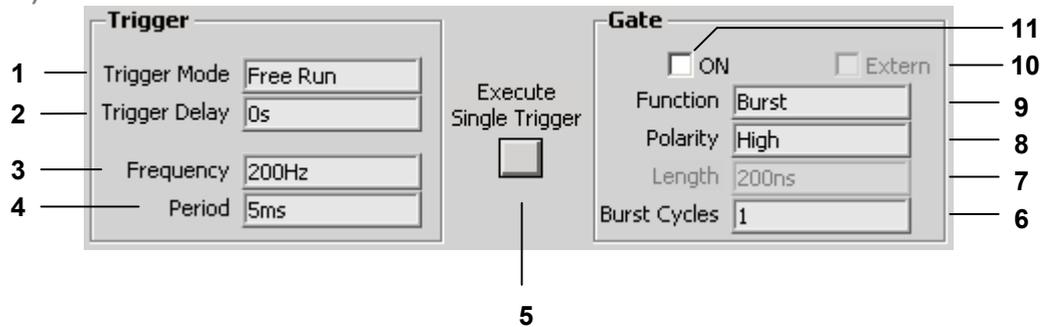


Pull down menu

| | | |
|------------------|---|-------|
| Sweep Freq ▶ | Open submenu: Set the sweep frequency range | |
| Center | Entering the center frequency | |
| Span | Entering the frequency range | |
| Start | Entering the starting frequency | (1) |
| Stop | Entering the stopping frequency | (2) |
| Trigger Mode | Select trigger mode | (3) |
| Sweep Spacing | Select sweep scaling | (8) |
| Sweep MKR ▶ | Open submenu: Set frequency marker | |
| Marker Frequency | Set marker frequency | (6) |
| Marker ON | Switch frequency marker on/off | (5) |
| Sweep Time | Set sweep time | (7) |
| Sweep EXEC SGL | Start once-only sweep | (4) |
| Sweep ON | Switch SWEEP operating mode on/off | (8) |

7.6.4.3 Trigger/Gate

Function display
(insert with toolbar
button Trigger/Gate)



Pull down menu

| | | |
|---------------------|---|--------|
| Trigger Mode | Select trigger mode | (1) |
| Trigger Delay | Set trigger delay | (2) |
| Polarity | Select active trigger edge | (8) |
| Trigger Frequency | Set internal trigger generator frequency | (3) |
| Trigger Period | Set internal trigger generator period | (4) |
| Gate/Burst | Open submenu: Set Gate/Burst operating mode | |
| Gate Function | Select gate function | (9) |
| Gate Length | Set gate length | (7) |
| Gate Extern | Control gate via external trigger signal | (10) |
| Polarity | Select gate polarity | (8) |
| Burst Cycles | Set number of burst signal periods | (6) |
| Gate ON | Switch Gate/Burst mode on/off | (11) |
| Exec Single Trigger | Execute once-only triggering | (5) |

7.6.4.4 Loading User-Defined Waveforms

Main function display (always visible)



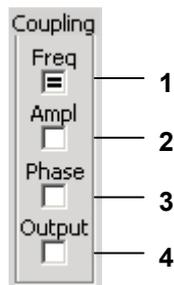
Function

load Wave

With PC software R&S AM300-K2 “Waveform Composer” (order number 1147.2013.02), user-defined (arbitrary) waveforms can be imported at the push of a button. Waveform Composer is used to set and manage arbitrary waveforms.

7.6.4.5 Coupling

Main function display (always visible)

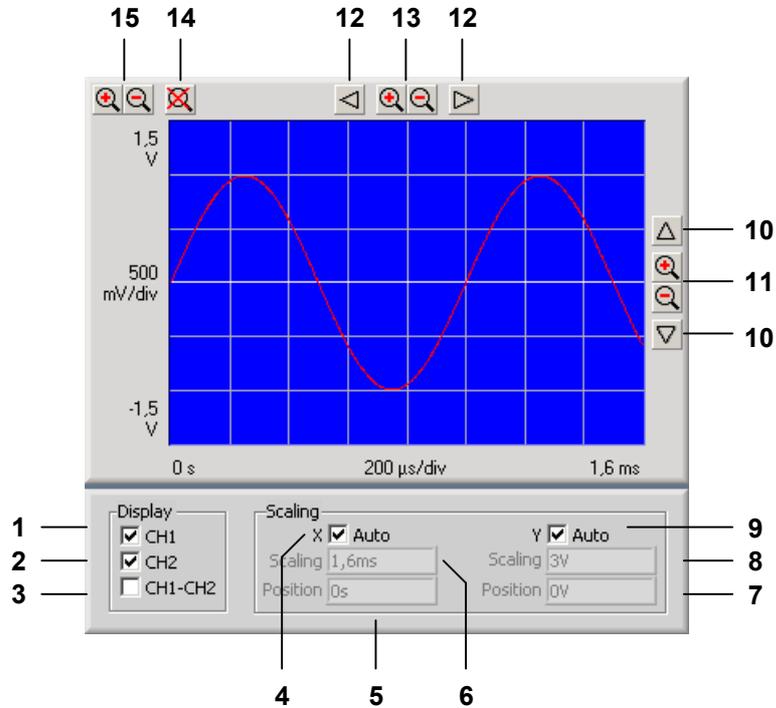


Pull down menu

| | | |
|---------------------|---|-------|
| ✓ Frequency CH1=CH2 | Switch frequency coupling on/off | (1) |
| Amplitude CH1=CH2 | Switch amplitude coupling on/off | (2) |
| Output CH1=CH2 | Switch output coupling on/off | (3) |
| Phase CH1=CH2 | Switch phase coupling on/off | (4) |
| Coupling OFF | Switch off all coupling in channels CH1 and CH2 | |

7.6.4.6 Display Settings (Display)

Diagram
(always visible)



Functions

Display Display waveforms

- (1) Switch channel CH1 display on/off
- (2) Switch channel CH2 display on/off
- (3) Switch on display of voltage values from CH1 and CH2

Scaling Scaling of diagram area

- (4) Scale X axis automatically
- (6) Scale X axis manually
- (5) Set starting value of X axis
- (9) Scale Y axis automatically
- (8) Scale Y axis manually
- (7) Set starting value of Y axis

Zoom Zoom the screen window

- (12) Move screen window in X direction
- (10) Move screen window in Y direction
- (13) Zoom screen window in/out in X direction
- (11) Zoom screen window in/out in Y direction
- (15) Zoom screen window in/out in X/Y direction
- (14) Automatically scale X/Y axis

8 Instrument Interfaces

This chapter The chapter 8 contains a description of the R&S AM300'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 (KEYB)

Connector There is a 6-pin PS/2 connector KEYB [25] on the R&S AM300's rear panel for an external keyboard.

| Pin assignment | Pin | Signal |
|----------------|-----|--------------|
| | 1 | KEYBOARDDATA |
| | 2 | MOUSEDATA |
| | 3 | GND |
| | 4 | 5V, KEYBOARD |
| | 5 | KEYBOARDCLK |
| | 6 | MOUSECLK |

8.2 Monitor Connector (MON)

Connector There is connector MON [24] on the rear panel of the R&S AM300 for an external monitor.

| Pin assignment | Pin | Signal |
|----------------|-----|--------|
| | 1 | R |
| | 2 | G |
| | 3 | B |
| | 4 | (NC) |
| | 5 | GND |
| | 6 | GND |
| | 7 | GND |
| | 8 | GND |
| | 9 | GND |
| | 10 | GND |
| | 11 | (NC) |
| | 12 | (NC) |
| | 13 | HSYNC |
| | 14 | VSYNC |
| | 15 | (NC) |

8.3 Reference Input and Output (EXT REF IN, REF OUT)

| | |
|---------------------------|---|
| External reference | If an external reference is used, the internal reference oscillator is synchronized to the 10 MHz reference signal at connector 10 MHz In [17]. The input level must be 0.5 to 2V. |
| Internal reference | The 10 MHz signal from the internal reference oscillator is available at the 10 MHz Out connector [18] so that other devices can be synchronized to the R&S AM300. The output level is 0 dBm. |
| Instrument setting | You can switch over between the internal and external reference in the CONFIG menu (➔ 6-207). |

8.4 USB Interface (PC, DEV)

Connector The USB-Host [19] and USB-Device [20] connectors on the rear panel of the R&S AM300 are for a USB device.

Pin assignment



| Pin | Signal |
|-------|------------|
| 1 | Vbus (Vcc) |
| 2 | D- |
| 3 | D+ |
| 4 | GND |
| Shell | Shield |

9 Error Messages

This chapter Refer to chapter 9 for a detailed description of errors that may occur in the R&S AM300. You will also find notes on troubleshooting.

Further information Chapter 6 describes all the R&S AM300's menus and the associated functions in detail.

9.1 System Messages

System messages System messages inform you of internally detected errors. The following informs 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 a 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 (0-23). The instrument may have to be checked in the service shop.

Overtemperature
Error
"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 AM300 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 a system message occurs, an entry is made under SYSTEM MESSAGES (↗ 6-217).

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