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C E

Operating Manual

Arbitrary and Function Generator R&S®AM 300

Order No. 1147.1998.03

ROHDE & SCHWARZ

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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 µHz $\leq$ f $\leq$ 30 MHz		$\pm$ 0.1 dB
30 MHz < f $\leq$ 35 MHz		$\pm$ 0.25 dB
Units		V (V_{SS}), dBm

Spectral Purity (Sine)

Harmonic distortion		
	$\geq$ 3 (U_{SS}) output voltage	< 3 V (V_{SS})
20 Hz $\leq$ f $\leq$ 1 MHz	< -60 dBc	< -65 dBc
1 MHz < f $\leq$ 5 MHz	< -55 dBc	< -55 dBc
5 MHz < f $\leq$ 35 MHz	< -35 dBc	< -40 dBc
Non-harmonic distortion		
10 µHz $\leq$ f $\leq$ 5 MHz	typ. (-70 dBc)	< -60 dBc
5 MHz < f $\leq$ 25 MHz	typ. (-55 dBc)	< -45 dBc
25 MHz < f $\leq$ 35 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 kHz		1 % to 99 %, selectable
10 µHz $\leq$ f $\leq$ 50 MHz		50 % fixed
Rise/fall time		
10 µHz $\leq$ f $\leq$ 10 MHz		< 10 ns
10 MHz < f $\leq$ 50 MHz		< 5 ns
Overshoot		< 5 %
Pulse		

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 kHz)
Exponential		
Type		rising or falling
Arbitrary		
Rise time		< 10 ns
Linearity		$\pm$ 0.1 % (f < 10 kHz)
Download time via USB		16 s (binary 256 k points)

Output Characteristic

Offset (50 Ω)		
Setting range	$\pm$ 5 V, |signal level + offset| $\leq$ 5 V	
Accuracy	$\pm$ 1 % of setting $\pm$ 2 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})	

Modulation[1]

Modulation modes	AM, FM, φM, 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 μHz 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 µHz	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 kΩ (DC coupling)
Latency (burst, sweep)		< 100 ns (typically)
Sync output		
Outputs		2
Voltage		TTL-compatible
Pulse width		≥ 50 ns
Polarity		selectable

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 555011 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

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

Safety instructions

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

2. For measurements in circuits with voltages $V_{rms} > 30$ 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.

ROHDE & SCHWARZ

EC Certificate of Conformity

ROHDE & SCHWARZ

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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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   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.

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.

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.

The upper frequency limits of 35 MHz for sine signals and 50 MHz for square signals offers enough leeway for future tasks.

Performance   The main characteristics are as follows:

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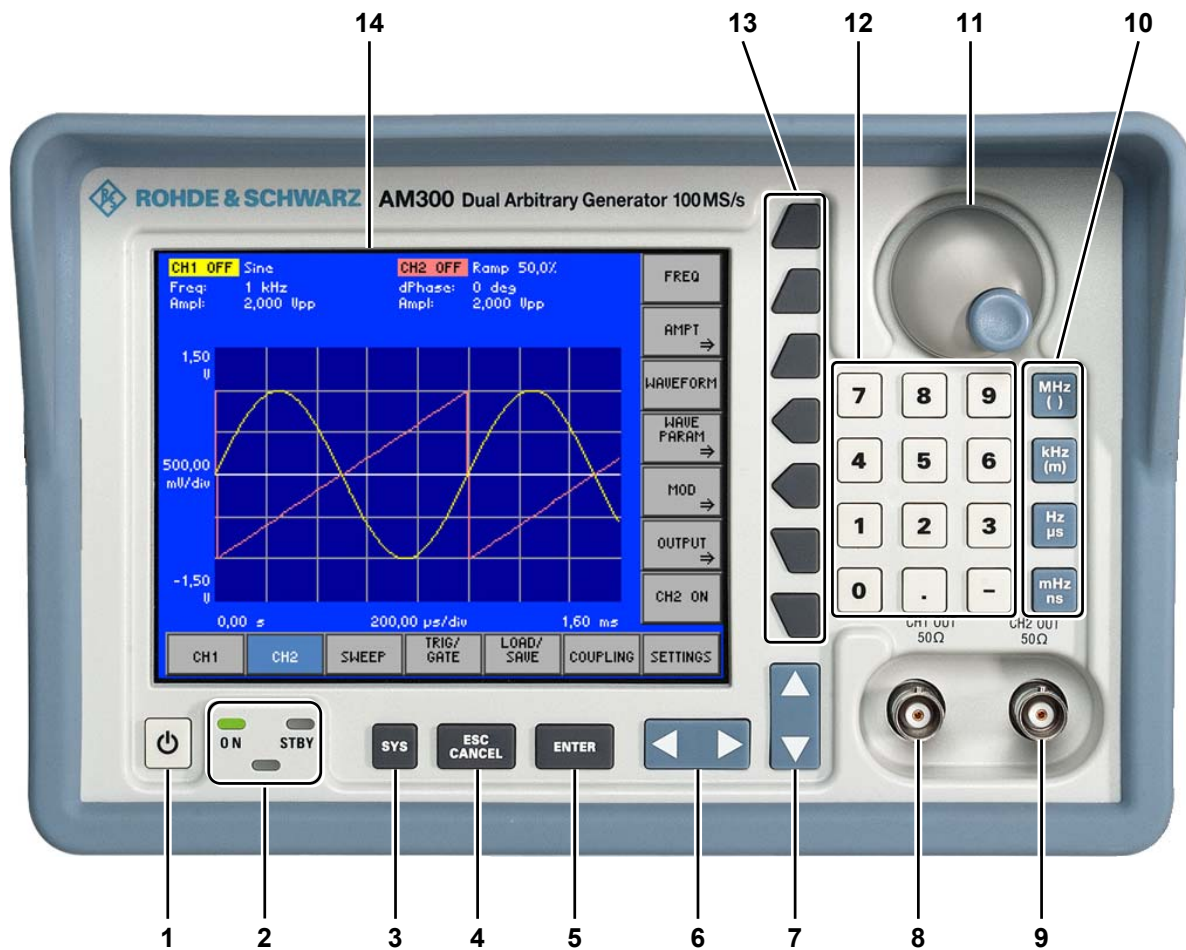
1	ON/STANDBY switch	**8**	Signal output CH1 (BNC connector)
2	ON/STANDBY indicator	**9**	Signal output CH2 (BNC connector)
3	SYS key	**10**	Unit keys
4	ESC/CANCEL key	**11**	Rotary knob
5	ENTER key	**12**	Numerical keys
6	Cursor keys ◄ / ►	**13**	Function keys
7	Cursor keys ▼ / ▲	**14**	Screen

2.2 Rear View

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

3   Putting the R&S AM300 into Operation

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

Further   Chapter 2 contains an overview of the R&S AM300's control elements,
information   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   When you unpack the R&S AM300, proceed as follows:
procedure
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.

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°.
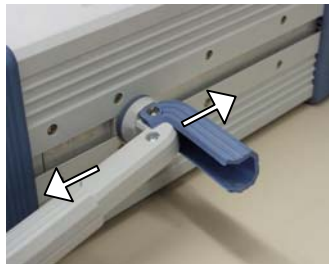
3. Close the setting lever by pressing on the outer surface.

   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

[F10] ⇐ | ⇒ [F11]

[F1] ... [F7]

[A] ... [D]

[Esc]

[←], [→]

[0] ... [9], [.], [-]

[F9]

[Enter]

[↑], [↓]
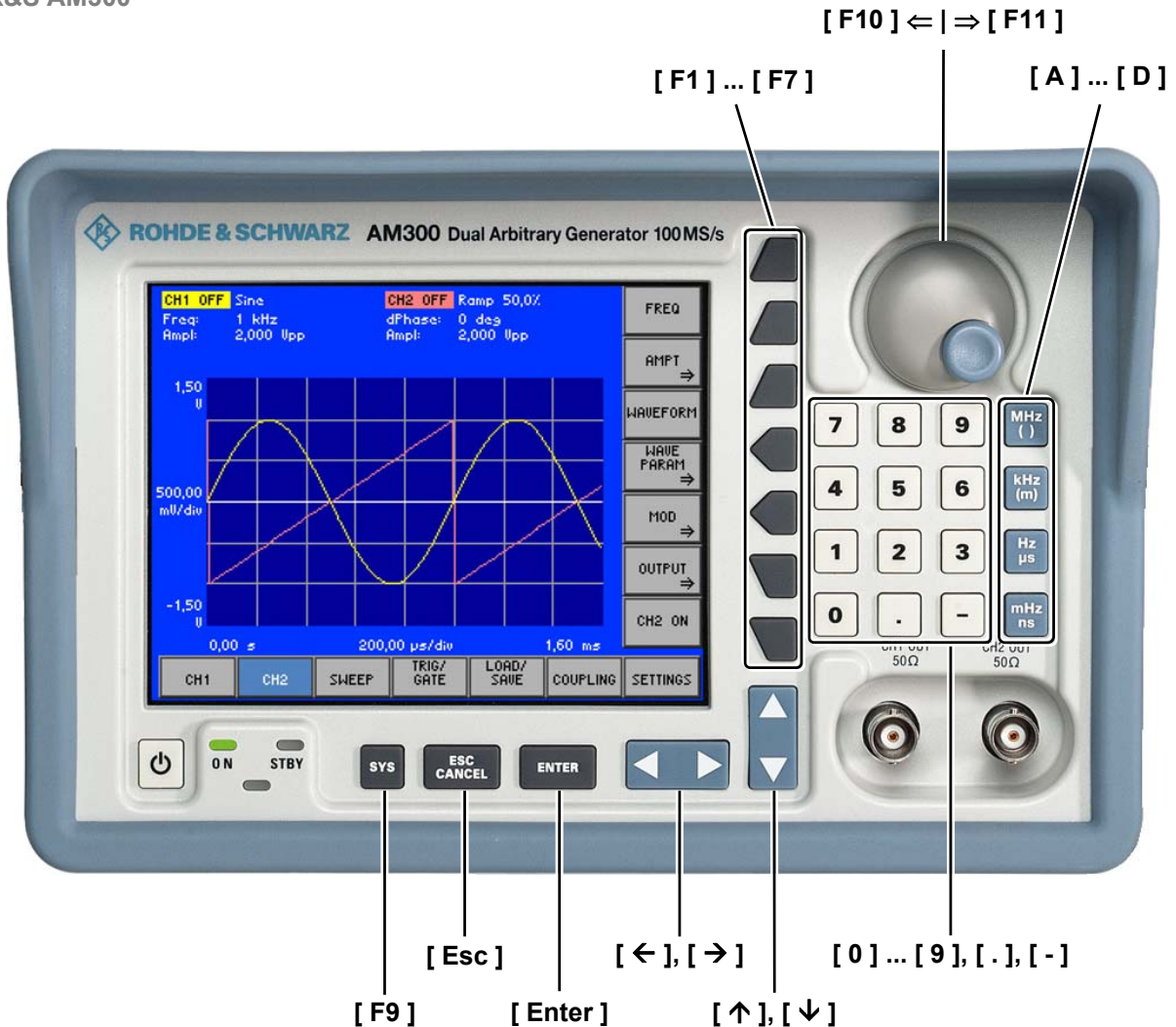
4   Getting Started

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 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 $\Rightarrow$] key.

- Press the [Upp] 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 $\Rightarrow$] key.

- Press the [RECT DUTY] key.

- Use the numeric keys to enter the value [**2**] [**0**]. 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**
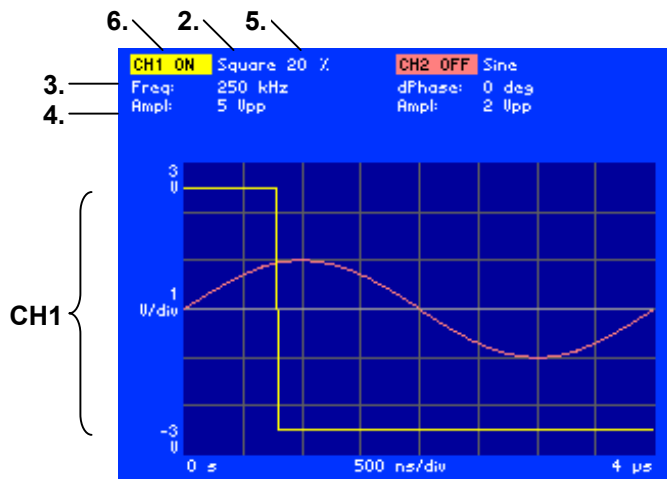
5   Manual Operating Concept

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.
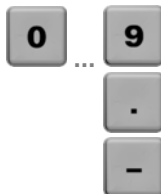
0 ... **9**   − Inserts one of the digits "0" to "9" at the cursor position.

.   − 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.

MHz ( )
- 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

kHz (m)
- 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

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

mHz ns
- 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.

ENTER
–   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.

ESC CANCEL
–   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).

SYS
–   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
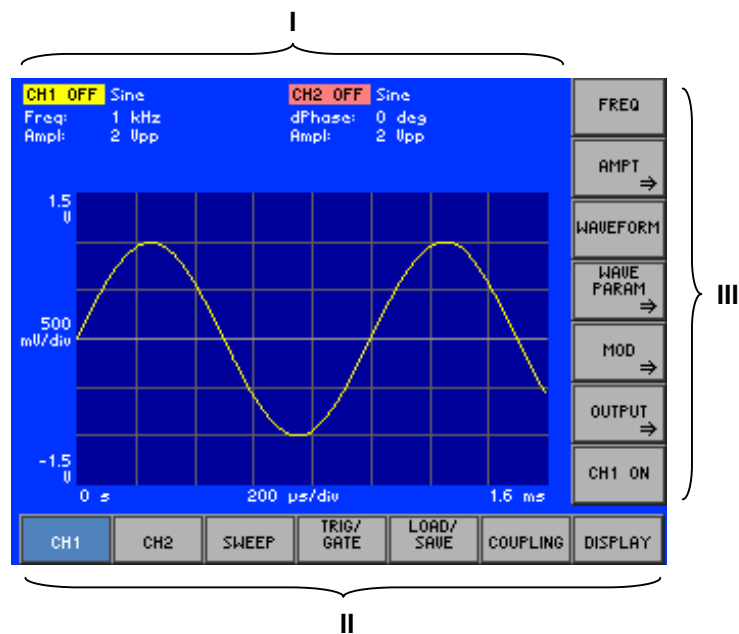
5.2.1   Diagram Area

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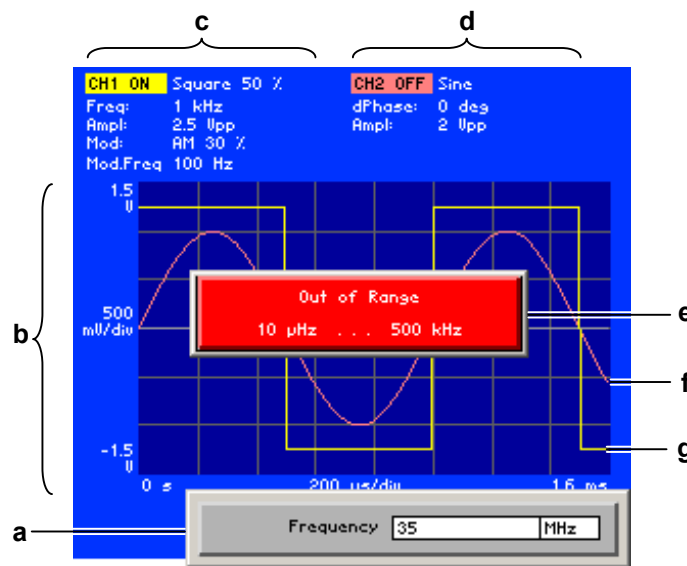
Curve diagram   A 8 x 6 grid is superimposed on the diagram area to make it easier to analyze waveforms.

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.

Activated function key

No function assigned

De-activated function key
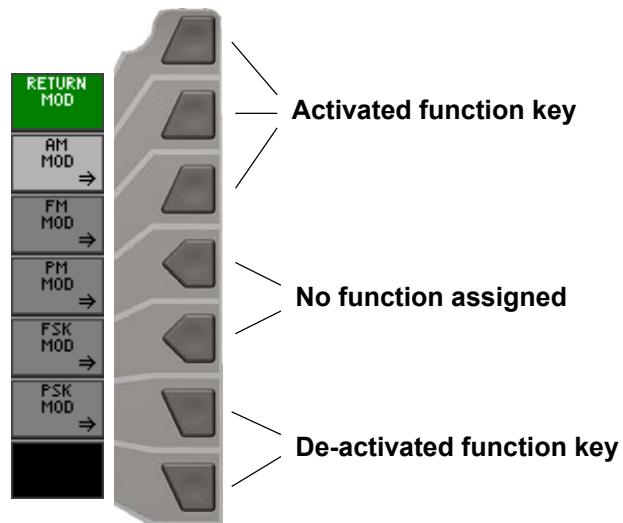
5.3　Calling and Changing Menus

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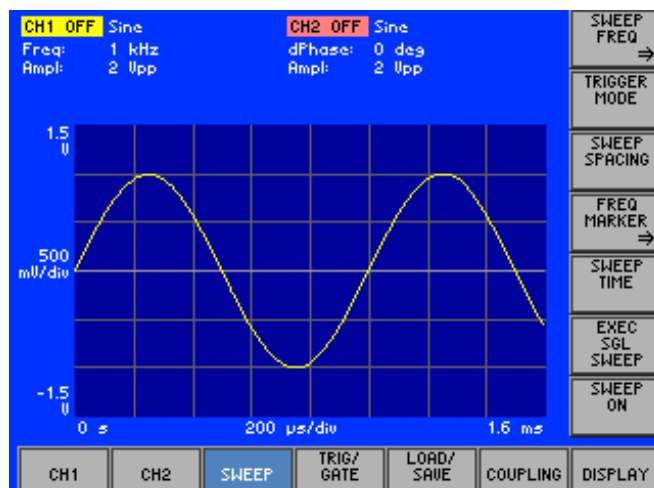
📄 **Note**　A double arrow ⇒ pointing to a function key, e. g. ⌈ SWEEP FREQ ⇒ ⌋, tells you that pressing this key will call a submenu.

Calling/quitting submenus

2. Press the [SWEEP FREQ ⇒] **function key** in the [SWEEP] **menu**.

The SWEEP FREQ submenu opens and the new functions are assigned to the function keys [13].
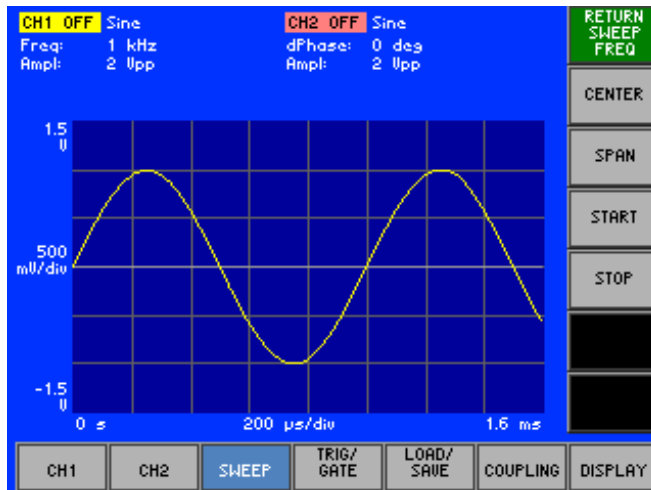
3. Press the [RETURN SWEEP FREQ] **function key** in the [SWEEP FREQ ⇒] **submenu**.

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** DISPLAY with the ◀ or ▶ [6] **cursor keys**.

2.   Press the ZOOM⇒ **function key** in the DISPLAY **menu.**

3.   Press the AUTO XY **function key** in the ZOOM⇒ **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 highlighed when the instrument function is active.

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

1.   Select the CH2 menu with the ◀ or ▶ cursor key [6].

2.   Press the CH2 ON **function key** in the CH2 **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 CH2 ON **function key** in

the CH2 **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".
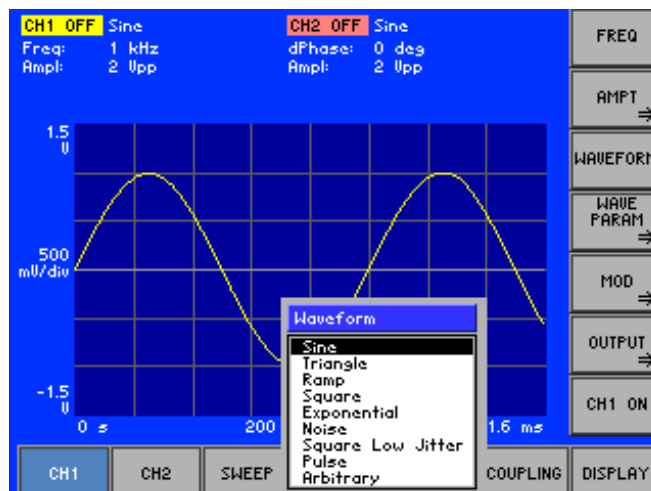
2. Select a waveform with **rotary knob** [11].
3. Press the **ENTER key** [5] to close the selection field.

   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.
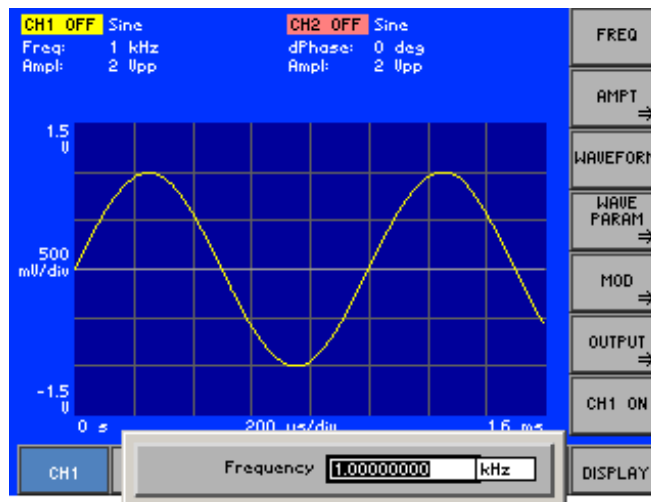
Entering
a new value

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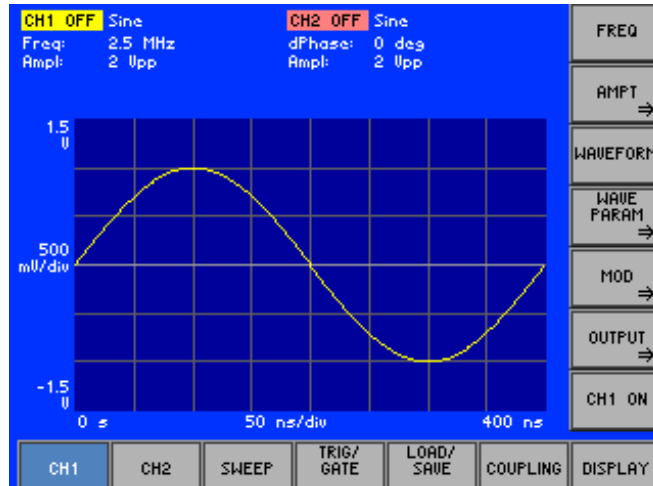
b) Press the **ENTER key** [5] to terminate the entry.

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 [AMPT⇒] **function key** in the [CH1] **menu.**

2. Press the [Upp] **function key** in the [AMPT⇒] **subenu.**

   An entry field containing the current setting is displayed.
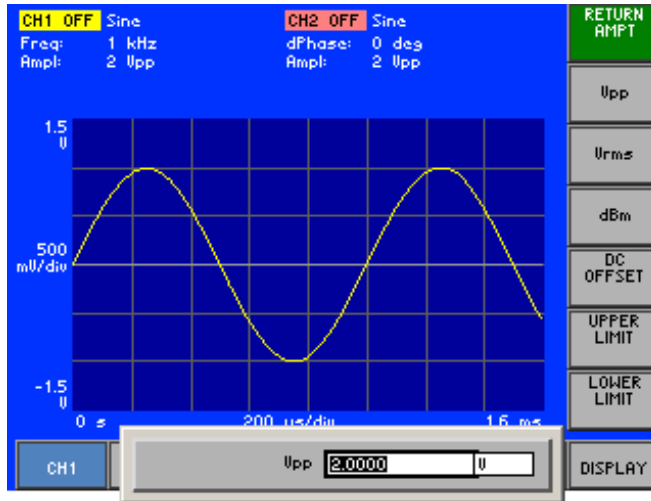
Entering
a new value,
e. g. 2.5

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

   $1 \times$ [►]   ⇨   [Upp 2.0000 U]
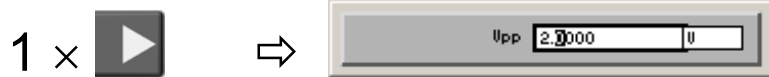
4. **a)** Press the ▼ or ▲ **cursor key** [7] until you obtain the value you want.

   Pressing the ▲ cursor key once increments the value by one; pressing the ▼ cursor key once decrements the value by one.

   $5 \times$ [▲]   ⇨   [Upp 2.5000 U]

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

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

   $5 \times$ (knob)   ⇨   [Upp 2.5000 U]

   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**.

   [kHz (m)]   ⇨   [U+ 2500.0 mU]
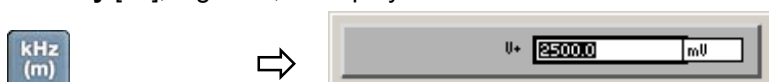
   The numerically set value is displayed using the **new unit**. The input window is **not** closed.

Terminating entries

6. **a)** Press the **ENTER key** [5] to terminate the entry.
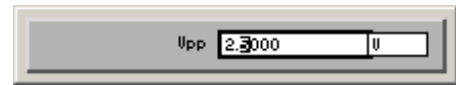
The R&S AM300 sets the value that has been set numerically but with the **old unit**. The entry window is closed.

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	Upp	U+	Uinf	Upp	Up	SCALING
	Urms	U-	U0			
	dBm	Upp				
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

| 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

MOD ⇒	**Open submenu:** Modulate waveform	
RETURN MOD	Exit submenu	
AM MOD ⇒	**Open submenu:** Set amplitude modulation	
	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)
FM MOD ⇒	**Open submenu:** Set frequency modulation	
	RETURN FM MOD	Exit submenu	
	FM FREQ	Set modulation frequency	(↗ 6-120)
	FM DEVIATION	Set modulation depth	(↗ 6-120)
	FM WAVEFORM	Select modulation signal	(↗ 6-119)
	FM ON	Switch modulation on/off	(↗ 6-121)
PM MOD ⇒	**Open submenu:** Set phase modulation	
	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)
FSK MOD ⇒	**Open submenu:** Set frequency shift keying	
	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)

PSK MOD →	**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)

OUTPUT →	**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)
SYNC →	**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)

CH1 ON	Switch on output channel 1	(↗ 6-143)

5.5.1.2 SWEEP Menu

Function key assignment

`SWEEP FREQ →`	**Open submenu:** Set the sweep frequency range	(↗ 6-147)
	`RETURN SWEEP FREQ` Exit submenu	
	`CENTER` Etering the center frequency	(↗ 6-148)
	`SPAN` Etering the frequency range	(↗ 6-148)
	`START` Etering the starting frequency	(↗ 6-149)
	`STOP` Etering the stopping frequency	(↗ 6-149)
`TRIGGER MODE`	Select trigger mode	(↗ 6-150)
`SWEEP SPACING`	Select sweep scaling	(↗ 6-151)
`FREQ MARKER →`	**Open submenu:** Set frequency marker	
	`RETURN FREQ MARKER` Exit submenu	
	`MARKER FREQ` Set marker frequency	(↗ 6-153)
	`MARKER ON` Switch frequency marker on/off	(↗ 6-153)
`SWEEP TIME`	Set sweep time	(↗ 6-151)
`EXEC SGL SWEEP`	Start once-only sweep	(↗ 6-150)
`SWEEP ON`	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)

EXEC 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**

CHANNEL ⇒	**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)

SCALING ⇒	**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)

ZOOM ⇒	**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

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

5.5.2.2 STATUS Menu

Function key assignment

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)

5.5.2.3 FILE Menu

Function key assignment

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

5.5.2.4 CONFIG Menu

Function key assignment

DATE/TIME	Sets the date and time	(↗ 6-205)
REF	Selects an internal or external reference source	(↗ 6-207)
INTERFACE	Configures the instrument interfaces	(↗ 6-209)
SCREEN SAVER	Sets the screen saver mode	(↗ 6-211)
MONITOR	Selects an internal or external monitor	(↗ 6-213)

5.5.2.5 SERVICE Menu

Function key assignment

SELFTEST	Performs a selftest	(↗ 6-214)

5.5.2.6 INFO Menu

Function key assignment

HARDWARE INFO	Displays module data	(↗ 6-216)
STATISTICS	Displays instrument statistics	(↗ 6-216)
SYSTEM MESSAGES	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

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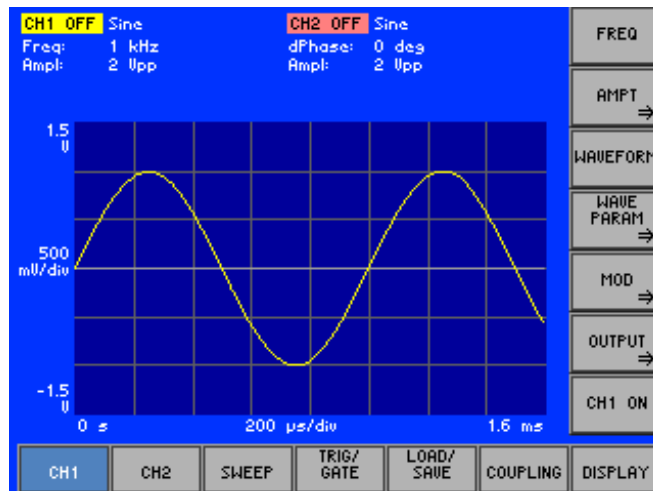
Menus for configuring and setting output parameters The menus used to set the generator functions are displayed in the menu area. The order of the menus mirrors that of the procedure for configuring and starting measurements:

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".

```
Waveform
 Sine
 Triangle
 Ramp
 Square
 Exponential
 Noise
 Square Low Jitter
 Pulse
 Arbitrary
```

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 %".

```
CH1 OFF  Square 50 %        CH2 OFF  Sine
Freq:    1 kHz              dPhase:  0 deg
Ampl:    2 Vpp             Ampl:    2 Vpp


 1.5
  V



 500
mV/div




-1.5
  V
     0 s          200 µs/div        1.6 ms
```
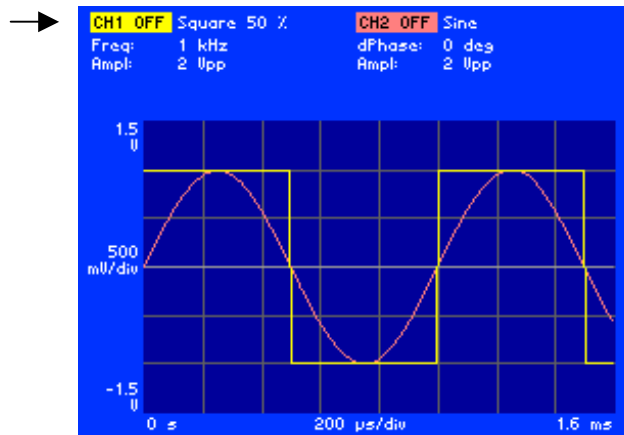
📄 **Note**

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".

    <div style="text-align:center">Frequency [1.00000000] kHz</div>

2. Enter a new value (↗ 5-55).

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

    $$f_{min} \leq \text{frequency} \leq f_{max} \qquad \text{in 10 µHz steps}$$

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

Frequency range of the waveforms

Waveform	f_{min}	f_{max}
Sine	10 µHz	35 MHz
Triangle, Ramp	10 µHz	500 kHz
Square	10 µHz	500 kHz
Exponential	10 µHz	500 kHz
Noise	35 MHz (bandwidth)	
Square Low Jitter	10 µHz	50 MHz
Pulse	100 µHz	16.6667 MHz
Arbitrary Normal	10 µHz	35 MHz
Arbitrary Sample Accurate	10 µHz	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.
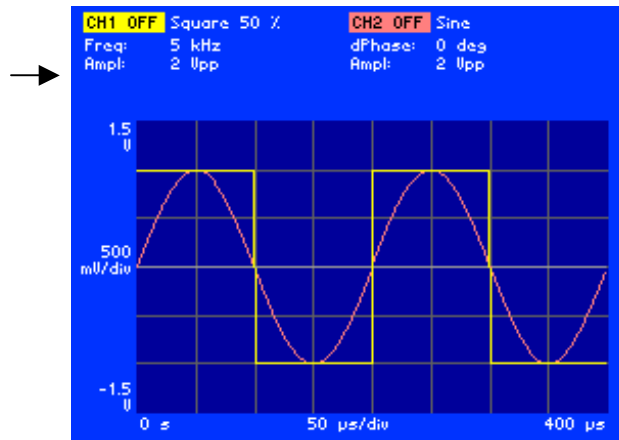
The currently applicable signal frequency is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Freq: 5 kHz".

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
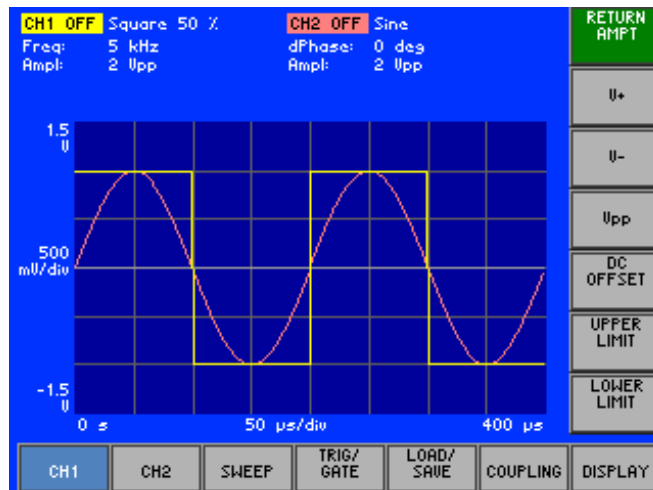
|	Sine	Triangle Ramp Square		Exponential	Noise	Pulse	Arbitrary
Signal amplitude	Upp Urms dBm	U+ U- Upp		Uinf U0		Upp	Up	SCALING
DC component	DC OFFSET	DC OFFSET			DC OFFSET	DC OFFSET	DC OFFSET
Output voltage limitation	UPPER LIMIT LOWER LIMIT	UPPER LIMIT LOWER LIMIT		UPPER LIMIT LOWER LIMIT	UPPER LIMIT LOWER LIMIT	UPPER LIMIT LOWER LIMIT	UPPER 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:
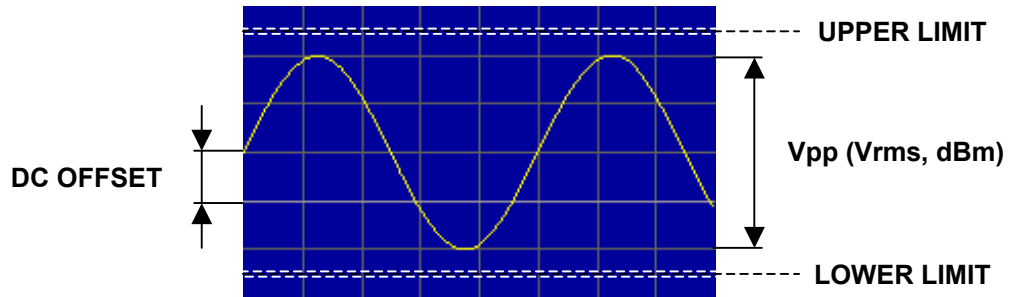
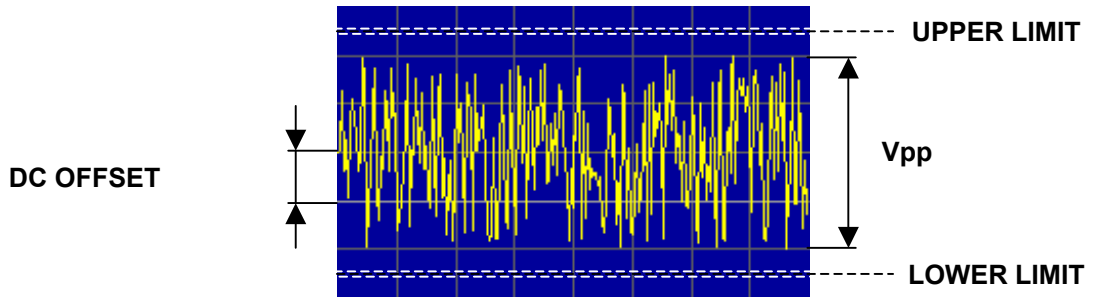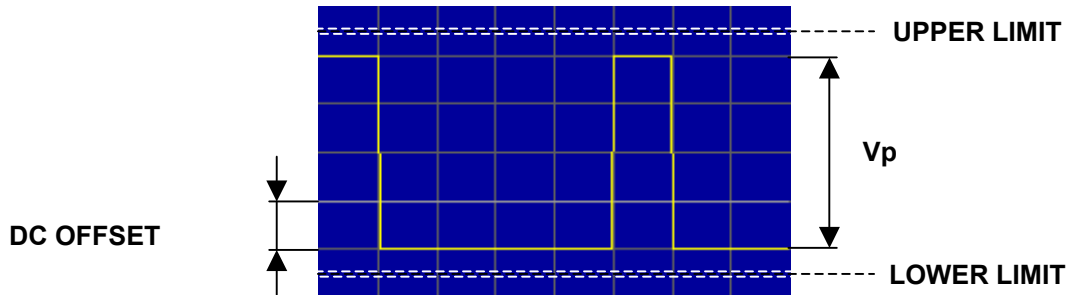**Selecting the AMPT submenu**

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 [Vpp] **function key**.

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

   Vpp [2.0000] [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:

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

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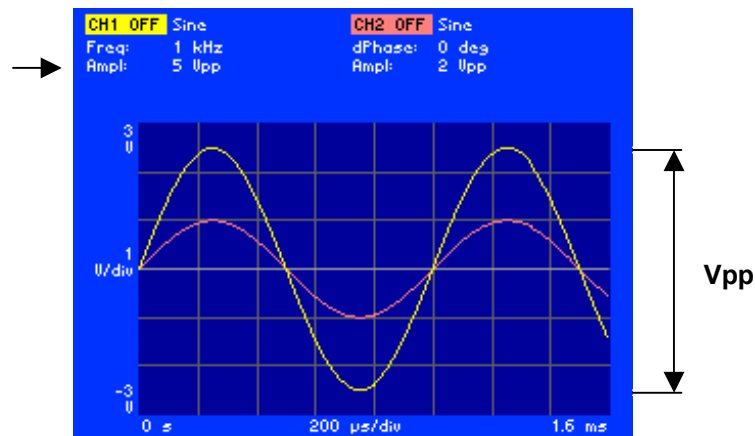
The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Ampl: 5 V_{pp}".

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$_\Rightarrow$ **submenu** press the Vrms **function key**.

   An entry field containing the current setting is displayed.

   Vpp (rms) 1.7678   V

2. Enter a new value ($\nearrow$ 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$_\Rightarrow$ **submenu** press the dBm **function key**.

   An entry field containing the current setting is displayed.

   Vpp (dBm) 17.9590   dBm

2. Enter a new value ($\nearrow$ 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 ($\nearrow$ 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.

    DC Offset [0.0000]   [U]

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:

    $DC_{min} \le DC$ offset $\le DC_{max}$ in 0.1 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
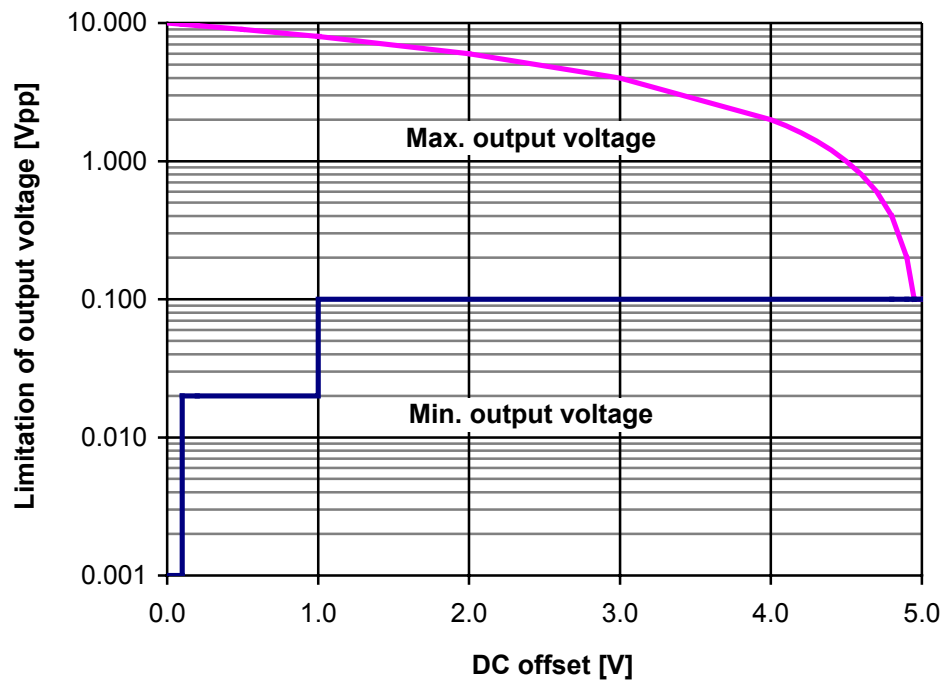
The DC offset and signal amplitude combinations that can be set are within the two limit lines.

$V_{out\_min} = 0.02\ V_{pp}$ for $0.1\ V \le |offset| < 1\ V$

$V_{out\_min} = 0.10\ V_{pp}$ for $1\ V \le |offset| \le 5\ V$

where: V_{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.
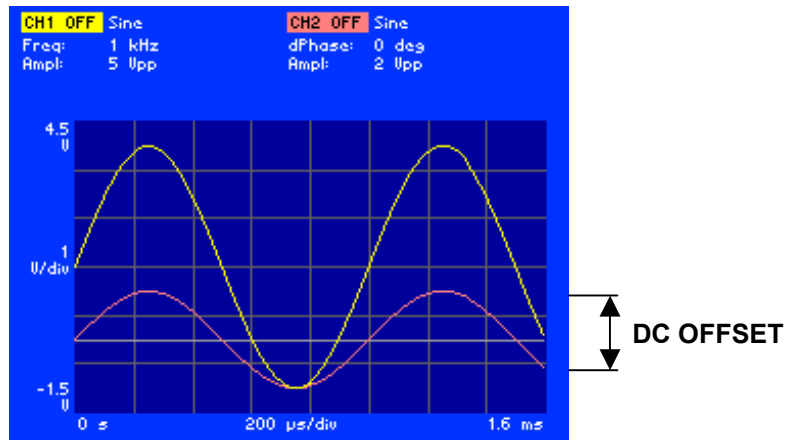
Setting the Limitation of the Output Voltage

| 📄 **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 [AMPT ⇒] **submenu** press the [UPPER LIMIT] **function key**.

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

   > Upper Limit **5.000**   U

3. Enter a new value (↗ 5-55).

   The permissible entry range for the UPPER LIMIT value is:

   +1 mV ≤ upper Limit ≤ +5 V   in 1 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 [AMPT ⇒] **submenu** press the [LOWER LIMIT] **function key**.

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

   > Lower Limit **-5.000**   U

3. Enter a new value (↗ 5-55).

   The permissible entry range for the LOWER LIMIT value is:

   -1 mV ≥ lower limit ≥ -5 V   in 1 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
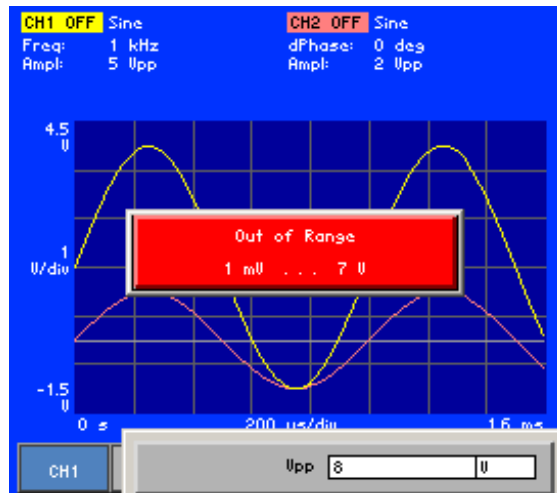
Note: Having acknowledged the message by pressing the **ENTER key** [5] you can repeat the setting.

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.

[RETURN AMPT]	Exit submenu	
[U+]	Set positive peak value	(↗ 6-86)
[U-]	Set negative peak value	(↗ 6-86)
[Upp]	Set signal amplitude as peak-to-peak value	(↗ 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)

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 ($\nearrow$ 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 $\boxed{\text{AMPT}_\Rightarrow}$ **submenu** press the $\boxed{\text{V+}}$ **function key**.

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

   $$\boxed{\text{V+} \quad \boxed{1.0000} \qquad \boxed{\text{V}}}$$

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

   The permissible entry range for the positive peak value is:

   0.5 mV $\leq$ V+ $\leq$ +5 V   in 0.1 mV steps

Setting a negative peak value V-

1. In the $\boxed{\text{AMPT}_\Rightarrow}$ **submenu** press the $\boxed{\text{V-}}$ **function key**.

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

   $$\boxed{\text{V-} \quad \boxed{-1.0000} \qquad \boxed{\text{V}}}$$

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

   The permissible entry range for the negative peak value is:

   -0.5 mV $\geq$ V- $\geq$ -5 V   in 0.1 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.
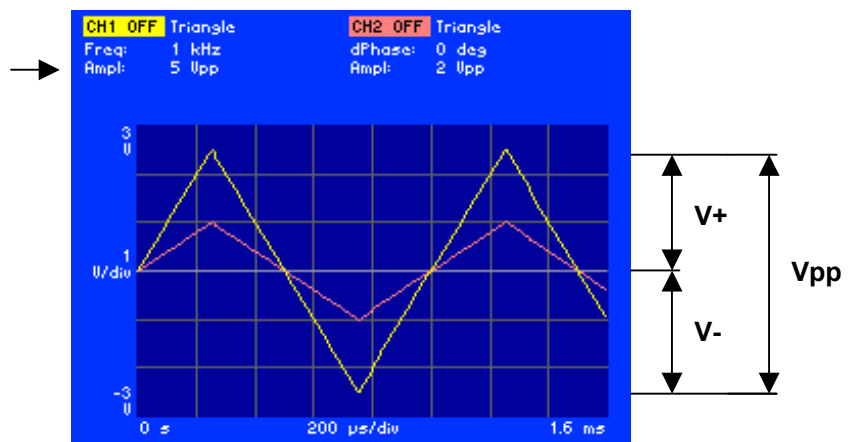
The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Ampl: 5 V$_{pp}$".

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:
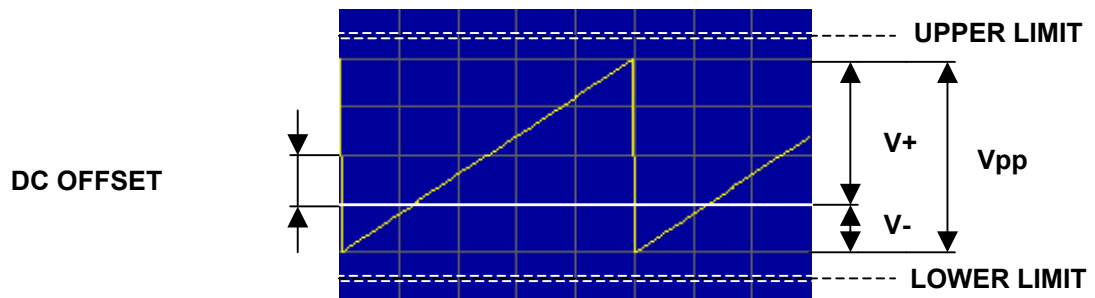
Selecting the AMPT submenu

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.

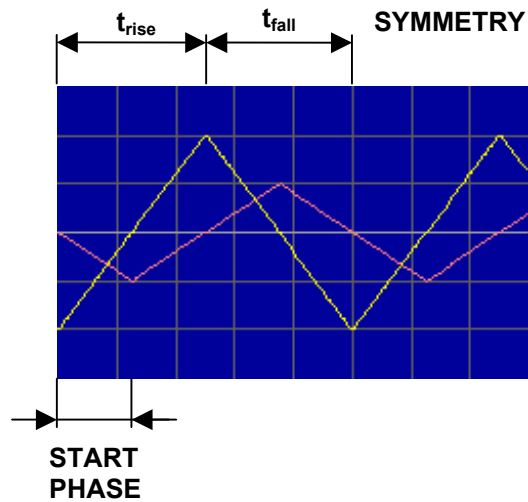|		
[RETURN AMPT]	Exit submenu	
[U+]	Set positive peak value	(↗ 6-86)
[U-]	Set negative peak value	(↗ 6-86)
[Upp]	Set signal amplitude as peak-to-peak value	(↗ 6-79)
[DC OFFSET]	Set DC component	(↗ 6-81)
[UPPER LIMIT]	Set upper limit for output voltage	(↗ 6-83)
[LOWER LIMIT]	Set lower limit for output voltage	(↗ 6-83)

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:
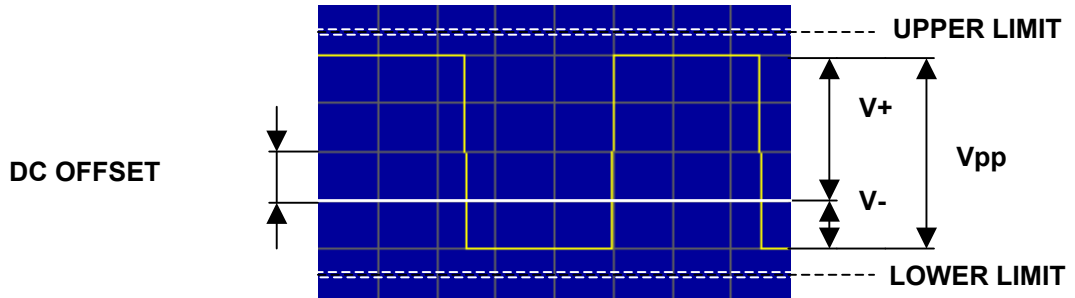
Selecting the AMPT submenu

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.

RETURN AMPT	Exit submenu	
U+	Set positive peak value	(↗ 6-86)
U–	Set negative peak value	(↗ 6-86)
Upp	Set signal amplitude as peak-to-peak value	(↗ 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)

6.2.1.3.5 EXPONENTIAL Waveform

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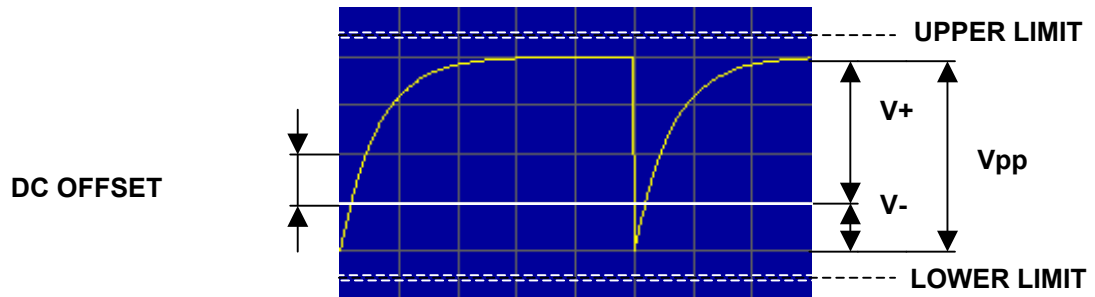
Selecting the AMPT submenu

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.

RETURN AMPT	Exit submenu	
U+	Set positive peak value	(↗ 6-86)
U–	Set negative peak value	(↗ 6-86)
Upp	Set signal amplitude as peak-to-peak value	(↗ 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)

6.2.1.3.6 NOISE Waveform

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

DC OFFSET

UPPER LIMIT

Vpp

LOWER LIMIT

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.

RETURN AMPT	Exit submenu	
Vpp	Set signal amplitude as peak-to-peak value	(↗ 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)

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.

RETURN AMPT	Exit submenu	
Up	Set absolute value of amplitude	(↗ 6-92)
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)

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 [AMPT $\Rightarrow$] **submenu** press the [Up] **function key**.

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

   | Up | 2.0000 | U |

2. Enter a new value (↗ 5-55).

   The permissible entry range for the absolute value is:

   $0 \text{ mV} \leq V_p \leq 10 \text{ V}$ in 0.1 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.
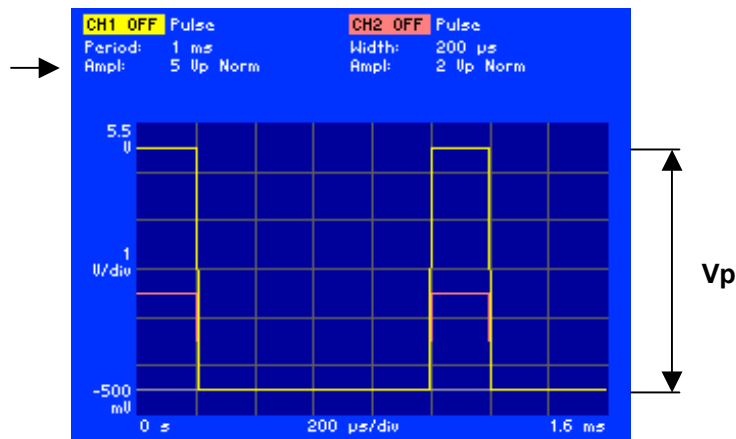
The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Ampl: 5 Vp Norm". The extension "Norm" indicates that the pulse is not inverted (↗ 6-108).

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.
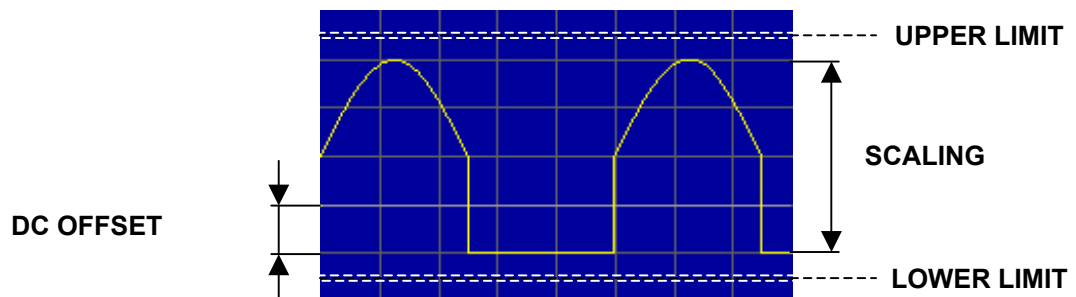
Selecting the AMPT submenu

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.

RETURN AMPT	Exit submenu	
SCALING	Set scaling	(↗ 6-94)
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)

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:

$$V_{pp} = V'pp * scaling$$

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.

Waveform memory   **Output voltage with scaling = 3 V/Full Scale**
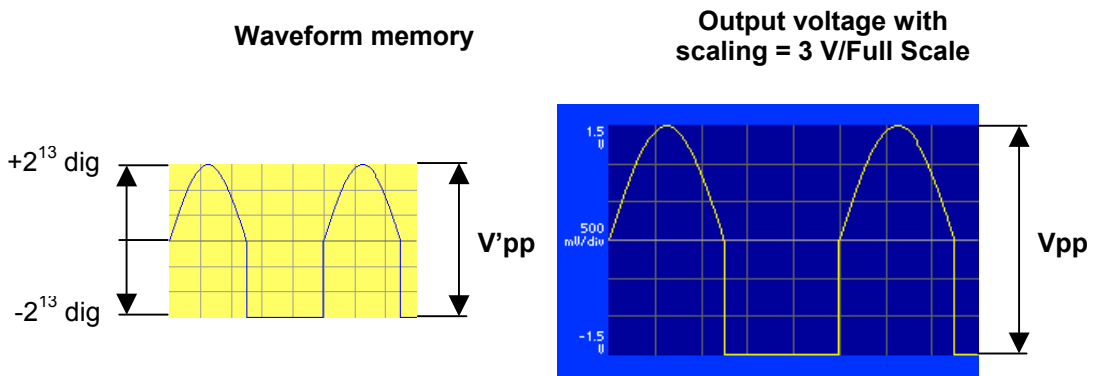
Setting the scaling

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 (↗ 5-55).

The permissible entry range for the scale factor is:

1 mV ≤ scaling ≤ 10 V   in 0.1 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.
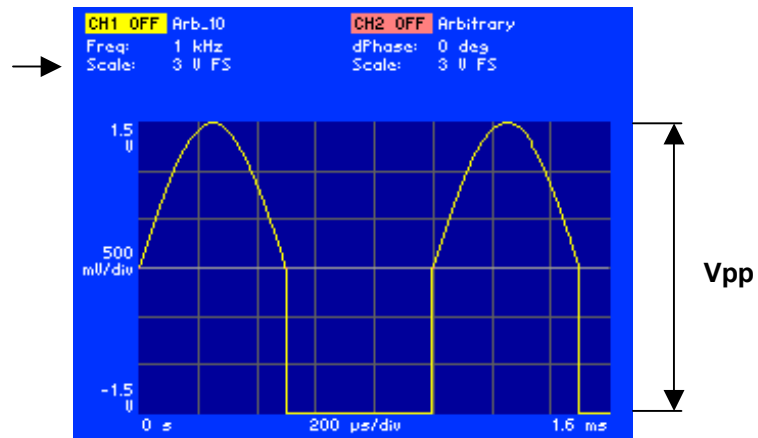
The currently applicable signal amplitude is displayed in the parameter field below the channel name CH1 or CH2, e.g. for CH1 "Scale: 3 V FS". The extensions "FS" stands for Full Scale.

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 SYM-METRY	START PHASE RECT DUTY	START PHASE POLARITY	PULSE PERIOD PULSE WIDTH POLARITY	START PHASE LOAD FROM MEMORY 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 .
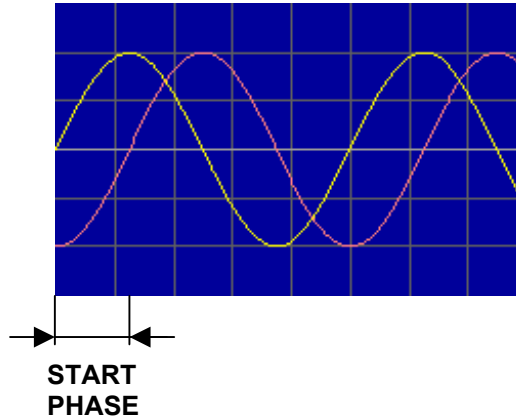
**START
PHASE**

Selecting the   **1.**   Select the **Sine** waveform (↗ 6-72).
WAVE PARAM
submenu   **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)

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   **1.**   In the [WAVE PARAM ⇒] **submenu** press the [START PHASE] **function key**.
start phase

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

Start Phase [0]   deg

2.   Enter a new value (↗ 5-55).

The permissible entry range for the start phase is:

-180 deg ≤ start phase ≤ +180 deg   in 0.01° 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.
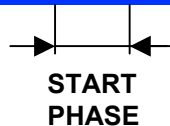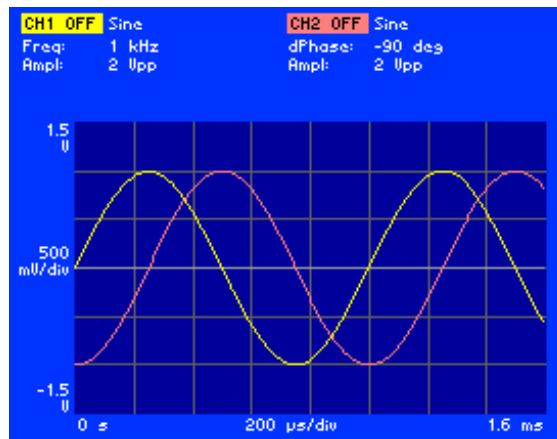
**START
PHASE**

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
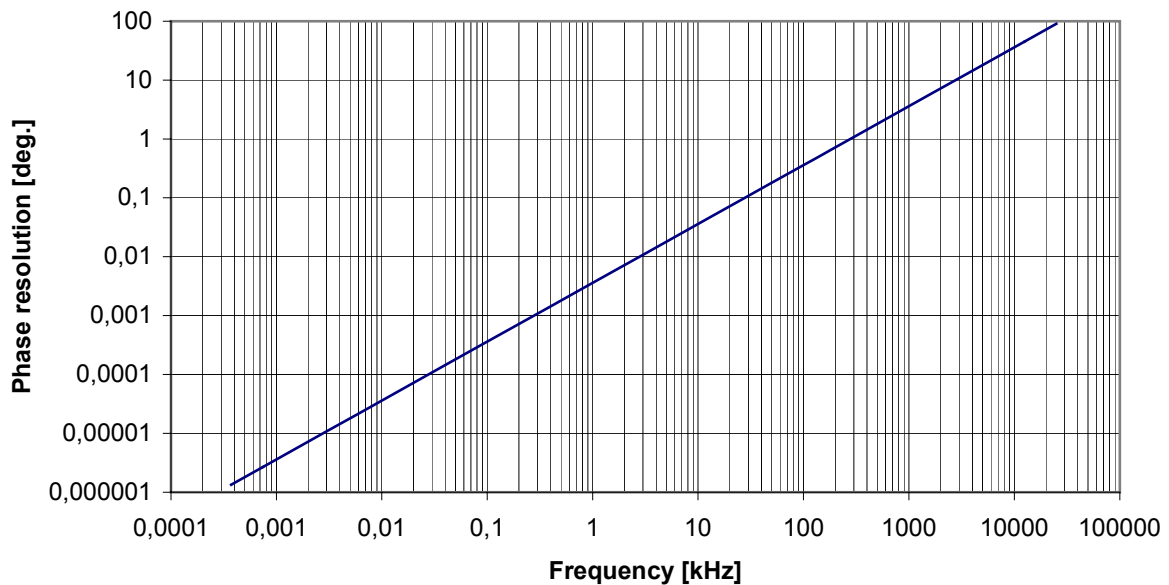
6.2.1.4.2   **TRIANGLE Waveform**

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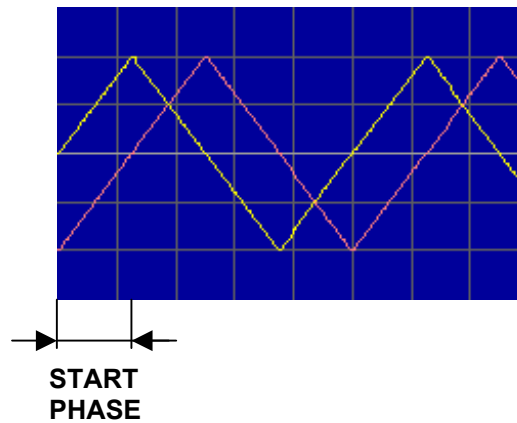
**START
PHASE**

**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   **1.** Select the **Ramp** waveform (↗ 6-72).
WAVE PARAM
submenu   **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
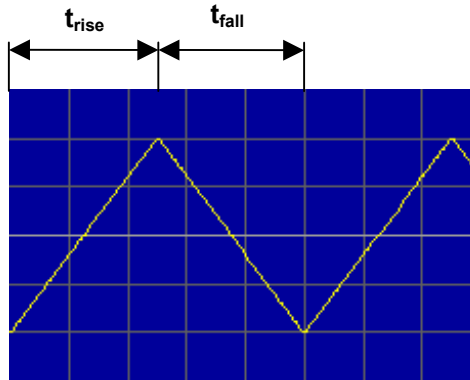
The symmetry of the **Ramp** waveform can be set via the ratio between the length of the rising edge t_{rise} and the total period of the signal $t_{rise} + t_{fall}$.

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

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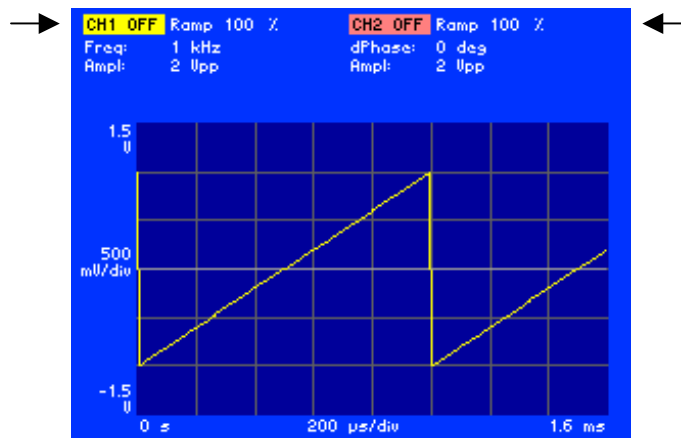
The currently applicable symmetry of the waveform is displayed in the parameter field beside the channel name, e.g. "CH1: Ramp 100 %".

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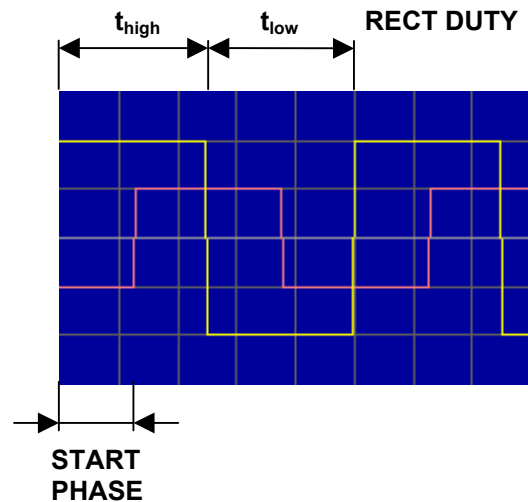
Selecting the   1.   Select the **Square** or **Square Low Jitter** waveform (↗ 6-72).
WAVE PARAM
submenu   2.   In the [CH1] **menu** press the [WAVE PARAM ⇒] **function key**.

                               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)

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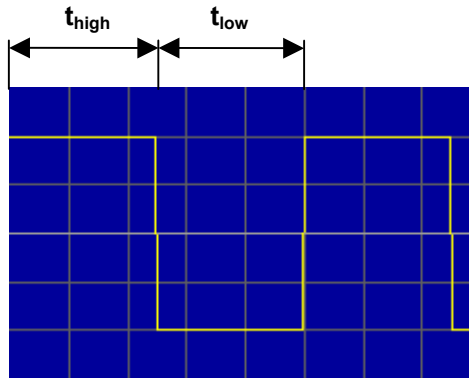
The duty cycle for a squarewave signal can be set via the ratio of the length of the high state t_{high} to the total period of the signal $t_{high} + t_{low}$.

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

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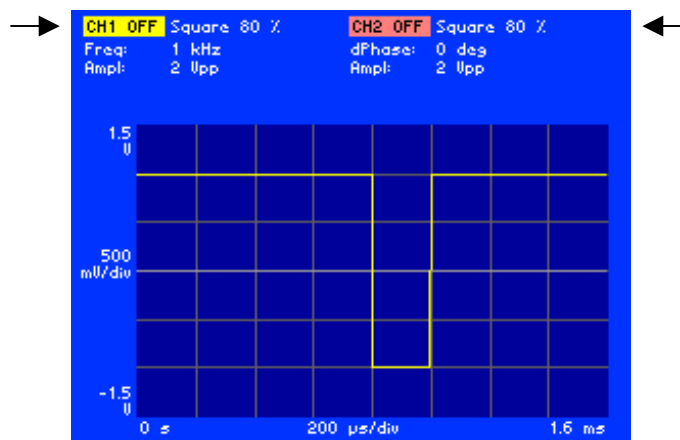
The currently applicable duty cycle of the waveform is displayed in the parameter field beside the channel name, e.g. "CH1: Square 80 %".

6.2.1.4.4   EXPONENTIAL Waveform

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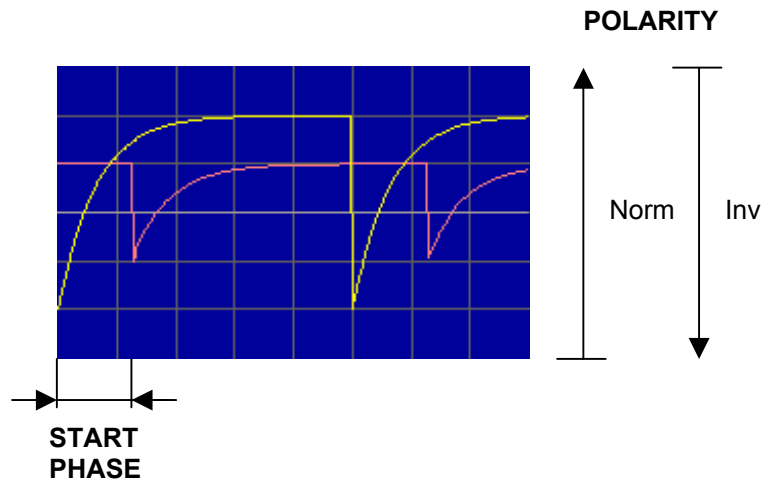
POLARITY

START
PHASE

Selecting the   **1.**   Select the **Exponential** waveform (↗ 6-72).
WAVE PARAM
submenu   **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)
POLARITY	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*π (= 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*π*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.

| Normal | Inverted |
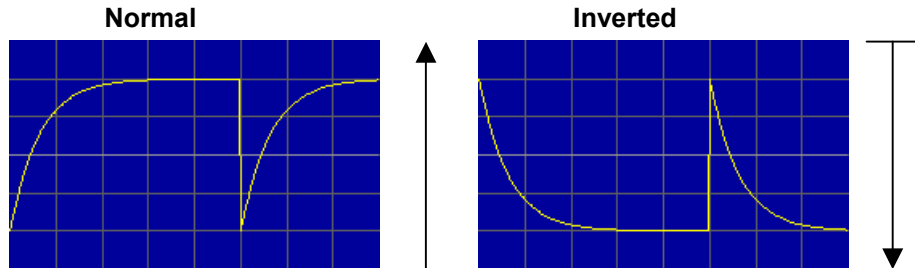
Setting the polarity

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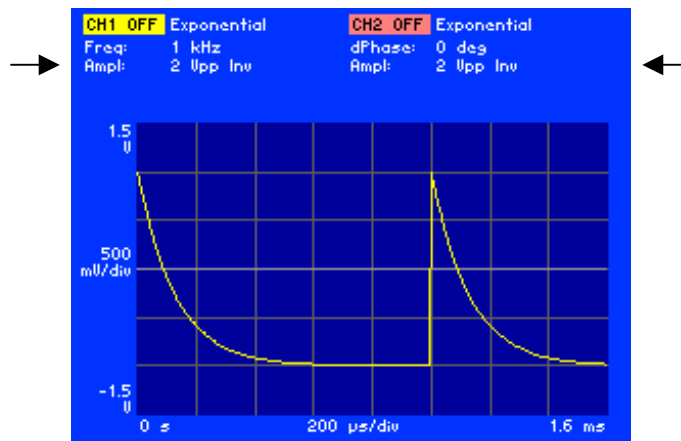
      The amplitude and currently applicable polarity of the waveform are displayed in the parameter field below the channel name, e.g. "CH1: Ampl: 2 V_{pp} Inv".

6.2.1.4.5   PULSE Waveform

Application   You can set the following parameters for the **Pulse** waveform:
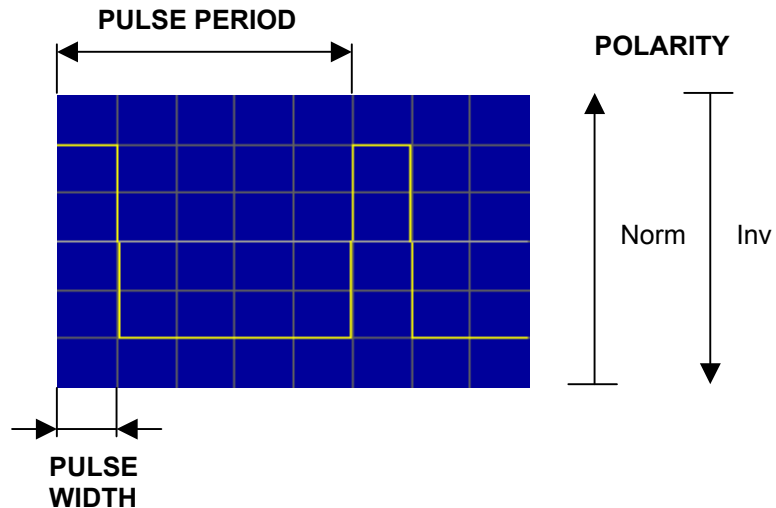
Selecting the   **1.**   Select the **Pulse** waveform (↗ 6-72).
WAVE PARAM
submenu   **2.**   In the ⬛cH1 **menu** press the [WAVE PARAM ⇒] **function key**.

                          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.

   Pulse Period [1.00000] ms

2. Enter a new value (↗ 5-55).

   The permissible entry range for the pulse period is:

   70 ns ≤ pulse period ≤ 9999 s   in 10 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.

   Pulse Width [200.00] µs
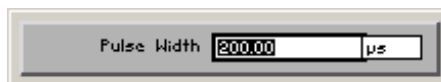
4. Enter a new value (↗ 5-55).

   The permissible entry range for the pulse width is:

   20 ns ≤ pulse width ≤ 9999 s   in 10 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.

PULSE WIDTH
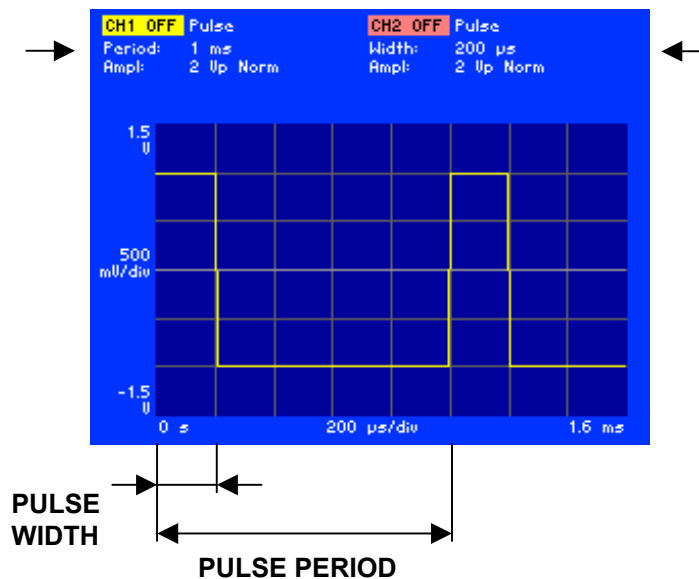
PULSE PERIOD

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:
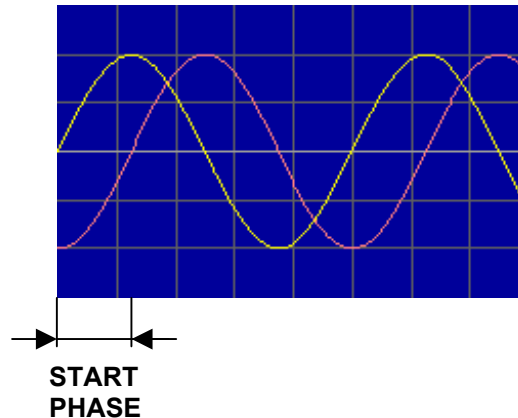
START
PHASE

**Selecting the
WAVE PARAM
submenu**

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

2. In the **menu** press the **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 Abitrary 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 [WAVE PARAM →] **submenu** press the [ARB MODE] **function key**.

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

Arbitrary Mode
Normal
Sample Accurate

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.

   Sample Freq [100.0000000000] MHz

2. Enter a new value (↗ 5-55).

   The permissible entry range for the transmission rate is:

   10 µHz ≤ sample freq ≤ 100 MHz in 10 µHz 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.
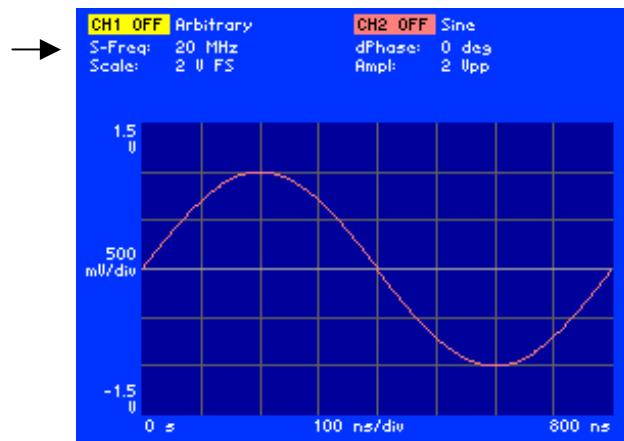
The currently applicable sample frequency is displayed in the parameter field below the channel name CH1, e.g. "S-Freq: 20 MHz".

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

			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.
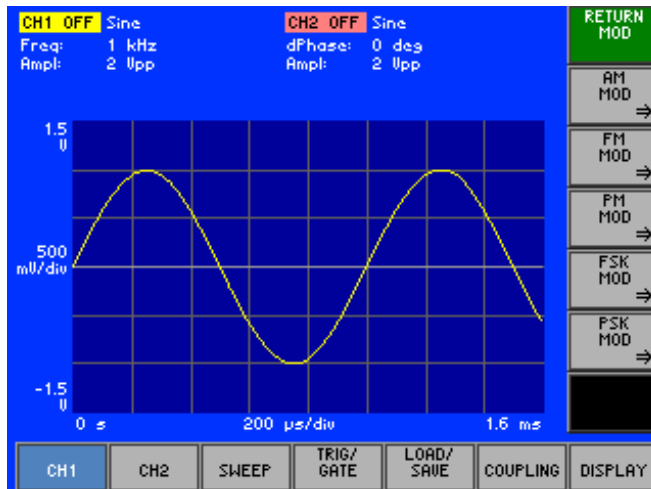
Function key assignment

RETURN MOD	Exit submenu	
AM MOD ⇒	**Open submenu:** Set amplitude modulation	(↗ 6-114)
FM MOD ⇒	**Open submenu:** Set frequency modulation	(↗ 6-118)
PM MOD ⇒	**Open submenu:** Set phase modulation	(↗ 6-122)
FSK MOD ⇒	**Open submenu:** Set frequency shift keying	(↗ 6-126)
PSK MOD ⇒	**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:
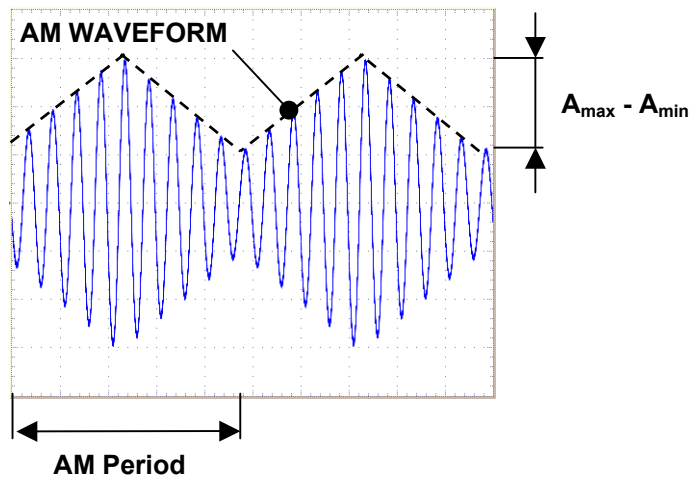
Selecting the AM MOD submenu

- 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 〔 AM MOD ⇒ 〕 **submenu** press the 〔 AM WAVEFORM 〕 **function key**.

A selection field containing the specified settings is displayed. The default setting is "Sine".
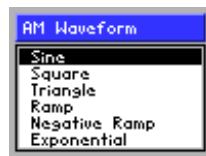
2. Use the **rotary knob** [11] to select a setting.

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 [AM MOD ⇒] submenu press the [AM FREQ] **function key**.

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

   AM Frequency [100.00] [Hz]
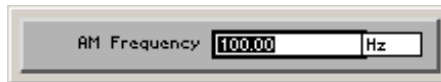
2. Enter a new value (↗ 5-55).

   The permissible entry range is:

   10 mHz ≤ Frequency ≤ 100 kHz   in 10 µHz steps

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

Setting the Modulation Depth
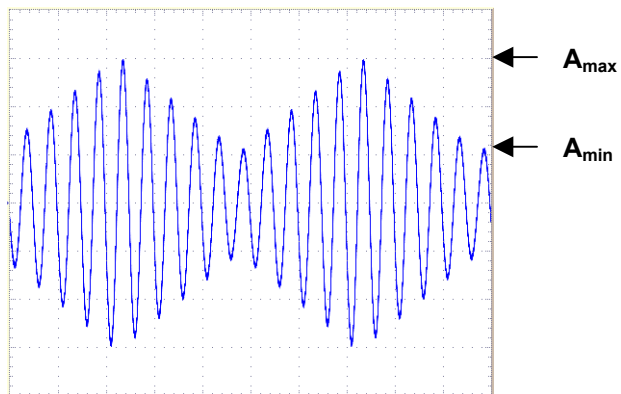
Application

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 [AM MOD ⇒] submenu press the [AM DEPTH] **function key**.

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

   AM Depth [50.0] [%]

2. Enter a new value (↗ 5-55).

   The permissible entry range for the modulation depth is.

   0 % ≤ AM Depth ≤ 100 %   in 1 % 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 [AM MOD ⇒] **submenu** press the [AM ON] **function key**.

    The function key is highlighted.
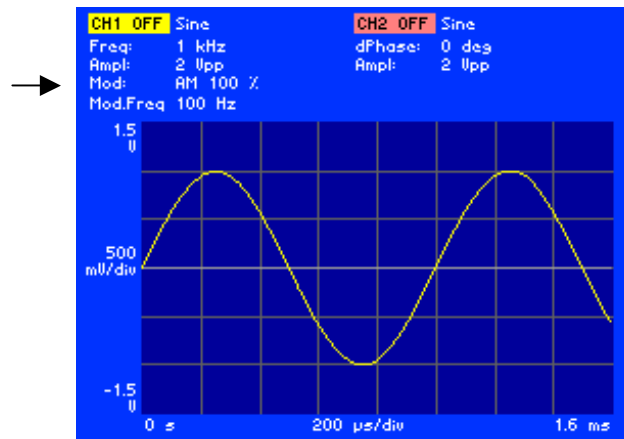
Display

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 [AM MOD ⇒] **submenu** press the [AM ON] **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.
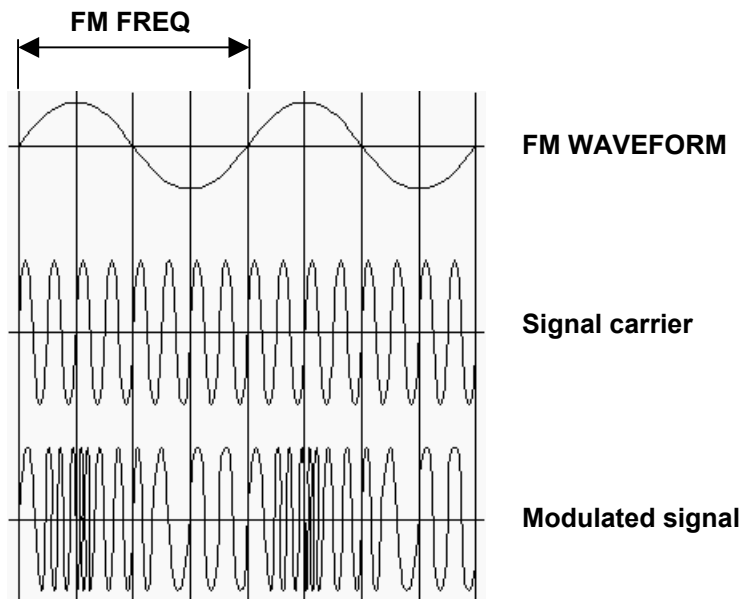
Selecting the FM MOD submenu

- 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 [FM MOD ⇒] **submenu** press the [AM WAVEFORM] **function key**.

    A selection field containing the specified settings is displayed. The default setting is "Sine".
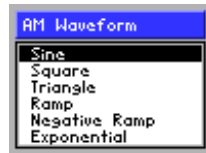
2. Use the **rotary knob** [11] to select a setting.
3. Press the **ENTER key** [5] to close the selection field.

    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 [FM MOD ⇒] **submenu** press the [AM FREQ] **function key**.

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

   FM Frequency [100.00] Hz
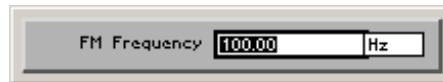
2. Enter a new value (↗ 5-55).

   The permissible entry range is:

   10 mHz ≤ FM Frequency ≤ 100 kHz   in 10 µHz 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 [FM MOD ⇒] **submenu** press the [FM DEVIATION] **function key**.

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

   FM Deviation [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 [FM MOD ⇒] **submenu** press the [FM ON] **function key**.

The function key is highlighted.
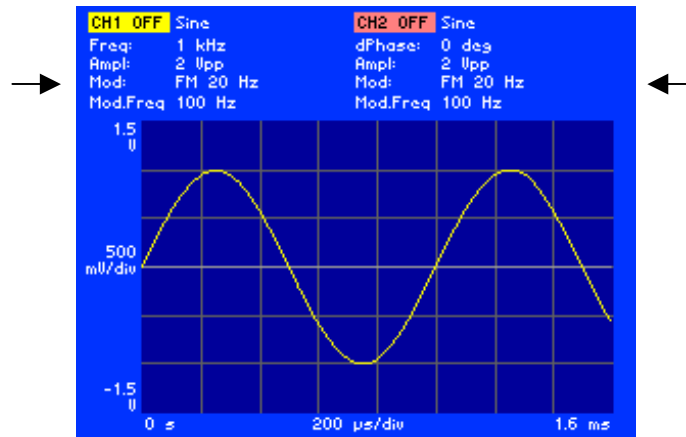
Display

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 [FM MOD ⇒] **submenu** press the [FM ON] **function key**.

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

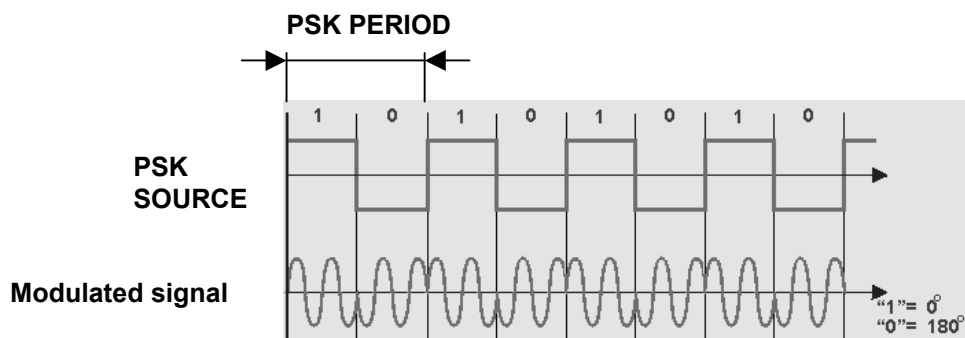📄 **Note**   To deliver the output signal to the output complete with all the functions and parameters that have been set, you need to switch the channel on (↗ 6-143).

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.

PM FREQ

PM WAVEFORM

Signal carrier

Modulated signal
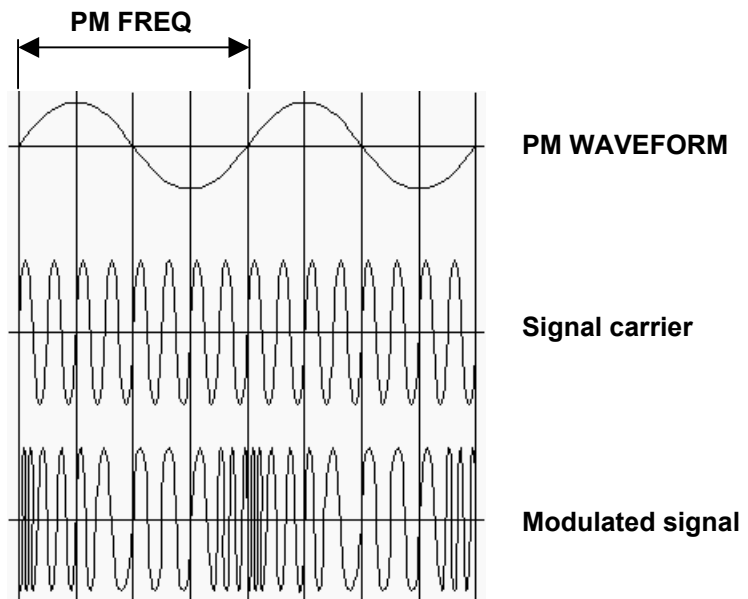
Selecting the PM MOD submenu

- 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 ⎡PM MOD⎤⇒ **submenu** press the ⎡PM WAVEFORM⎤ **function key**.

   A selection field containing the specified settings is displayed. The default setting is "Sine".
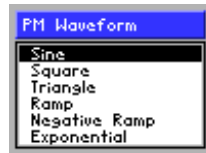
2. Use the **rotary knob** [11] to select a setting.

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 [PM MOD ⇒] **submenu** press the [PM FREQ] **function key**.

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

   > PM Frequency [100.00] Hz
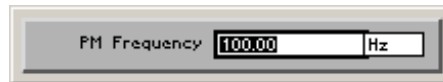
2. Enter a new value (↗ 5-55).

   The permissible entry range is:

   10 mHz ≤ PM Frequency ≤ 100 kHz   in 10 µHz 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 [PM MOD ⇒] **submenu** press the [PM PHASE] **function key**.

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

   > PM Phase [0.00] deg

2. Enter a new value (↗ 5-55).

   The permissible entry range for the phase deviation is:

   0 deg ≤ PM Phase ≤ 360 deg   in 0.01° 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 [PM MOD ⇒] **submenu** press the [PM ON] **function key**.

The function key is highlighted.
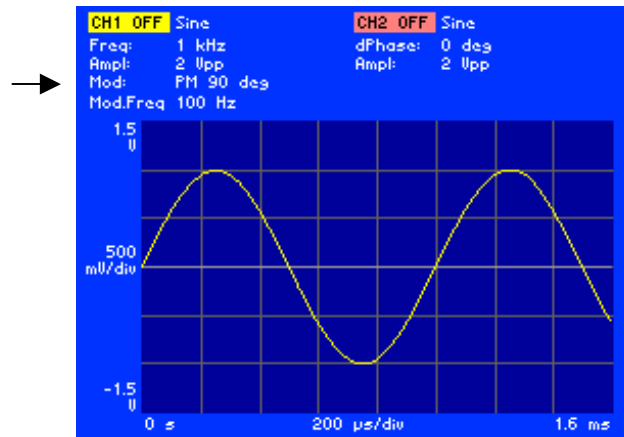
Display

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 [PM MOD ⇒] **submenu** press the [PM ON] **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.

FSK PERIOD

FSK SOURCE

Modulated signal
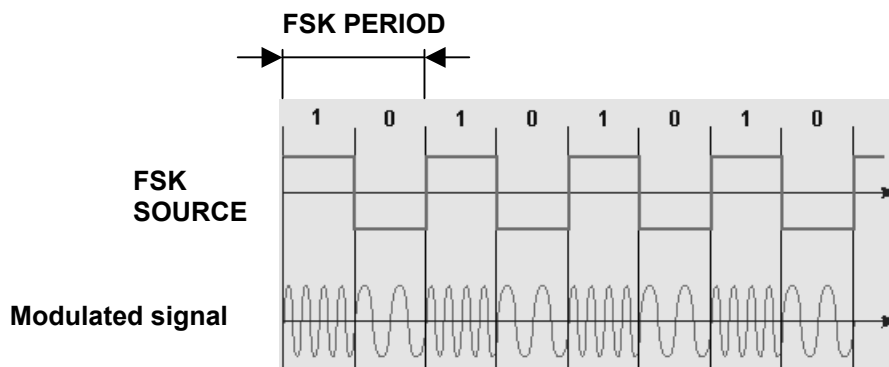
Selecting the FSK MOD submenu

- In the $\boxed{\text{MOD} \Rightarrow}$ **submenu** press the $\boxed{\text{FSK MOD} \Rightarrow}$ **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 [FSK MOD ⇒] **submenu** press the [FSK SOURCE] **function key**.

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

```
FSK Source
Internal
External
```

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 [FSK MOD ⇒] **submenu** press the [FSK FREQ] **function key**.

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

```
FSK Frequency  1.000000    Hz
```

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

101 µHz ≤ FSK Frequency ≤ 2 MHz   in 1 µHz steps

Setting the FSK period	**1.** In the `FSK MOD ⇒` **submenu** press the `FSK PERIOD` **function key**.

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

FSK Period 1.0000000 s

2. Enter a new value (↗ 5-55).

The permissible entry range is:

500 ns ≤ FSK Period ≤ 9901 s   in 10 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 `FSK MOD ⇒` **submenu** press the `HOPPING FREQ` **function key**.

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

Hopping Frequency 100.00 Hz

2. Enter a new value (↗ 5-55).

The permissible entry range for the hopping frequency is:

10 mHz ≤ Hopping Frequency ≤ f_{max} in 10 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 `WAVE PARAM ⇒` **submenu** press the `POLARITY` **function key**.

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

Polarity
High
Low

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.
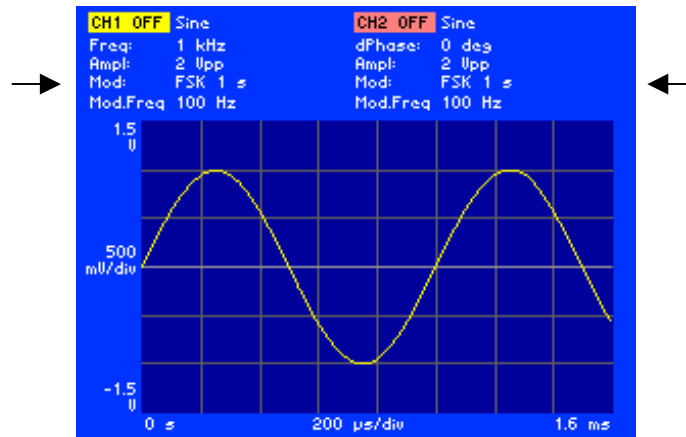
Display

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 [PSK MOD ⇒] **function key**.

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

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)

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 PSK MOD ⇒ **submenu** press the PSK SOURCE **function key**.

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

   PSK Source
   Internal
   External

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 PSK MOD ⇒ **submenu** press the PSK FREQ **function key**.

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

   PSK Frequency 1.000000 Hz

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

   101 µHz ≤ PSK Frequency ≤ 2 MHz   in 1 µHz steps

Setting the PSK period

1. In the [PSK MOD ⇒] **submenu** press the [PSK PERIOD] **function key**.

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

   PSK Period [1.0000000] s

2. Enter a new value (↗ 5-55).

   The permissible entry range is:

   500 ns ≤ PSK Period ≤ 9901 s   in 100 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 [PSK MOD ⇒] **submenu** press the [PSK PHASE] **function key**.

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

   PSK Phase [0.00] deg
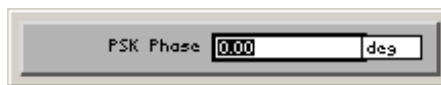
2. Enter a new value (↗ 5-55).

   The permissible entry range for the phase shift is:

   0 deg ≤ PSK Phase ≤ 360 deg   in 0.01° 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 [WAVE PARAM ⇒] **submenu** press the [POLARITY] **function key**.

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

   Polarity
   High
   Low

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 [PSK MOD ⇒] **submenu** press the [PSK ON] **function key**.

The function key is highlighted.
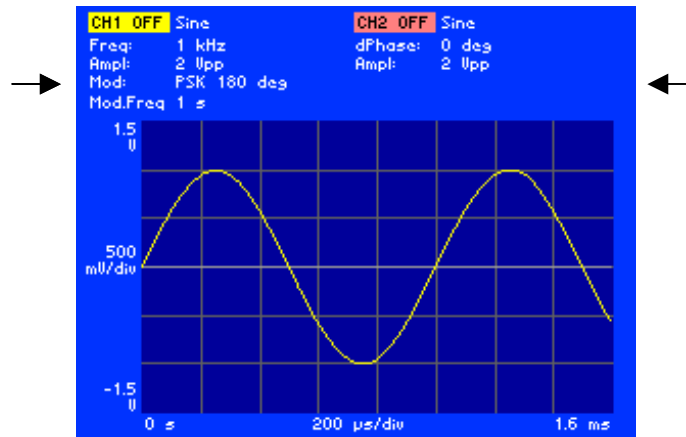
Display

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 s".

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 [PSK MOD ⇒] **submenu** press the [PSK ON] **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.
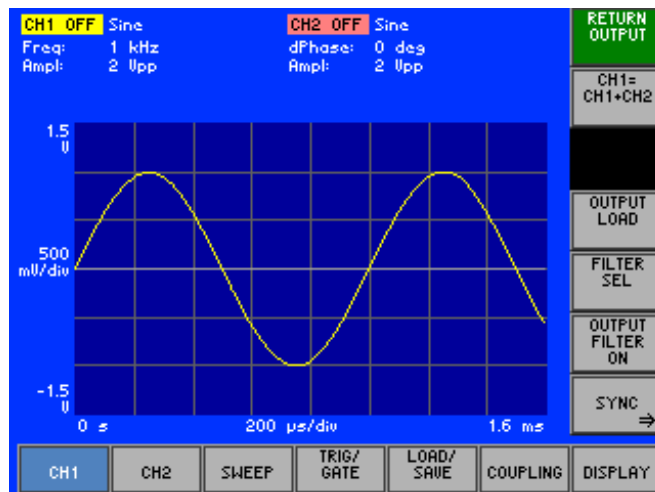
Function key assignment

[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 `CH1= CH1+CH2` 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.

CH1

+

CH2

=
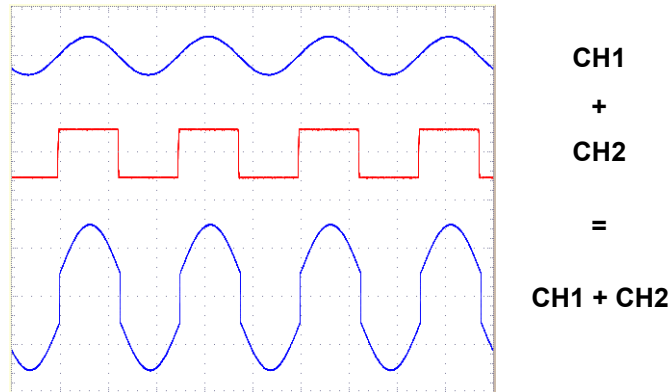
CH1 + CH2

Switching channel summing on/off

1. In the `OUTPUT ⇒` **submenu** press the `CH1= CH1+CH2` **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 `OUTPUT ⇒` **submenu** press the `CH1= CH1+CH2` **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 OUTPUT⇒ **menu** press the OUTPUT LOAD **function key**.

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

   Output Load [50] Ohm

2. Enter a new value (↗ 5-55).

   The permissible entry range for the output load is:

   1 $\Omega \leq$ Output Load $\leq$ 1 MΩ   **in 1 Ω steps**

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

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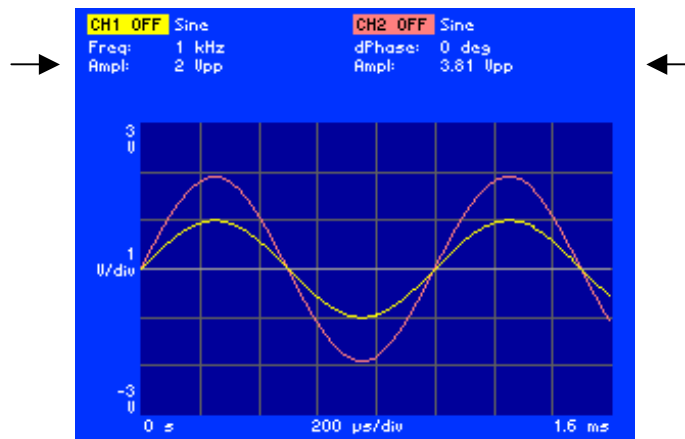
The currently applicable output voltage for the output load concerned is displayed in the parameter field below both channel names CH1 and CH2, e.g.: for CH1 at 50 Ω "Ampl: 2 V_{pp}"
            for CH2 at 1 kΩ "Ampl: 3.81 V_{pp}".

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 ⎡OUTPUT⇒⎤ **submenu** press the ⎡FILTER SEL⎤ **function key**.

    A selection field containing specified settings is displayed. The default setting is "Auto".
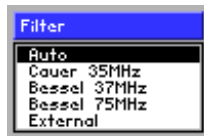
2. Use the **rotary knob** [11] to select a setting.

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 | OUTPUT ⇒ | **submenu** press the | OUTPUT FILTER ON | **function key**.

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

Output lowpass
OFF
ON
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.
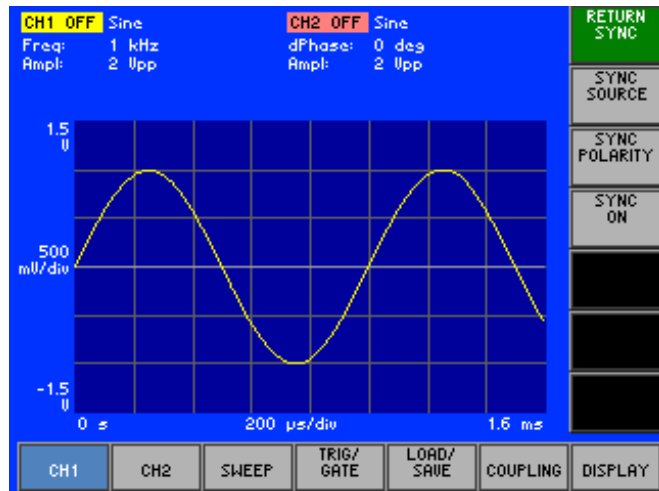
Function key assignment

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.

WAVEFORM
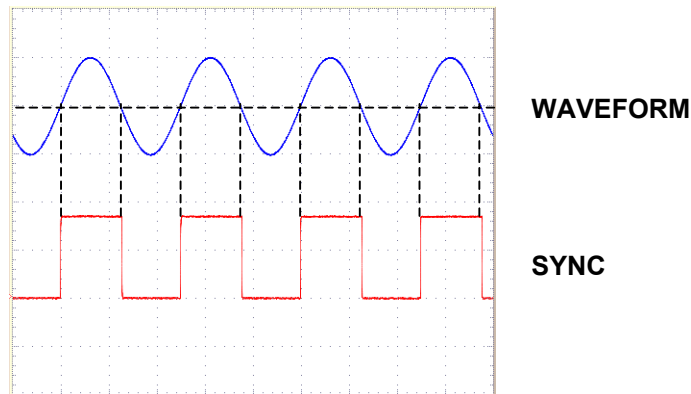
SYNC

▪ **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.

WAVEFORM
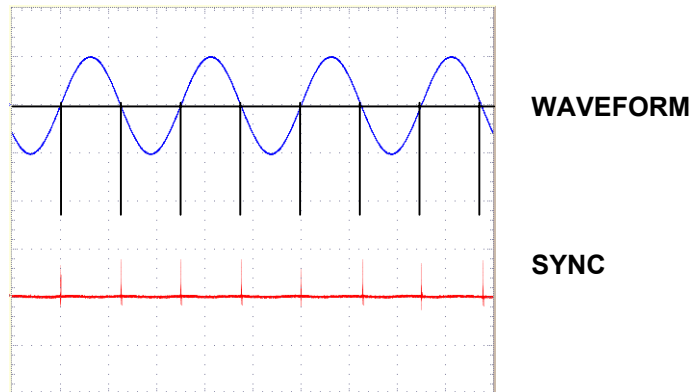
SYNC

- **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 [SYNC⇒] **submenu** press the [SYNC SOURCE] **function key**.

   A selection field containing specified settings is displayed. The default setting is "Comparator".
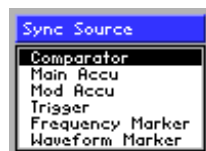
2. Use the **rotary knob** [11] to select a setting.

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 SYNC ⇒ **submenu** press the SYNC POLARITY **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 SYNC ⇒ **submenu** press the SYNC ON **function key**.

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

2. In the SYNC ⇒ **submenu** press the SYNC ON **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
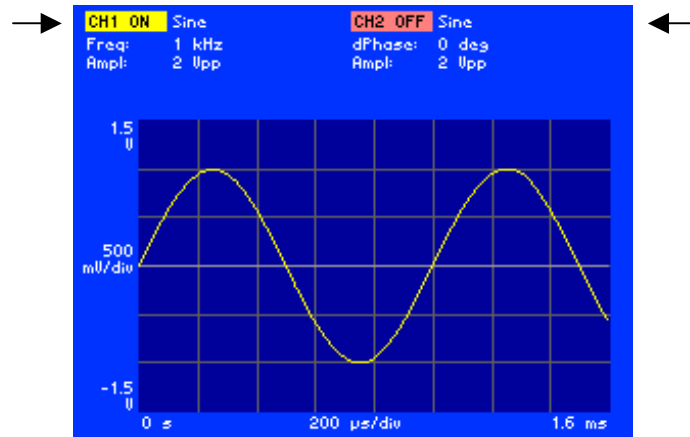
The currently applicable status is displayed in the parameter field beside the channel names, e.g. "CH1 ON", "CH2 OFF".

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
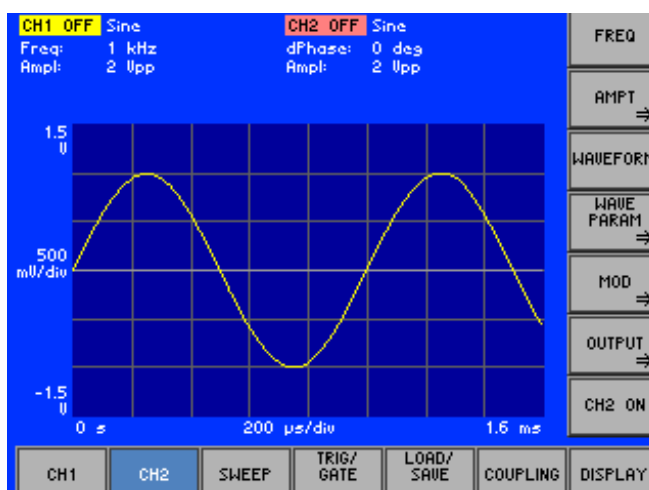
| FREQ | Set the frequency of the current waveform | (↗ 6-75) |

| 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
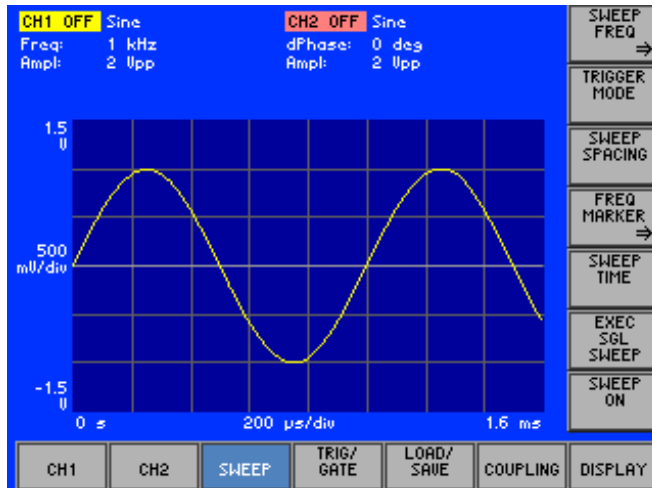
Key	Function	Reference
SWEEP FREQ ⇒	**Open submenu:** Set the sweep frequency range	(↗ 6-147)
TRIGGER MODE	Select trigger mode	(↗ 6-150)
SWEEP SPACING	Select sweep scaling	(↗ 6-151)
FREQ MARKER ⇒	**Open submenu:** Set frequency marker	(↗ 6-152)
SWEEP TIME	Set sweep time	(↗ 6-151)
EXEC SGL SWEEP	Start once-only sweep	(↗ 6-150)
SWEEP ON	Switch SWEEP operating mode on/off	(↗ 6-154)

📄 **Note**   The [EXEC SGL SWEEP] 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

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

Selecting the SWEEP FREQ submenu

- 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

`RETURN SWEEP FREQ`   Exit submenu
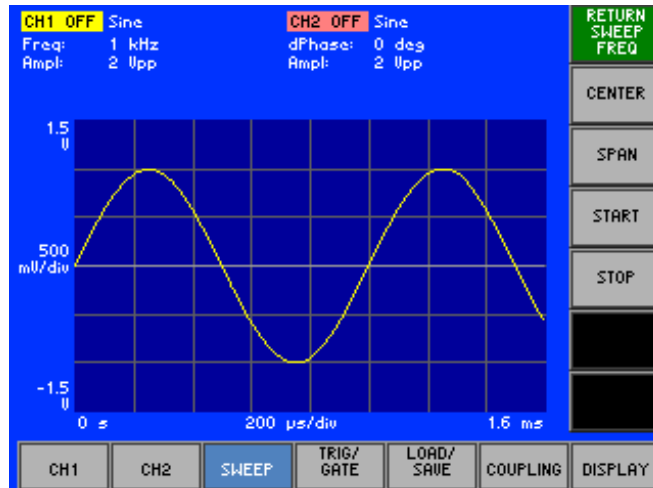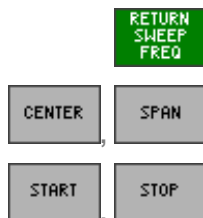
`CENTER` , `SPAN`   **1st method:** Set frequency range   (↗ 6-148)
For entering the center frequency (CENTER) and frequency range (SPAN)

`START` , `STOP`   **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 SWEEP FREQ ⇒ **submenu** press the CENTER **function key**.

An entry field containing the currently applicable setting is displayed. The default setting is "60 kHz".
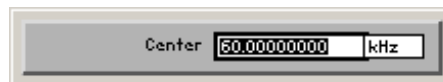
Center 60.00000000 kHz

2.   Enter a new value (↗ 5-55).

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

15 µHz ≤ Center ≤ 25 MHz   in 10 µHz steps

Setting the frequency display range

3.   In the SWEEP FREQ ⇒ **submenu** press the SPAN **function key**.

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

Span 80.00000000 kHz

4.   Enter a new value (↗ 5-55).

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

10 µHz ≤ Span ≤ 25 MHz   in 10 µHz 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 $\begin{array}{c}\text{SWEEP}\\\text{FREQ}_\Rightarrow\end{array}$ **submenu** press the $\boxed{\text{START}}$ **function key**.

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

Start [20.00000000] 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 mHz ≤ Start ≤ 35 MHz   in 10 µHz steps

Setting the stopping frequency

3.   In the $\begin{array}{c}\text{SWEEP}\\\text{FREQ}_\Rightarrow\end{array}$ **submenu** press the $\boxed{\text{STOP}}$ **function key**.

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

Stop [100.00000000] kHz
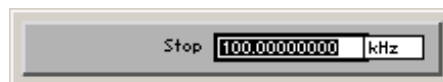
4.   Enter a new value (↗ 5-55).

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

100 mHz ≤ Span ≤ 35 MHz   in 10 µHz 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 `SWEEP` **menu** press the `TRIGGER MODE` **function key**.

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

   ```
   Trigger Mode
   Free Run
   Internal
   External
   Manual
   ```
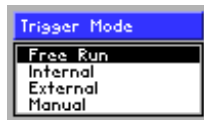
2. Use the **rotary knob** [11] to select a setting.

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 `SWEEP` **menu** press the `EXEC SGL SWEEP` **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".
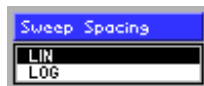
   Sweep Spacing
   LIN
   LOG

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".

   Sweep Time 1.00   ms

2. Enter a new value (↗ 5-55).

   The permissible entry range for the sweep time is:

   1 ms ≤ Sweep Time ≤ 999 s   in 10 µs 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
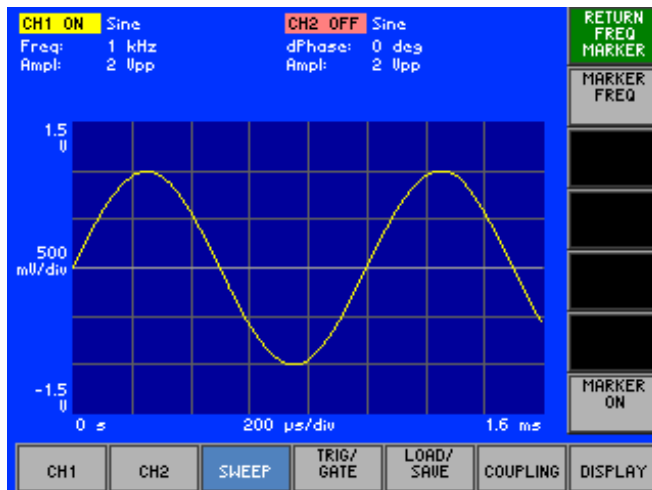
RETURN FREQ MARKER	Exit submenu	
MARKER FREQ	Set marker frequency	(↗ 6-153)
MARKER ON	Switch frequency marker on/off	(↗ 6-153)

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 | FREQ MARKER ⇒ | **menu** press the | MARKER FREQ | **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).

    Marker Frequency 60.0000   kHz
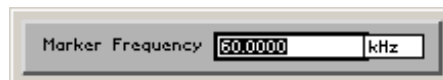
2. Enter a new value (↗ 5-55).

    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 | FREQ MARKER ⇒ | **submenu** press the | MARKER ON | **function key**.

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

2. In the | FREQ MARKER ⇒ | **submenu** press the | MARKER ON | **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 (↗ 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
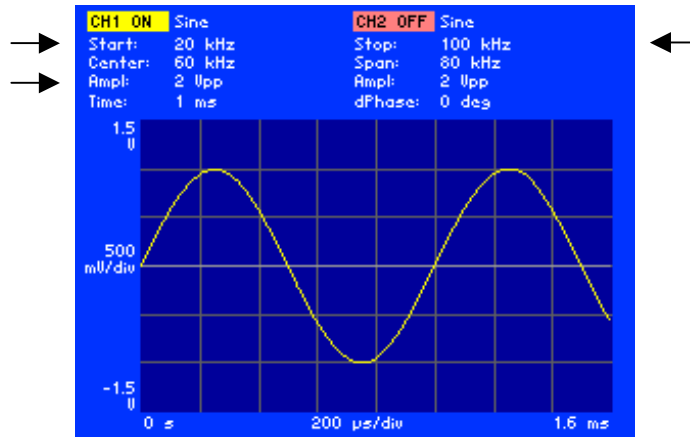
The currently applicable sweep parameters are displayed in the parameter field below the channel names, e.g. "Start: 20 kHz, Stop 100 kHz, Center: 60 kHz, Span 80 kHz, Time 1 ms".

**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).

AM300 Trigger System

Analog comparator CH1
Main phase battery CH1
Mod. gen. phase battery
Frequency marker
Waveform marker CH1

Sync output A

Analog comparator CH2
Main phase battery CH2

Sync output B

Waveform marker CH2

Ext. trigger/gate signal

Internal trigger generator

Gate   S5

Delay   Int. trigger/gate signal

T1

+1

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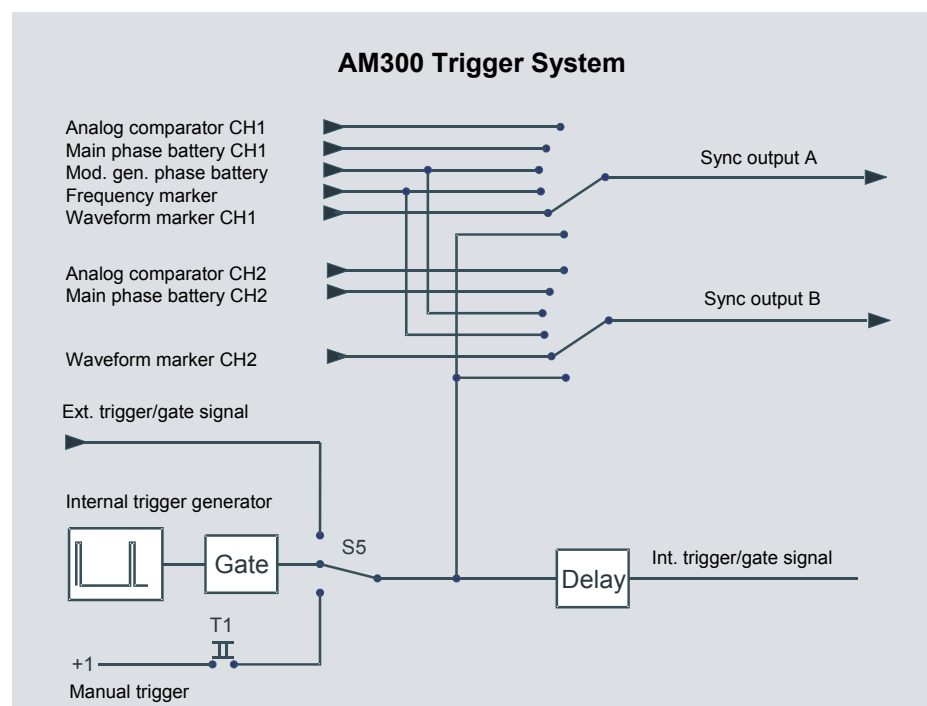
Note: If you wish to review all the trigger settings at a glance, you can arrange for the parameters to be clearly displayed complete with their currently applicable settings (↗ 6-198).

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

	Select trigger mode	(↗ 6-157)
TRIGGER MODE		

	Set trigger delay	(↗ 6-159)
TRIGGER DELAY		

	Select active trigger edge	(↗ 6-159)
POLARITY		

	Set internal trigger generator frequency	(↗ 6-160)
FREQ INT TRIG		

	Set internal trigger generator period	(↗ 6-160)
PERIOD INT TRIG		

	Open submenu: Set Gate/Burst operating mode	(↗ 6-161)
GATE/ BURST ⇒		

	Execute once-only triggering	(↗ 6-157)
EXEC SINGLE TRIGGER		

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 [TRIG/ GATE] **menu** press the [TRIGGER MODE] **function key**.

A selection field containing specified settings is displayed. The default setting is "Free Run".
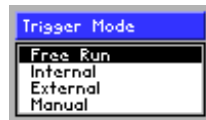
2. Use the **rotary knob** [11] to select a setting.

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 [TRIG/ GATE] **menu** press the [EXEC SINGLE TRIGGER] **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

Trigger signal

Delayed gate signal

Delay   Gate length

Triggering at a high-low edge of the trigger signal

Trigger signal

Delayed gate signal

Delay   Gate length
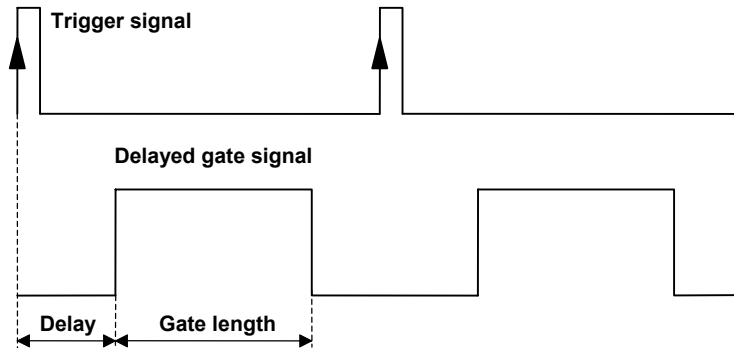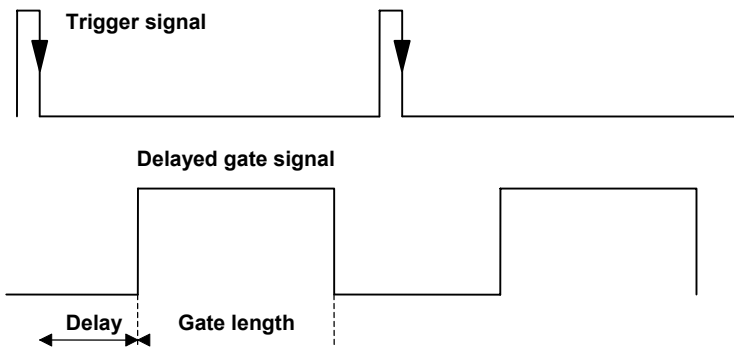
6.2.4.1.2   Method of the External Trigger Generator

Triggering at a low-high edge of the trigger signal

Trigger signal

Delayed trigger signal

Delay

Triggering at a high-low edge of the trigger signal
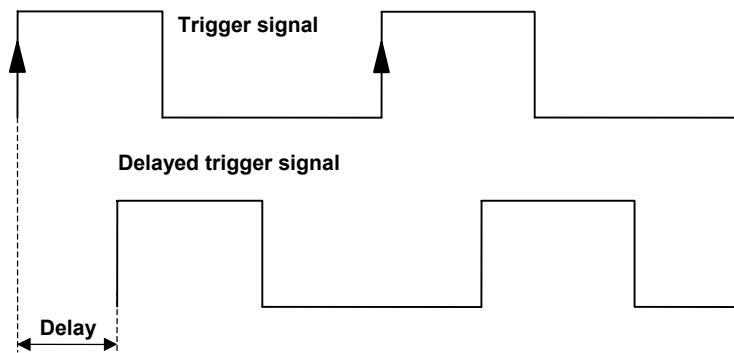
Trigger signal

Delayed trigger signal
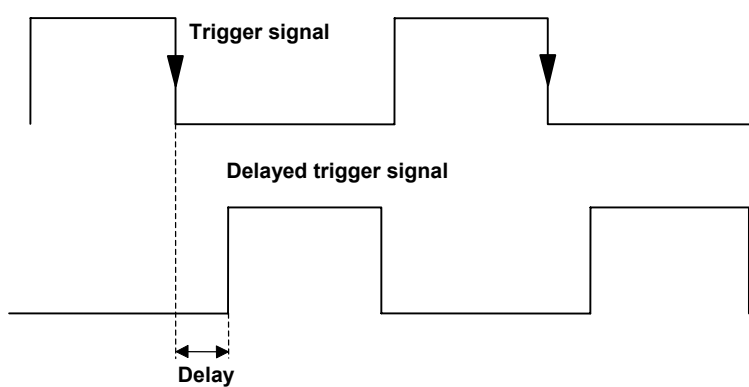
Delay

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".

   Trigger Delay [0.0000000] 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".

   Polarity
   High
   Low
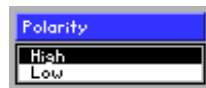
2. Use the **rotary knob** [11] to select a setting.

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".

   Trigger Freq. 1.000000000 kHz

2. Enter a new value (↗ 5-55).

   The permissible entry range is:

   101 µHz ≤ Trigger Freq. ≤ 2 MHz   in 1 µHz 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".

   Trigger Period 100.0000 ms

2. Enter a new value (↗ 5-55).

   The permissible entry range is:

   500 ns ≤ Trigger Period ≤ 9901 s   in 10 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.
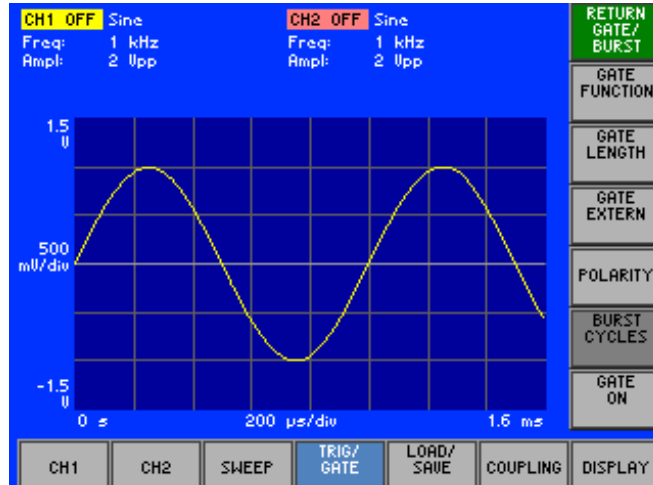
Function key assignment

[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 ⬚ GATE/ BURST → submenu press the ⬚ GATE FUNCTION **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
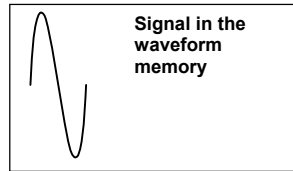
Initial situation

Gate functions
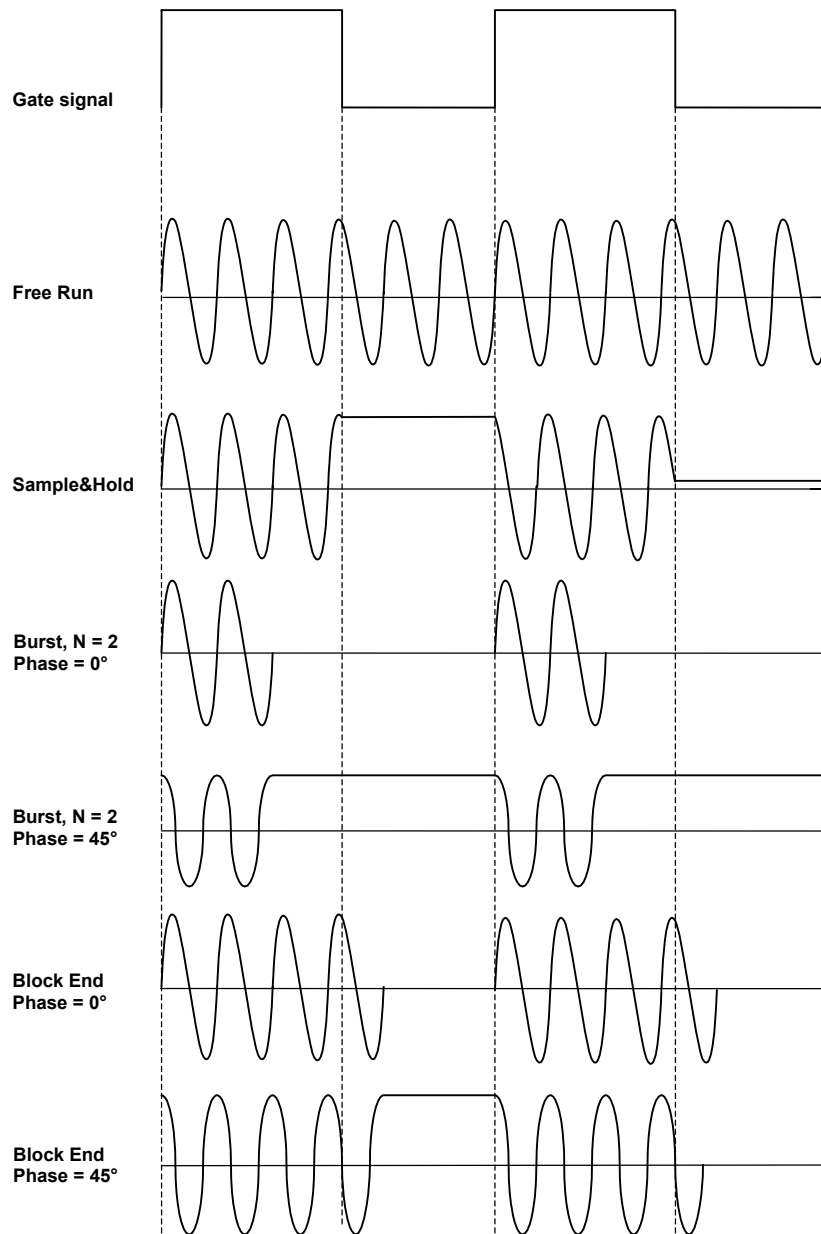
Method at Non-Periodical Signals

Initial situation

Signal in the waveform memory

Gate signal

Free Run

Gate funktions at gate length > signal duration

Sample&Hold Block End

Burst, N = 2

Gate funktions at gate length < signal duration

Sample&Hold

Burst, N = 2

Block End
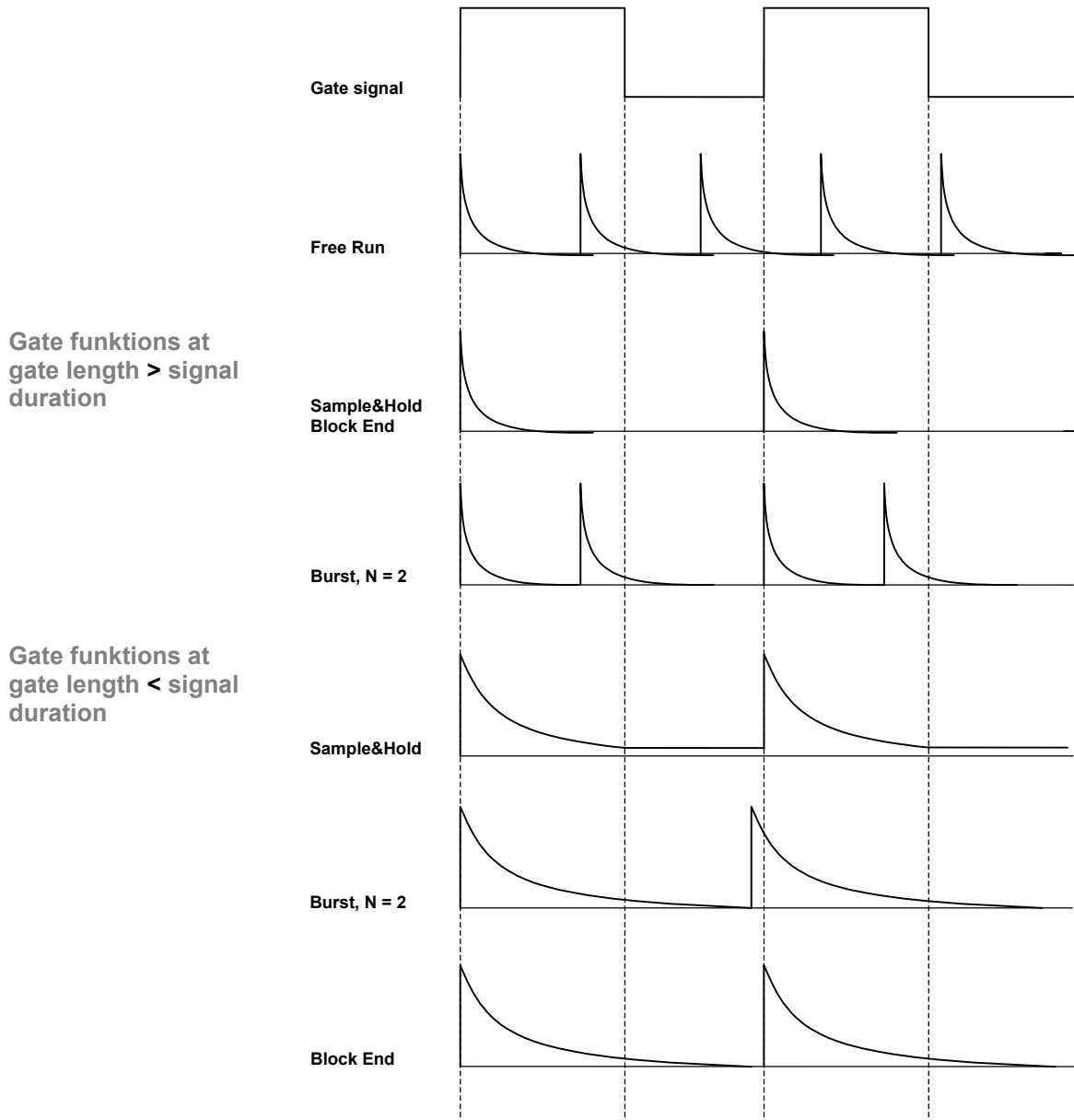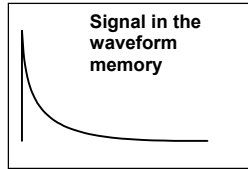
6.2.4.5.2 Setting the Gate Length

📄 **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 (↗ 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 GATE/BURST⇒ submenu press the GATE LENGTH **function key**.

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

    > Gate Length [100] ns

2. Enter a new value (↗ 5-55).

    The permissible entry range is:

    100 ns ≤ Gate Length ≤ 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).

6.2.4.5.3 Controlling the Gate via an External Trigger Signal

📄 **Note**	The GATE EXTERN 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 GATE/BURST⇒ submenu press the GATE EXTERN **function key**.

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

2. In the GATE/BURST⇒ submenu press the GATE EXTERN **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 ⟨GATE/BURST ⇒⟩ **submenu** press the ⟨POLARITY⟩ **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 [BURST CYCLES] 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

1. In the [GATE/ BURST ⇒] **submenu** press the [BURST CYCLES] **function key**.

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

    Burst Cycles [1]

2. Enter a new value (↗ 5-55).

    The permissible entry range for the burst period is:

    1 ≤ Burst Cycles ≤ 65535

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

    The new setting is stored.

Switching Burst mode on/off

1. In the [GATE/ BURST ⇒] **submenu** press the [GATE ON] **function key**.

    The function key is highlighted. After switching on, a burst is generated using the set number of signal periods.

2. In the [GATE/ BURST ⇒] **submenu** press the [GATE ON] **function key**.

    The function key is **no longer** highlighted and Burst mode is switched off.

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).

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

1. In the **LOAD/SAVE menu** press the **MEM -> CH1** or **MEM -> CH2 function key**.

 A selection field containing specified files is displayed.
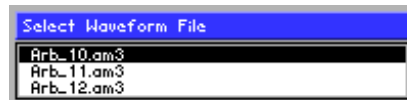
2. Use the **rotary knob** [11] to select a file.

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

 The 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.
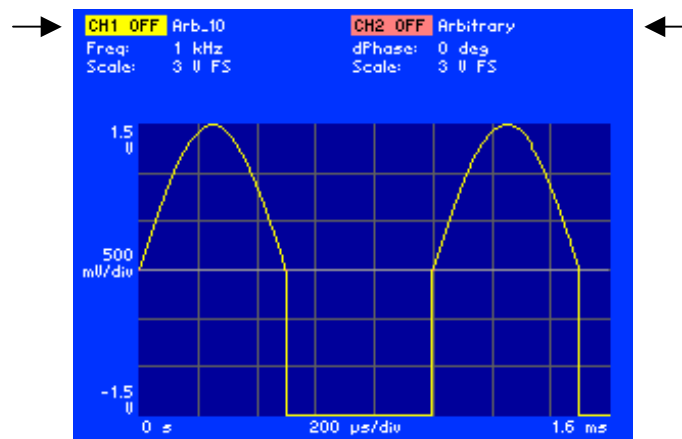
Display

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.
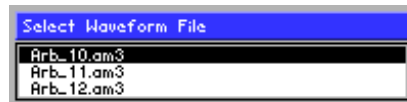
3. Use the **rotary knob** [11] to select a file.

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.
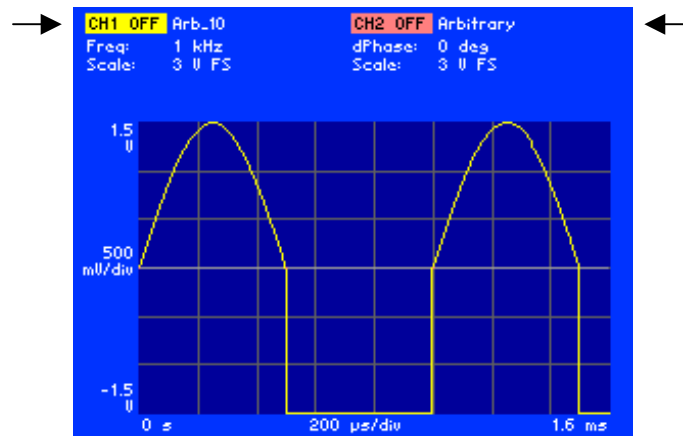
Display

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 **LOAD/ SAVE** **menu** press the **CH1 -> MEM** or **CH2 -> MEM** **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.:

    Arb_10

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 [LOAD/ SAVE] **menu** press the [DELETE MEM] **function key**.

    A selection field containing specified files is displayed.

    ```
    Delete Waveform File
    Arb_10.am3
    Arb_11.am3
    Arb_12.am3
    ```
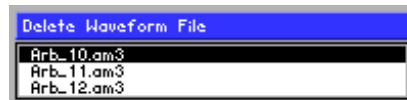
2. Use the **rotary knob** [11] to select a file.

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

    The following message is displayed:

    ```
    Do you want to delete file ""?

    Enter = yes     Escape = no
    ```
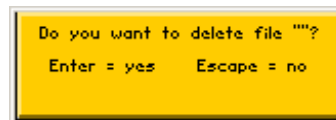
4. Press the **ENTER key** [5] to delete the file.

    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.
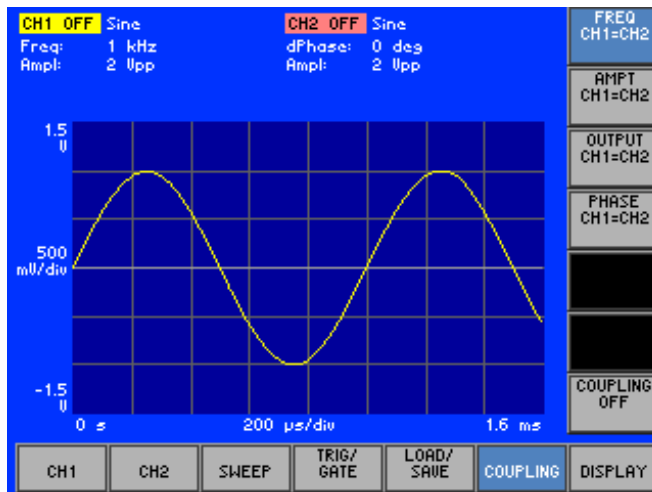
Function key assignment

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):

  Upp , U+ , U- , Uinf , U0 , Up , SCALING , DC OFFSET

- **Output** (↗ 6-134):

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

- **Phase** (↗ 6-98):

  START PHASE
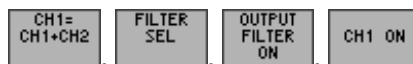
Switching a particular coupling on/off

1. In the COUPLING **menu** press one of these **function keys:** FREQ CH1=CH2 , AMPT CH1=CH2 , OUTPUT CH1=CH2 , PHASE CH1=CH2 .
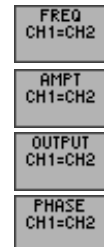
   The function key concerned is highlighted and the appropriate settings in channel CH1 also apply to channel CH2.

2. In the COUPLING **menu** press one of these **function keys:** FREQ CH1=CH2 , AMPT CH1=CH2 , OUTPUT CH1=CH2 , PHASE CH1=CH2 .
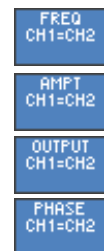
   The function key concerned is **no longer** highlighted and the coupling concerned is switched off. The respective settings in channel CH1 are still active in channel CH2. However, you can once more set the parameters individually in each channel.

Display in the case of frequency coupling
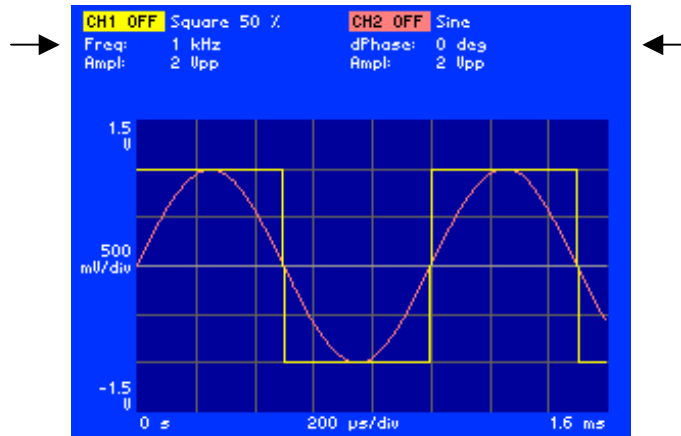
In the case of frequency coupling the currently applicable output frequency is displayed below the channel name CH1 in the parameter field, e.g. "Freq: 1 kHz", and the currently applicable start phase is displayed below the channel name CH2, e.g. "dPhase: 0 deg".

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.
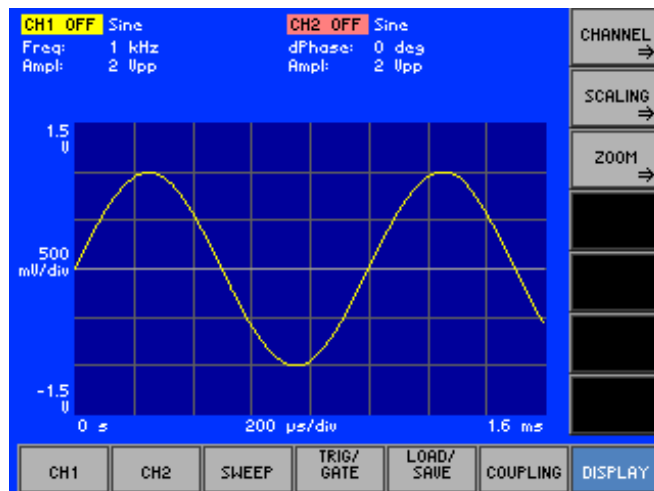
Function key assignment

CHANNEL ⇒	**Open submenu:** Display waveforms	(↗ 6-178)
SCALING ⇒	**Open Submenu:** Scaling of diagram area	(↗ 6-181)
ZOOM ⇒	**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.
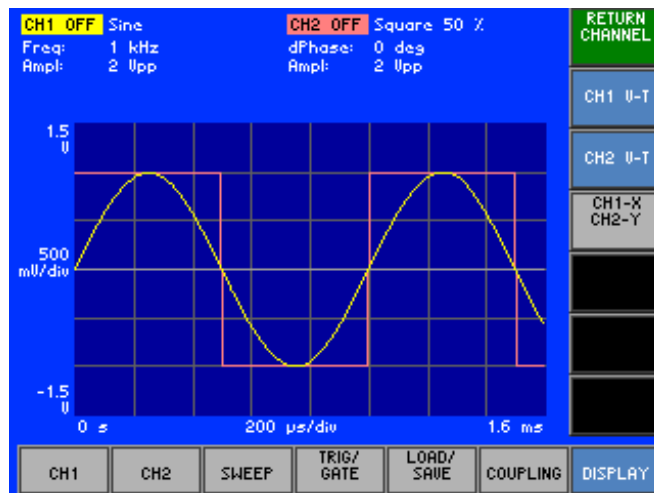
Function key assignment

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

1. 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:
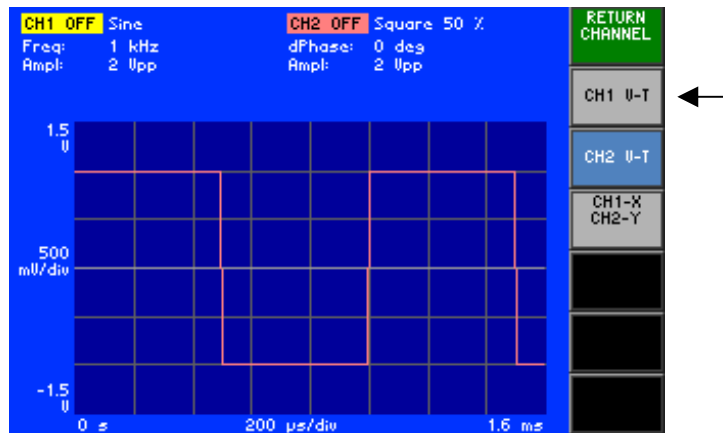
    Note: Only one waveform at a time (CH1 or CH2) can be hidden.

Switching on the display of channels CH1 and/or CH2

2. 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:
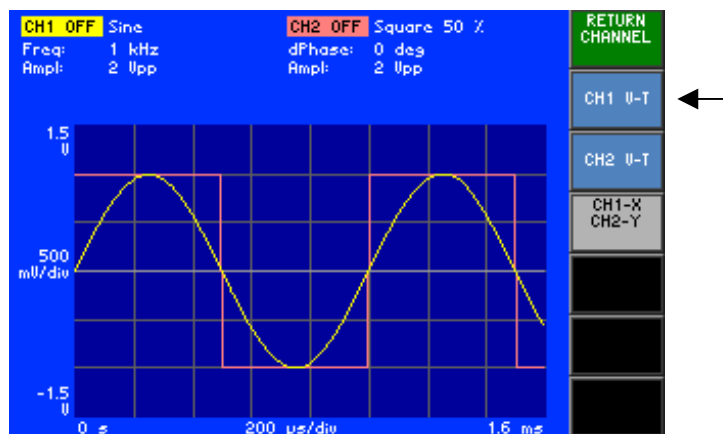
6.2.7.1.2   Displaying Channel Amplitude Values Orthogonally

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.
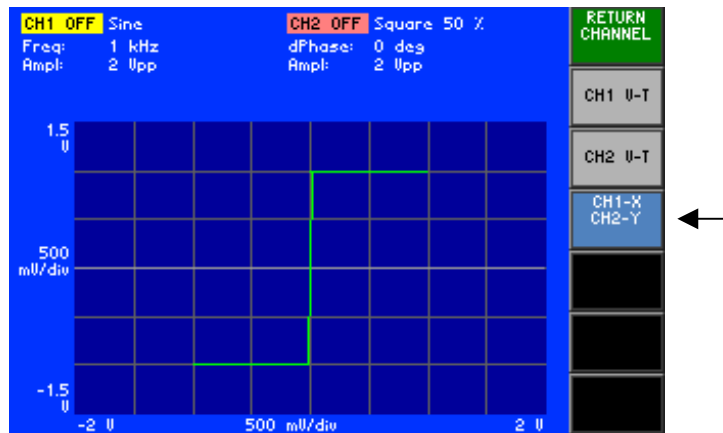
Switching off the orthogonal display

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:
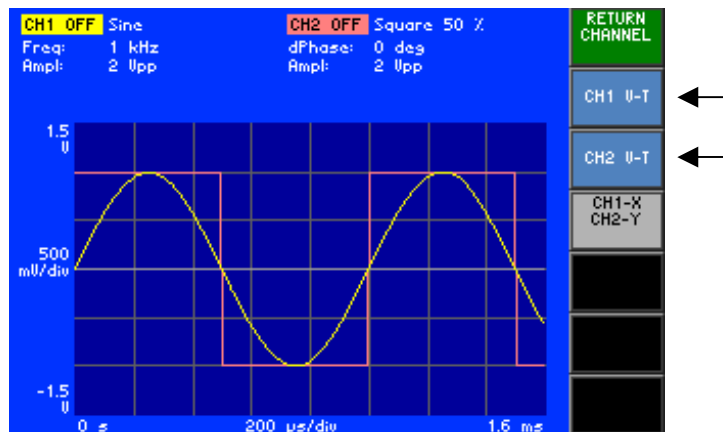
6.2.7.2   Scaling the Diagram Area

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.
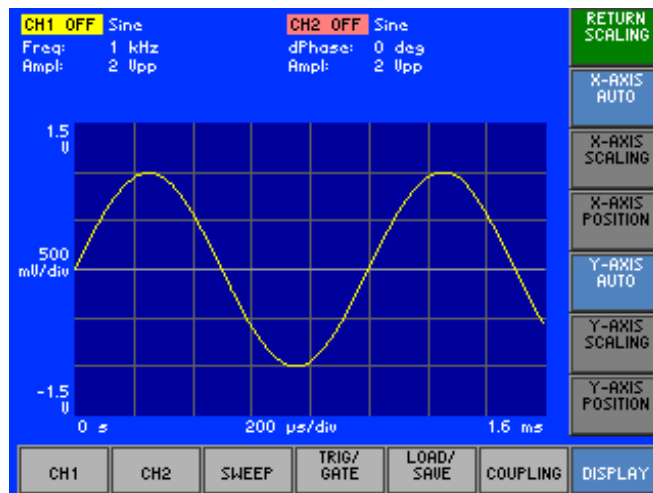
Function key assignment

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

1.   In the [SCALING ⇒] **submenu** press the [X-AXIS AUTO] **function key**.

The function key is highlighted and the X axis is automatically scaled.
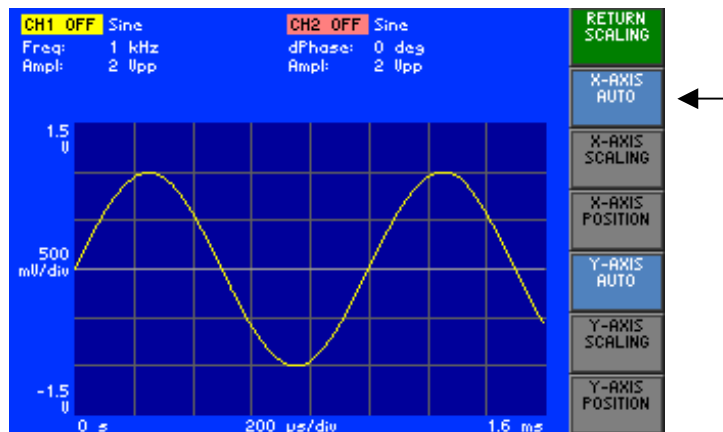
Switching the AUTO function off

2.   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

1.   In the [SCALING ⇒] **submenu** press the [X-AXIS SCALING] **function key**.

An entry field containing the currently applicable setting is displayed.

2.   Enter a new value (↗ 5-55).

The permissible entry range is:

8 ns ≤ T-Axis Scaling ≤ 100000 s   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:
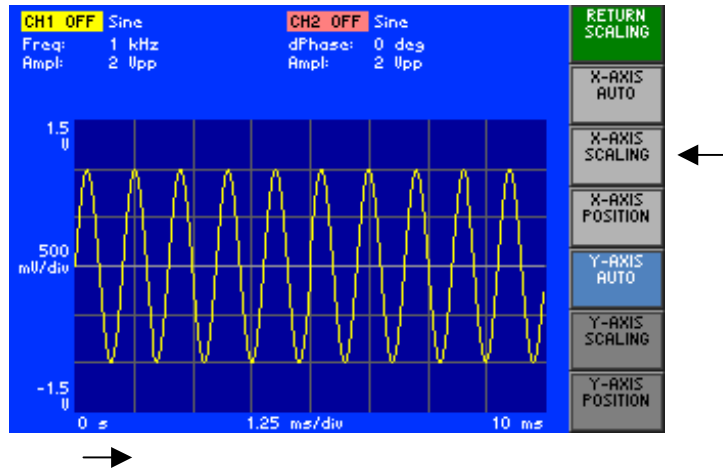
Setting the starting value of the X axis

1. In the ⌈SCALING ⇒⌉ **submenu** press the ⌈X-AXIS POSITION⌉ **function key**.

   An entry field containing the currently applicable setting is displayed.

   T-Axis Position [0.000000000] s

2. Enter a new value (↗ 5-55).

   The permissible entry range is:

   -200000 s ≤ T-Axis Position ≤ +200000 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:
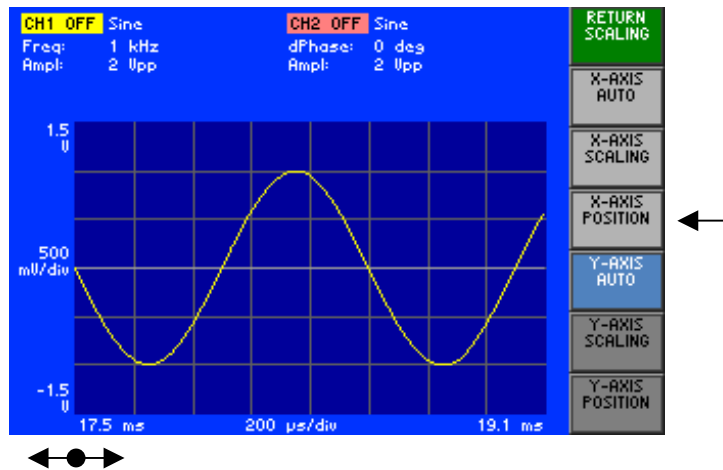
📄 **Note**   You can use the AUTO function to shift the X axis back into a defined display range (↗ 6-182).

6.2.7.2.2 Scaling the Y Axis

📄 **Note** The [Y-AXIS SCALING] and [Y-AXIS POSITION] 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 (Upp) 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 [SCALING ⇒] **submenu** press the [Y-AXIS AUTO] **function key**.

   The function key is highlighted and the Y axis is scaled automatically.
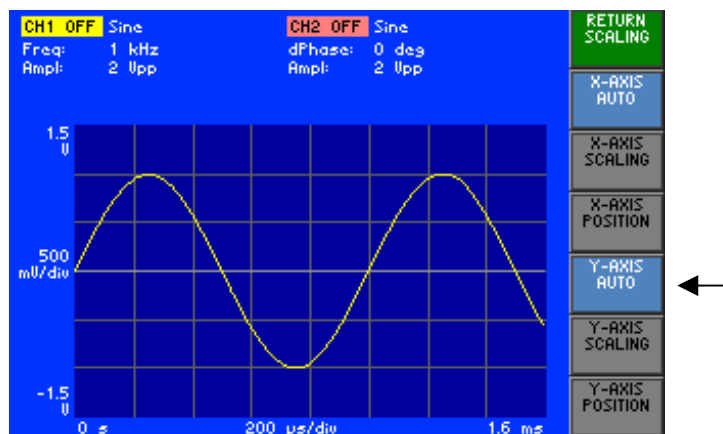
Switching the AUTO function off

2. In the [SCALING ⇒] **submenu** press the [Y-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 Y axis are available.

Scaling the Y axis manually

1. In the [SCALING ⇒] **submenu** press the [Y-AXIS SCALING] **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 mV ≤ Y-Axis Scaling ≤ 30 V   **in 100 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:
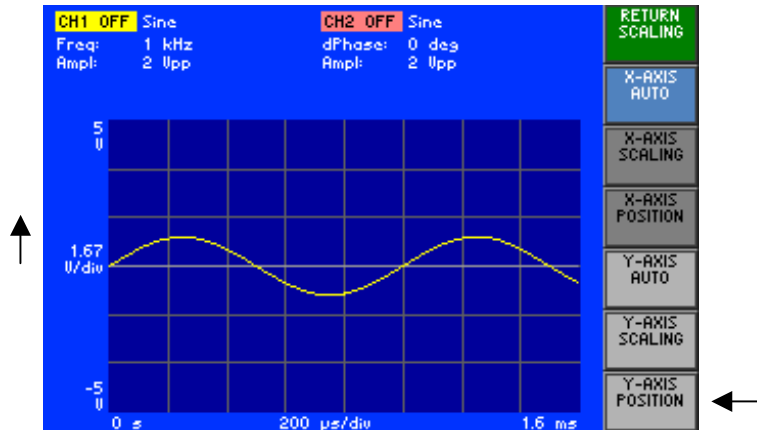
Setting the starting value of the Y axis

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 V ≤ Y-Axis Position ≤ +60 V   in 100 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:
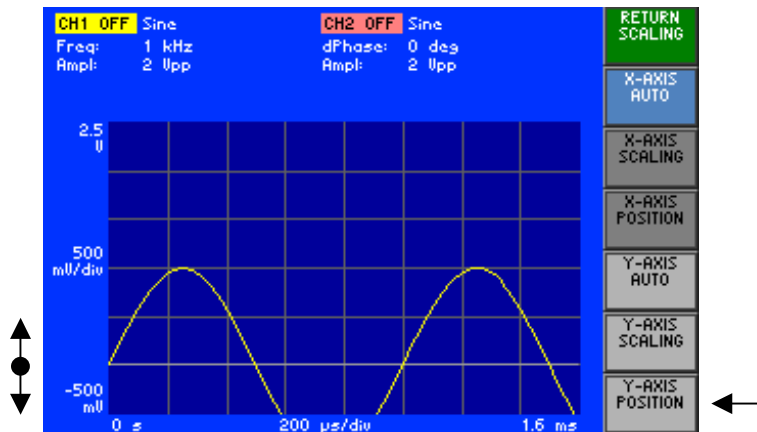
📄 **Note**   You can use the AUTO function to shift the Y axis back into a defined display range (↗ 6-184).

6.2.7.3   Zooming the Screen Window

What the settings are for

You can use the ZOOM submenu to move the current screen window within the diagram area and zoom in and out.

Selecting the ZOOM menu

•   In the [DISPLAY] **menu** press the [ZOOM ⇒] **function key**.

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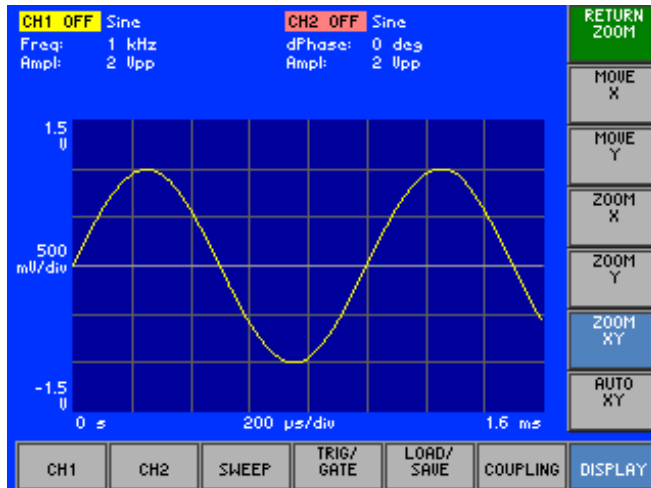
Function key assignment

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:
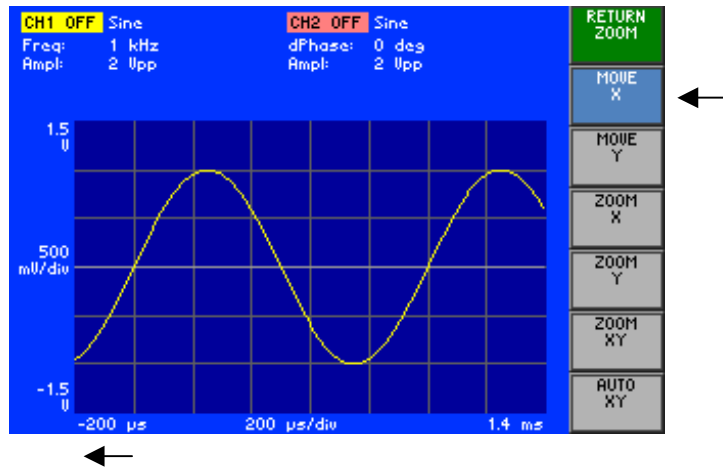
Moving in the
Y direction

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:
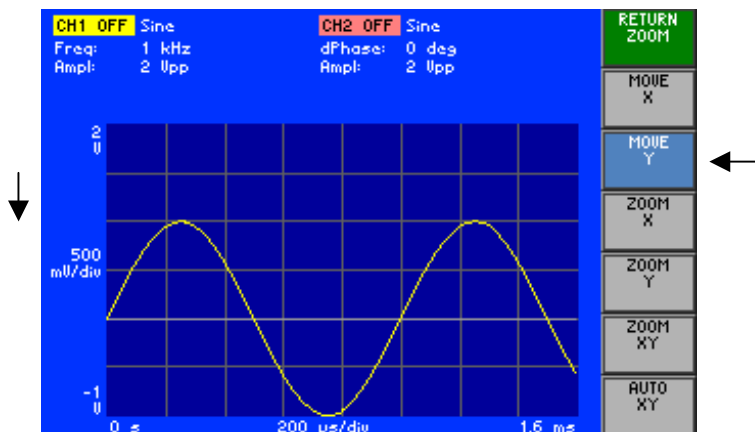
**Resetting the
diagram area**

- 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.
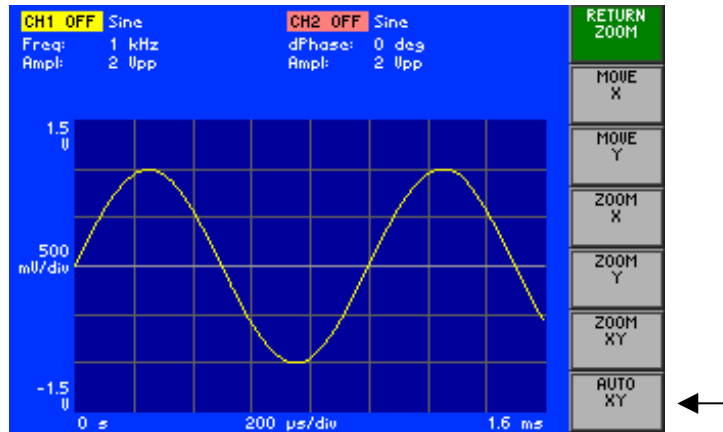
6.2.7.3.2   Zooming the Screen Window In/Out

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 µs ≤ X Axis ≤ 100000 s

in the Y direction: ±50 mV ≤ Y Axis ≤ ±15 V

**Zooming in/out
in the X direction
only**

1. In the **ZOOM⇒** **menu** press the **ZOOM X** **function key**.

2. 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:
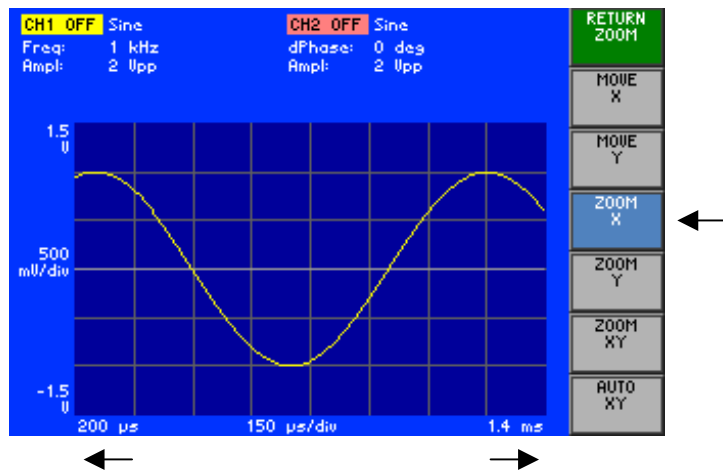
Zooming in/out in the Y direction only

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:
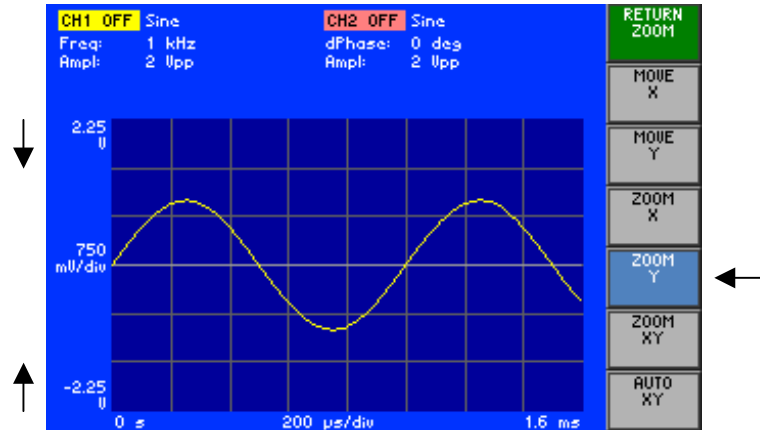
Zooming in/out in the X/Y direction

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:
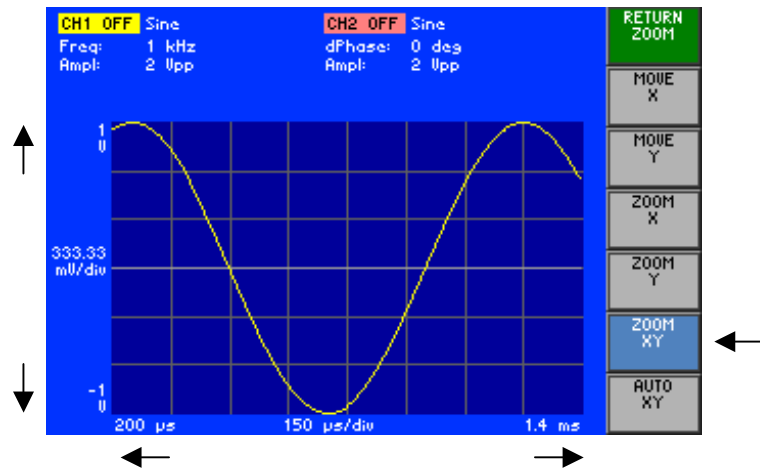
Resetting the diagram area

•   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** | PRESET | with the ◄ or ► **cursor key** [6].

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

```
                          SYS-Menu                      PRESET
            Factory ×
            SAVE1              Factory
            SAVE2              Factory                 PRESET
            SAVE3              Factory                SETTINGS
            SAVE4              Factory
            SAVE5              Factory
            SAVE6              Factory
            SAVE7              Factory
            SAVE8              Factory




       PRESET  STATUS   FILE   CONFIG   SERVICE   INFO
```

Function key assignment

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

| PRESET SETTINGS | 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** [PRESET] with the ◀ or ▶ **cursor key** [6].

   A table containing the available settings is displayed. The current setting is marked with the sign x.

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

   The selected option is highlighted.
   The PRESET memory location FACTORY contains the factory setting (↗ 6-68).

4. Press the **function key** [PRESET SETTINGS].

   The setting is defined to be the instrument default setting and is marked with the sign x.

Activating the instrument default setting

- Press the [PRESET] **function key** in the [PRESET] **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.

📄 **Note**

If no user-defined settings have been defined, the PRESET function key [PRESET] 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

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

Selecting the STATUS menu

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.
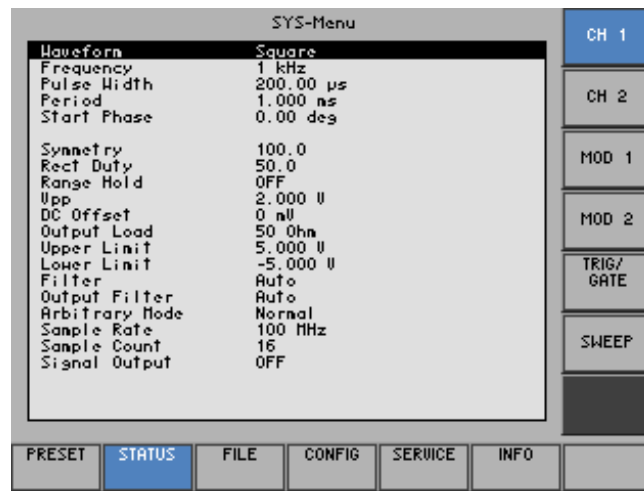
Explanation of parameters

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.
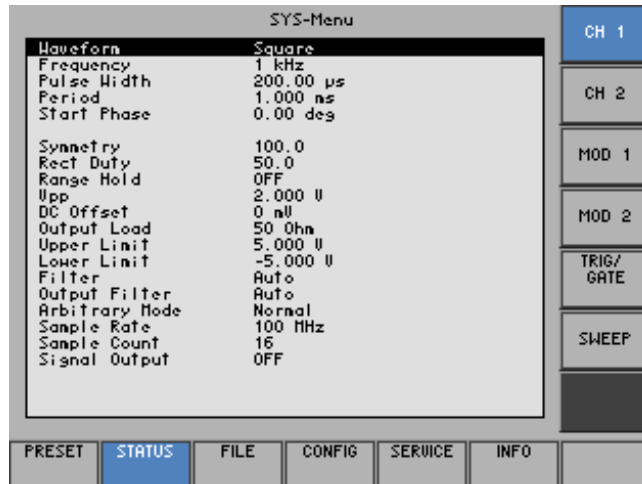
Meaning of the parameters

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.

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.
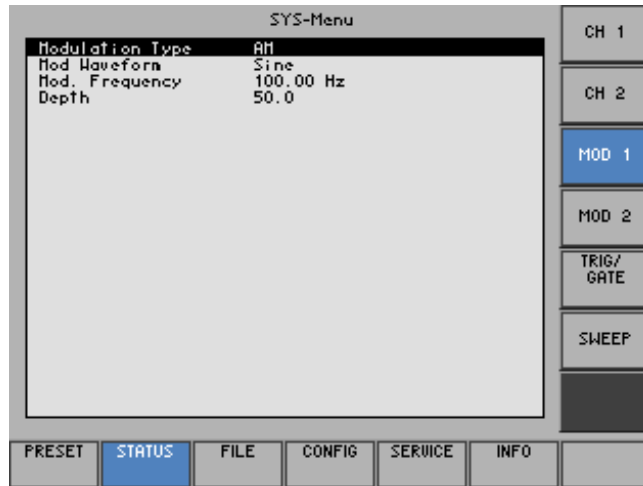
Meaning of the parameters

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.
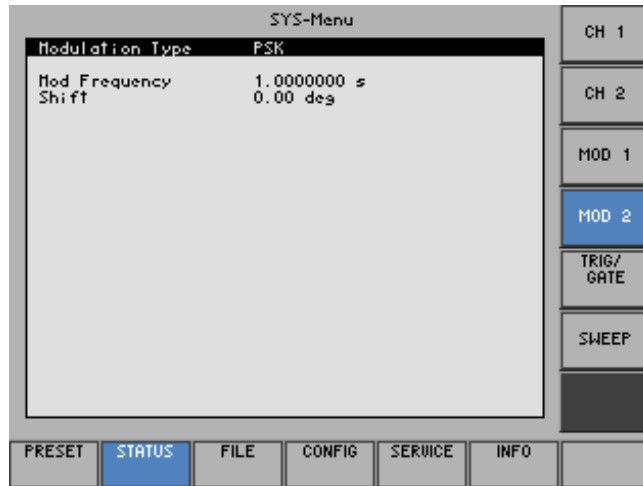
Meaning of the parameters

(↗ 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].
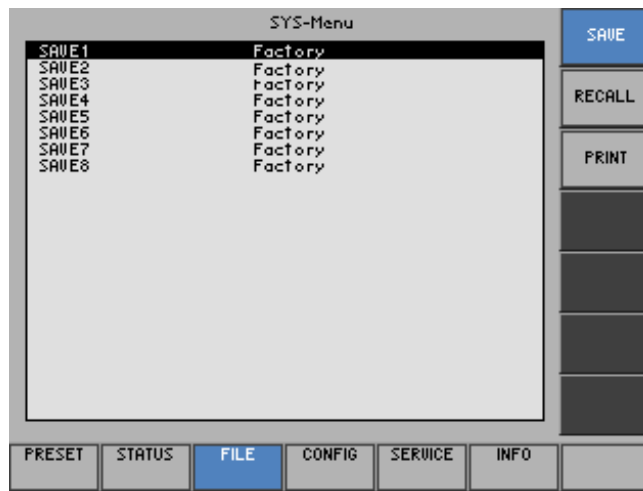
Function key assignment

SAVE	Saves a user-defined setting	(↗ 6-201)
RECALL	Loads a user-defined setting	(↗ 6-201)
PRINT	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:

```
              file recalled:
      user saved  ;11/26/03 11:57A
```
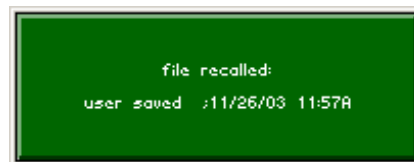
4. Confirm with the **ENTER key** [5].

📄 **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].

                                PRINT SCREEN   Press Enter
                                PRINTER   HP DeskJet mono

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

                                A selection field containing the available settings is displayed. The
                                default setting is "HP Deskjet mono".

                                PRINTER
                                HP DeskJet mono
                                HP DeskJet color
                                HP LaserJet III
                                HP LaserJet IV
                                HP LaserJet V

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

                           2.   Select the **PRINT SCREEN** parameter with the ▲ or ▼ **cursor key** [7].

                                PRINT SCREEN   Press Enter
                                PRINTER   HP DeskJet mono

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

                                The following Message is displayed.

                                Printing

                                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
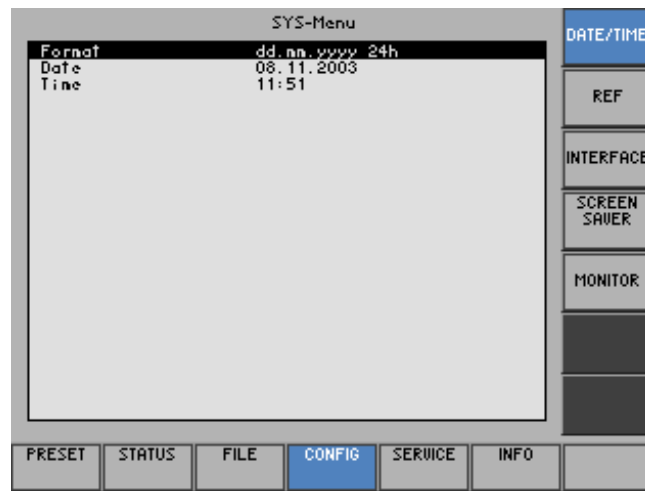
DATE/TIME	Sets the date and time	(↗ 6-205)
REF	Selects an internal or external reference source	(↗ 6-207)
INTERFACE	Configures the instrument interfaces	(↗ 6-209)
SCREEN SAVER	Sets the screen saver mode	(↗ 6-211)
MONITOR	Selects an internal or external monitor	(↗ 6-213)

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.nn.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.nn.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
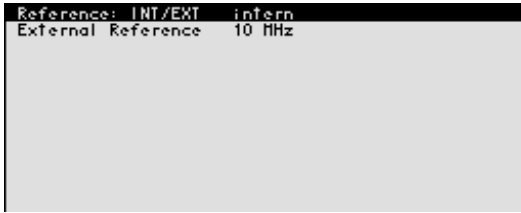
Use

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
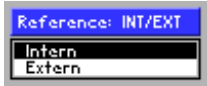
1. When required, connect the external reference source to the EXT REF IN connector [17].

2. Press the [REF] **function key** in the [CONFIG] **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 **REF** **function key** in the **CONFIG** **menu**.

   The current reference source setting is displayed.

2. Select the **External Reference** parameter with the ▲ or ▼ **cursor key** [7].
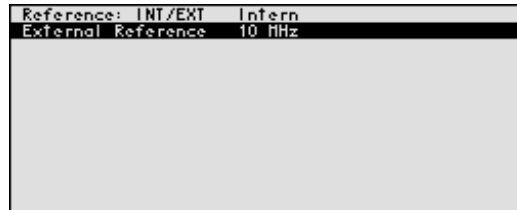
   ```
   Reference: INT/EXT   Intern
   External Reference   10 MHz
   ```

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

   A selection field containing the available settings is displayed. The default setting is "10 MHz".

   ```
   External Reference
     2 MHz
     5 MHz
    10 MHz
   ```
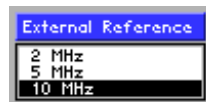
4. Select a reference source with **rotary knob** [11].

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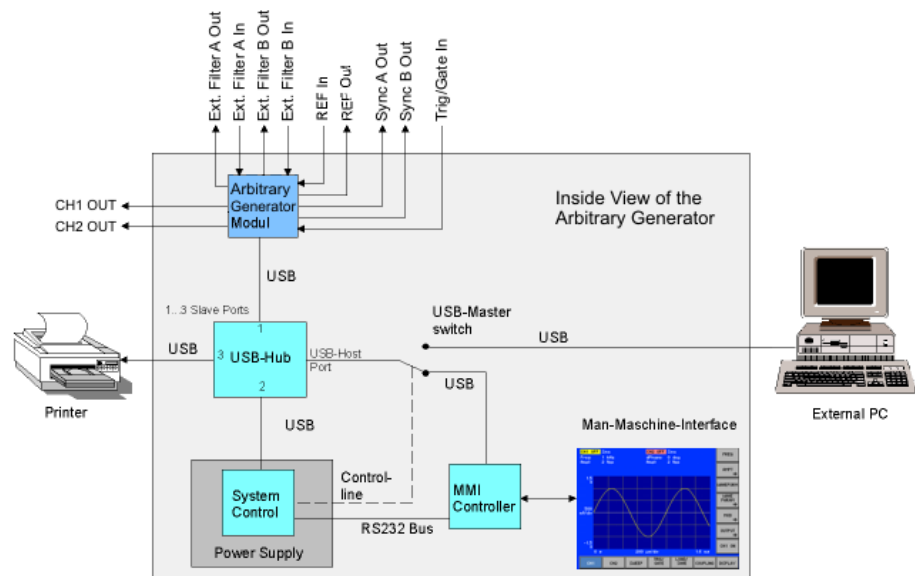
The behaviour of the USB master switch can be controlled via the following settings:

▪ **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".

▪ **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".

Setting the USB master selector

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 [SCREEN SAVER] **function key** in the [CONFIG] **menu .**

   A table listing the available parameters is displayed.

2. Select the **Sreen saver** parameter with the ▲ or ▼ **cursor key** [7].

   ```
   Screen saver      5 min
   REMOTE            picture
   ```

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

   A selection field containing the available settings is displayed. The default setting is "5 min".

   ```
   Screen saver
   none
   5 min
   10 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".
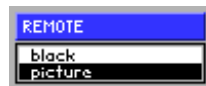
4.   Select a setting with **rotary knob** [11].

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:
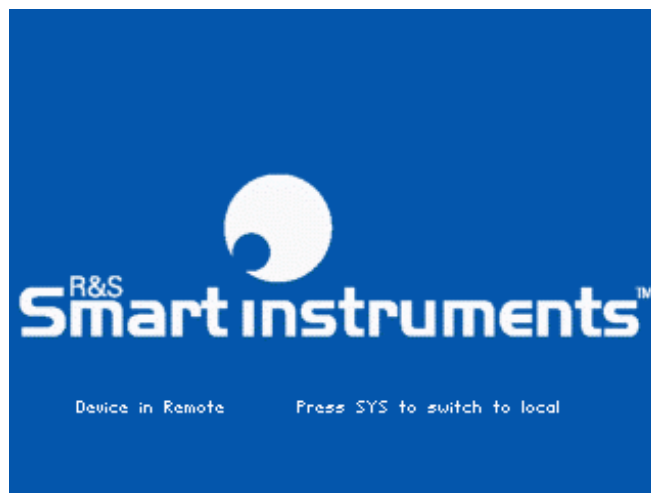
📄 **Note**   With remote control, the local control mode of the R&S AM300 is deactivated and can only be reactivated by pressing the SYS key [3] on the front panel. Switching between remote control and local control takes approx. 2 s.

6.3.4.5   Selecting an Internal or External Monitor

Use   Screen display is possible via the internal monitor or an external monitor.

- **intern**
  Screen display is via the built-in colour TFT display.

- **extern**
  Screen display is via the connected monitor.

Selecting   1. If required, connect a monitor to the MON connector [24].
the monitor

2. Press the MONITOR **function key** in the CONFIG **menu.**

    The current screen setting is displayed.
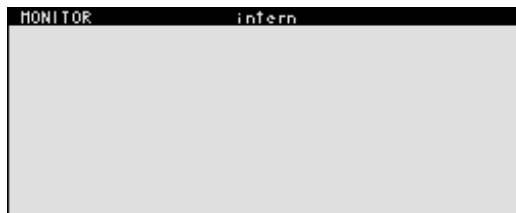
MONITOR	intern

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

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

MONITOR
intern
extern

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

SELFTEST   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

You can obtain information such as module data, instrument statistics and system messages from the INFO menu.

Selecting the INFO menu

1. Press the **SYS key** [3].

2. Select the [INFO] **menu** with the ◀ or ▶ **cursor key** [6].

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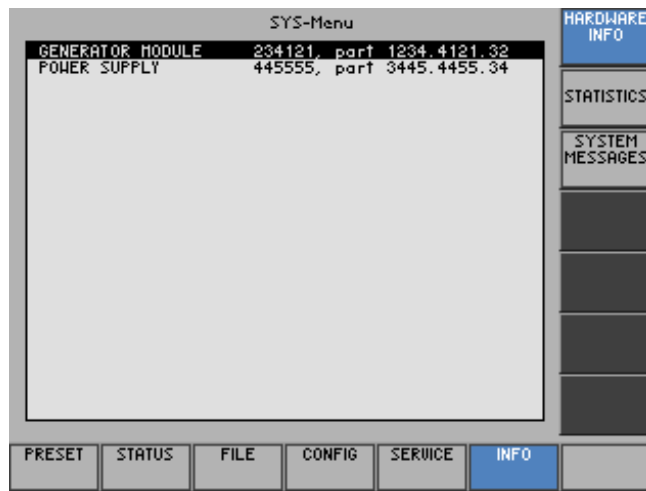
Function key assignment

HARDWARE INFO	Displays module data	(↗ 6-216)
STATISTICS	Displays instrument statistics	(↗ 6-216)
SYSTEM MESSAGES	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 ≏        443445, part 4555.4344.44
FW version      MMI 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.
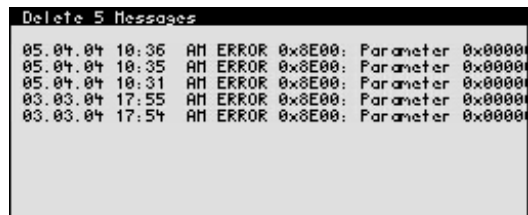
System messages help the service personnel to analyze the instrument and handle errors, and should therefore only be deleted by them.

Displaying system messages

1.   Press the SYSTEM MESSAGES **function key** in the INFO **menu**.

A table listing the current system messages is displayed.
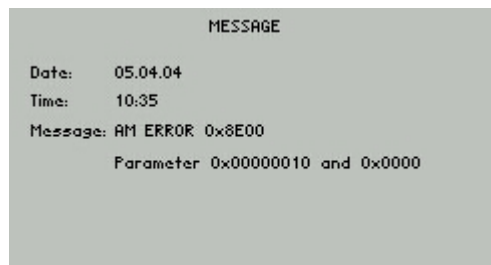
2.   Select a system message with the ▲ or ▼ **cursor key** [7].

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

The current system message is clearly displayed with the date and time of their occurrence and the error code.

4.   Press the **ENTER key** [5] for closing the display.

**Deleting system
messages (only for
service)**

1. Press the SYSTEM MESSAGES **function key** in the INFO **menu**.

    The table of current system messages is displayed.

2. Select the first line with the ▲ or ▼ **cursor key** [7].

    Delete 5 Messages

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

    The field for the input of the password is displayed.
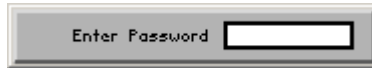
    Enter Password

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:

    PASSWORD ERROR
    Password failed
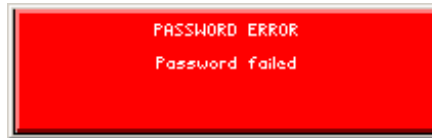
• Confirm the error message with the **ENTER key** [5].

    The deleting of the error messages is breaked 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.
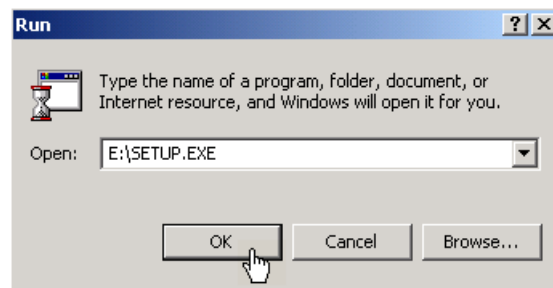
The installation is prepared and the installation wizard appears.

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.
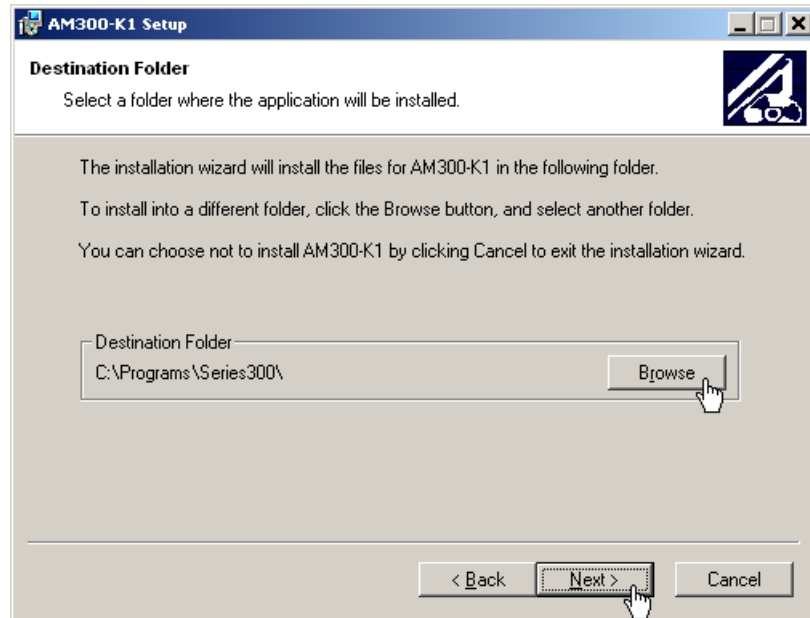
4. Click **<Next>** to continue the installation. Installation begins and the data are transferred to the PC. Please wait a moment.
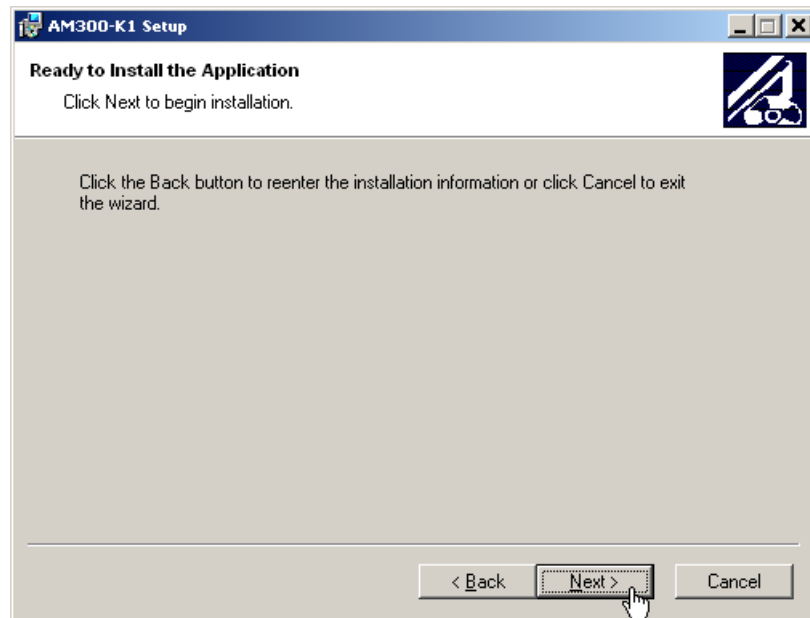
5. Click **<Finish>** to successfully complete the installation.
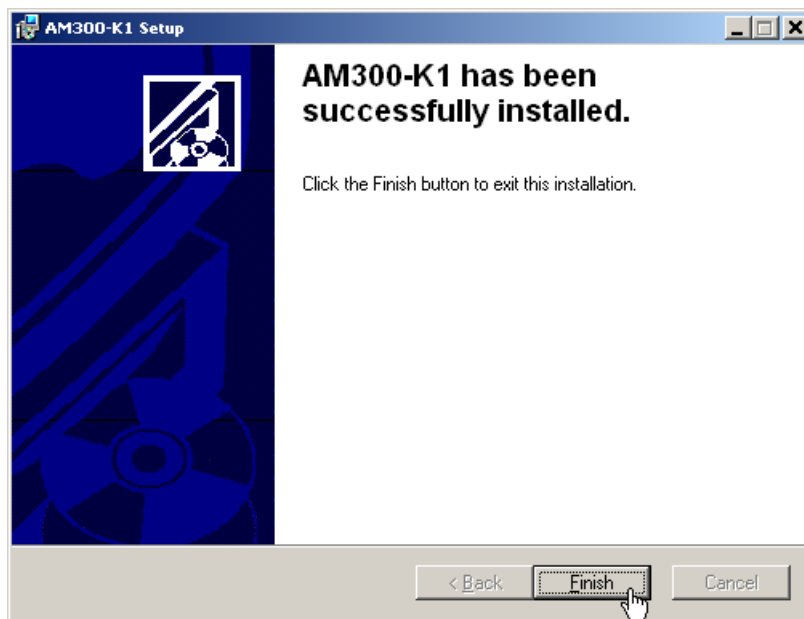
All new settings are now effective and the following appears in the Windows™ **Start\Programs\Rohde & Schwarz\Series300** start-up menu:
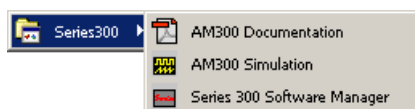
6. Install the device driver now (↗ next section).

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).
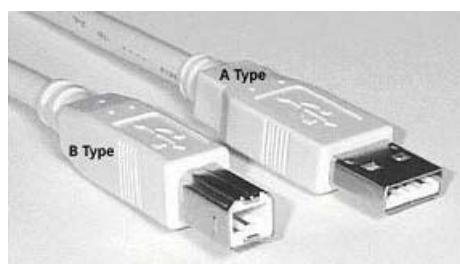
The CD ROM must be in the installation drive in order to install the driver.

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.

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).

Installing device drivers for Windows™ 2000

3. Click **<Next>** to continue the installation.

4. Select **Search for a suitable driver for my device** and click **<Next>** to continue the installation.
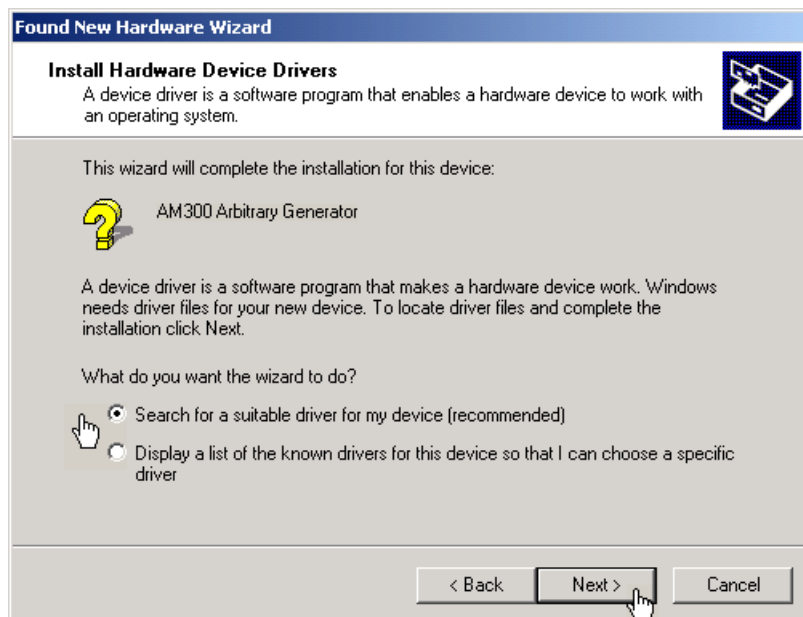
5. Select **CD-ROM drives** and click **<Next>** to continue the installation.
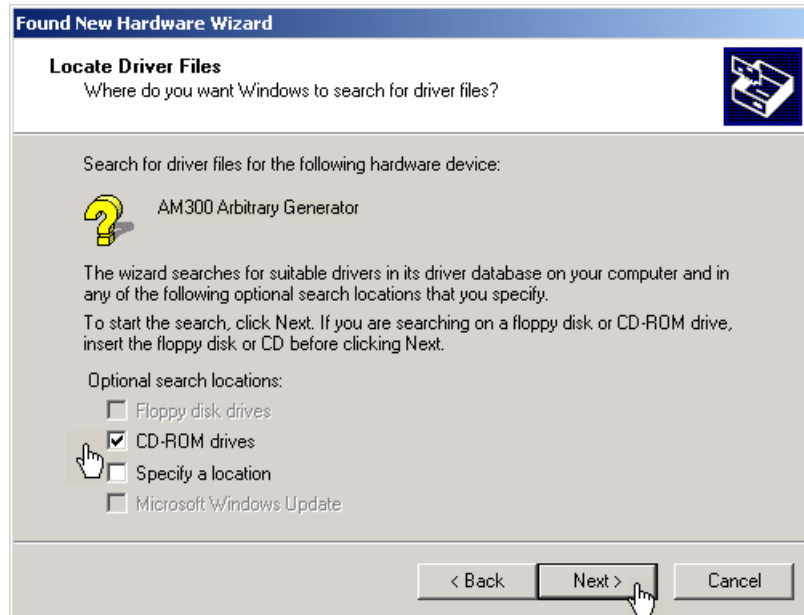
The search results for the driver data are now displayed.

6. Click **<Next>** to continue the installation.
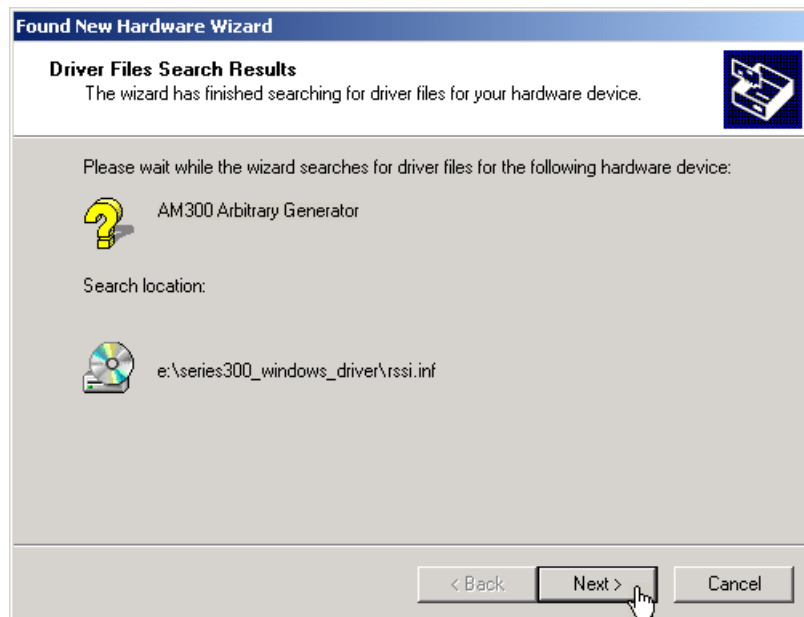
7. Click **<Finish>** to complete the installation.
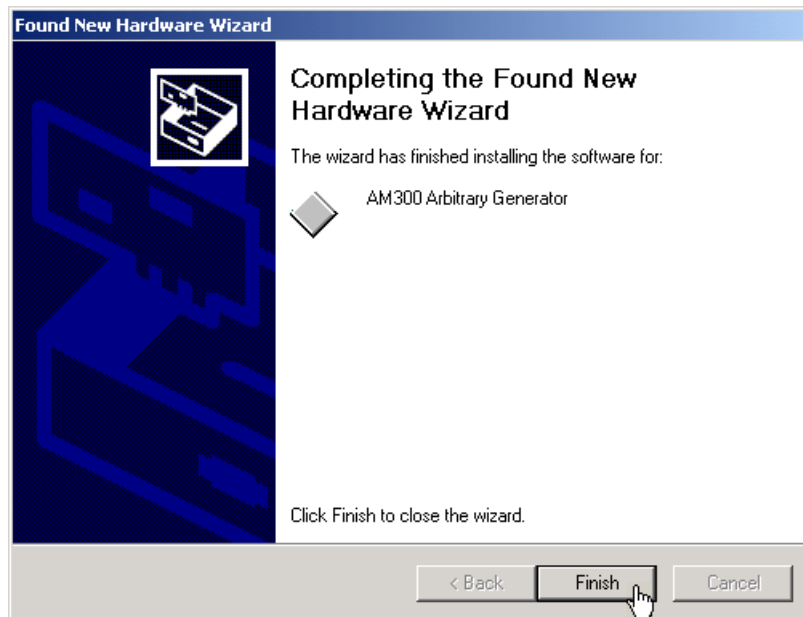
This is followed by the installation of the device driver for the **Rohde & Schwarz Power Supply**. Windows generally "remembers" all the necessary information when installing the arbitrary and function generator R&S AM300 and installs the Rohde & Schwarz Power Supply without a query. However, depending on the system, the installation assistant might be activated.

In this case, repeat instructions 3. to 7. to successfully complete the installation.

7.2.2   Creating the Program Version for Specific Instrument

Introduction   After the software has been installed, the following options are available in the Windows™ start-up menu under:
Start\Programs\Rohde & Schwarz\Series300:
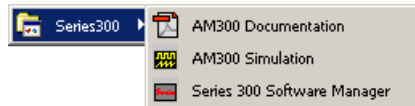
Entering **AM300 Simulation** starts a program in simulation mode. In this mode no device is connected. Before you can remotely control the R&S AM300, it is necessary to create a program version for specific instrument. Use the service program **Series 300 Software Manager** for this.

Starting the service program

1. In the Windows™ start-up directory select:
   Start\Programs\Rohde & Schwarz\Series300\Series 300 Software Manager

   The service program initializes. The program interface is divided into two areas:

   I A list of all previously connected Smart instruments
   II Information, status fields and command buttons for authorization
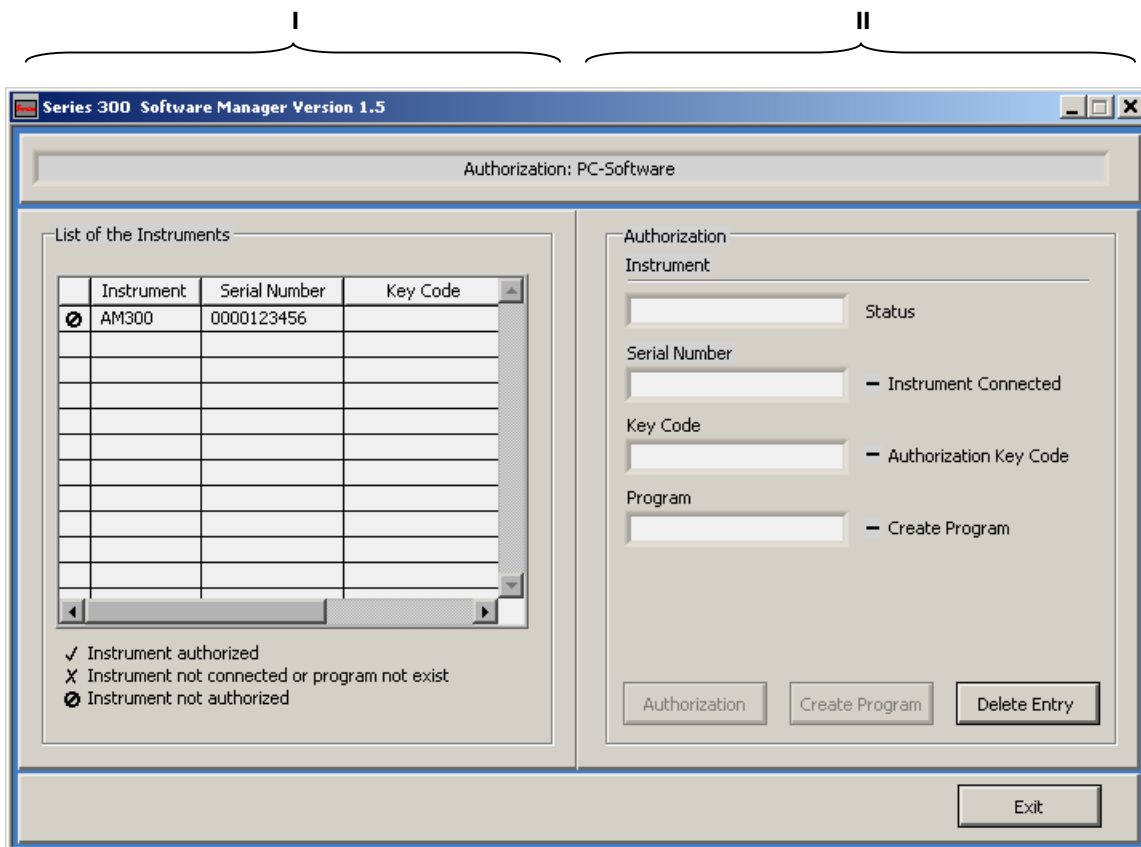
Entering the key code

2. 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" ( ).
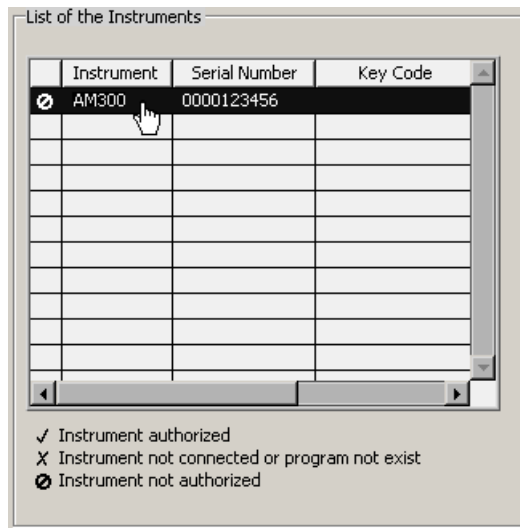
In **II** the authorization information is displayed:
(a) Current instrument information
(b) Instrument status
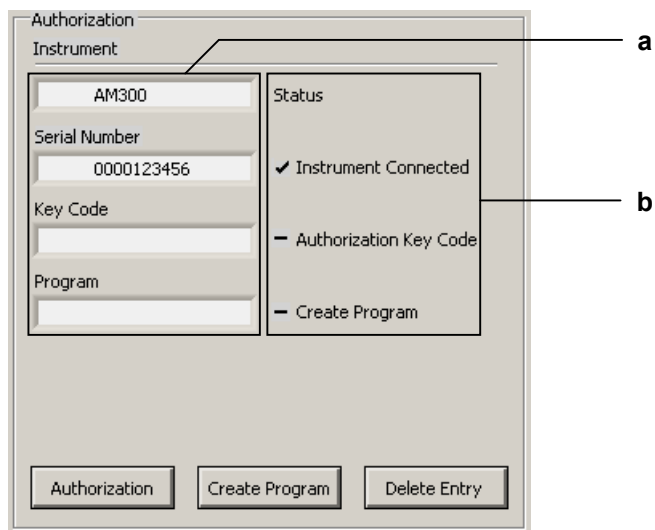
Creating the program version for specific instrument

3. 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**).
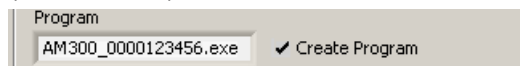
4. In **II** click **<Exit>** to close the service program. After correctly creating the program version, the option **AM300 0000xxxxxx** is available in the Windows™ start-up menu
Start\Programs\Rohde & Schwarz\Series300.
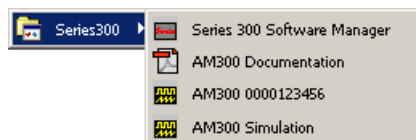
7.3   Starting the Remote Control

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).
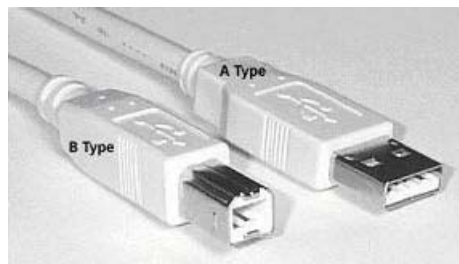
Prepare remote control

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:
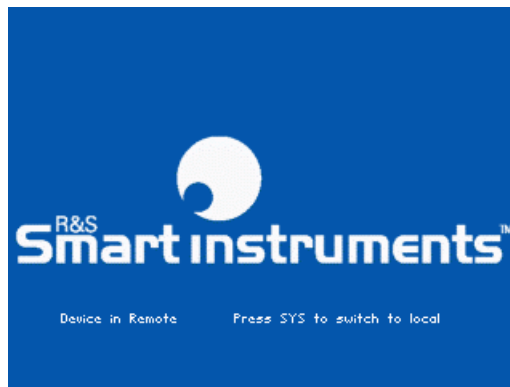
If the R&S AM300 is not automatically recognized, please check that the USB master switch of the R&S AM300 is at position **AUTO** (↗ 6-209).

📄 **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**.
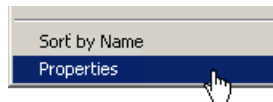
Click **<OK>** to create a link between the programm and start-up directory.
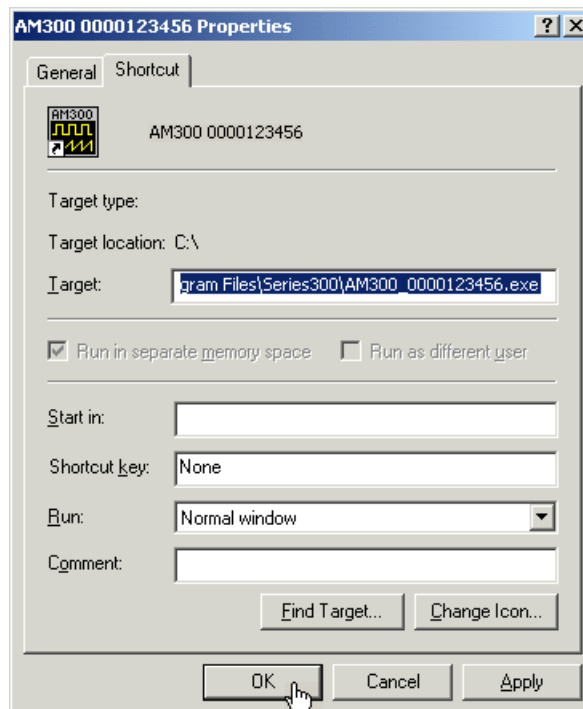
Start the program again (↗ above, instruction 1.)

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 **Vpp = 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**.
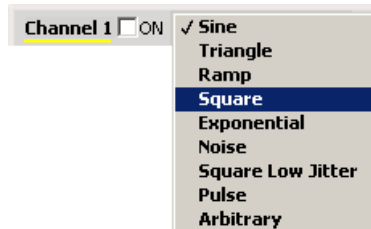
Setting the signal frequency 250 Hz

3. Click on the **Frequency** display.
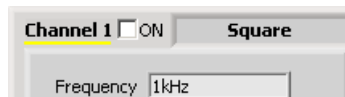
Functions are displayed with parameters in the setting area.
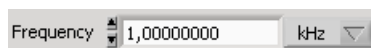
4. Set the measuring unit **<Hz>** for the **Frequency** input window by clicking the mouse.
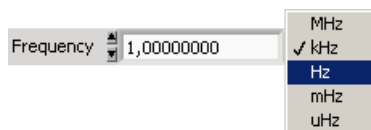
5. Push the **<Tab>** button on the keyboard. The **Frequency** input window is active. Enter the value **<250>** with the numeric keys. Complete the input with the **<Enter>** button.

Switching on the output

6. In the main function display CH1, click the **<On>** check box.
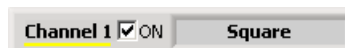
7.5 Control Concept

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
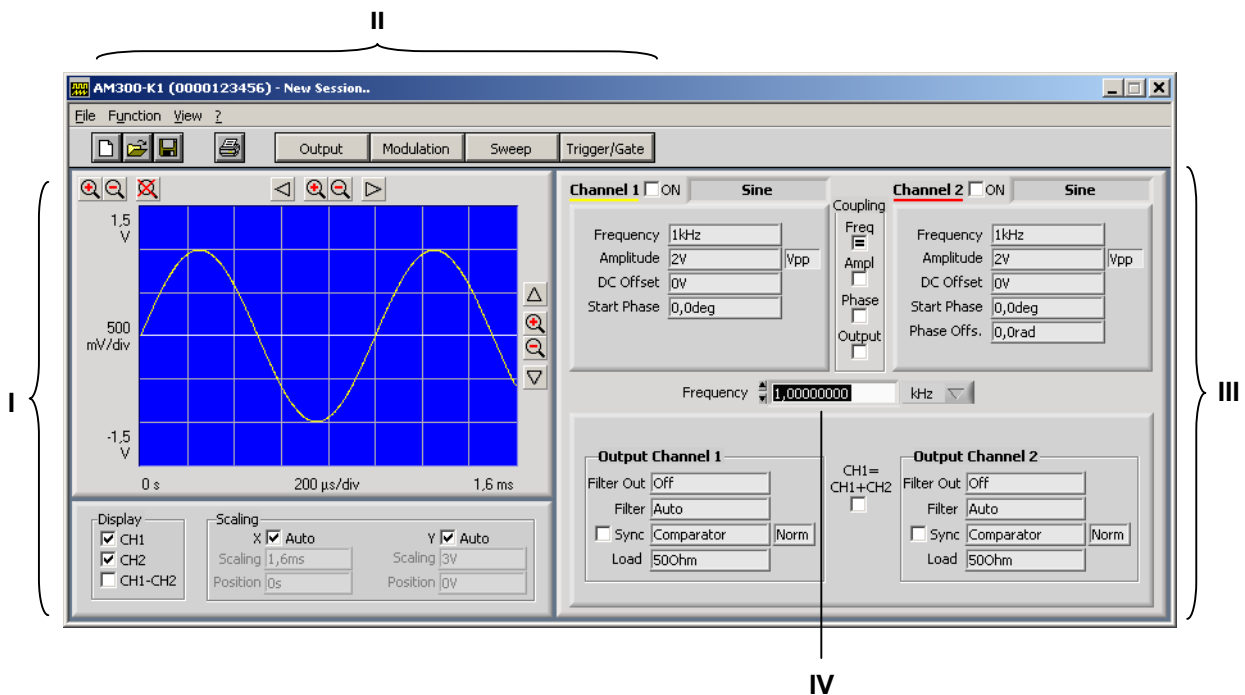
7.5.1.1 Diagram

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**)
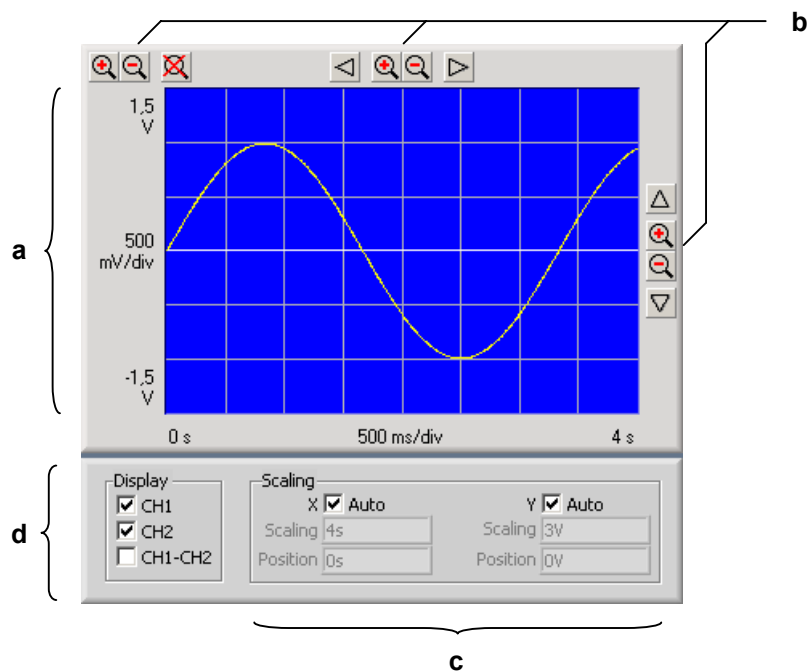
7.5.1.2 Menus

Calling up and displaying menus Different pull-down menus can be accessed in the menu area.
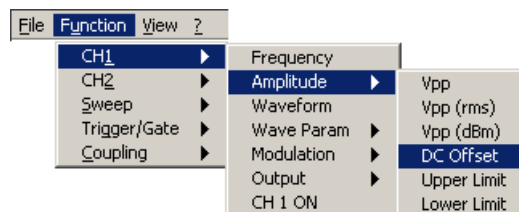
In addition, Windows™-typical menu items can be called up via a toolbar (icons).

Menus for setting the measuring parameters and functions are also available as a toolbar and can be selected directly.
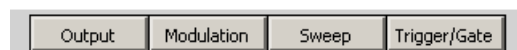
📄 **Note** The ▶ arrow after a menu option in the pull-down menu indicates that a submenu will appear after opening.

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
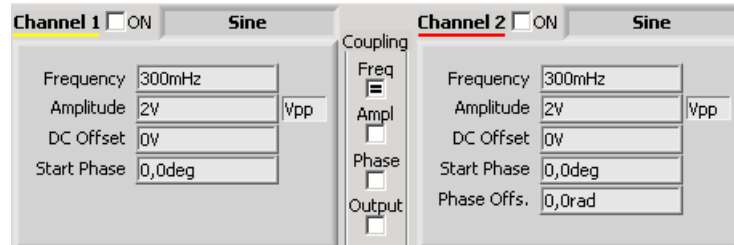
Inserting specific functions

In the lower part of the function display, different function displays, e.g. **Trigger/Gate**.
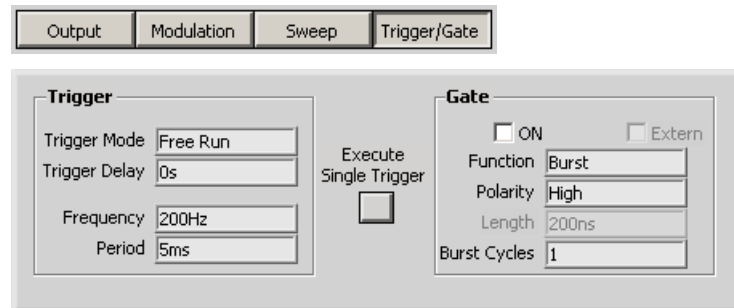
Note: If a selection is not highlighted, it has currently no function (current setting).

7.5.2   Setting the Parameters

General   Parameters can be set in different ways:

- Clicking the button

- Activating the check boxes
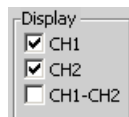
- Entering the parameters in the setting area (in the middle of the function area)
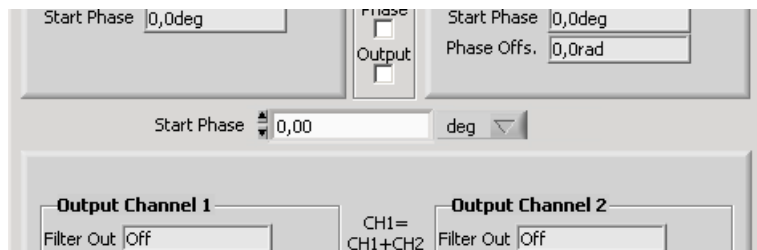
The keyboard and mouse can be used for the settings.

Entering the parameters in the setting area   Parameters are selected and entered in the setting area only.

1.   Click in that display where the parameters have to be changed, e.g. **Frequency**.
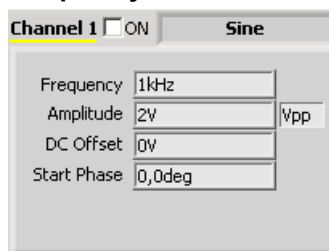
Functions are displayed with parameters in the setting area.
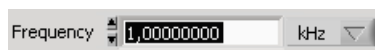
2.   Select the assigned settings in the selection field e.g. **mHz**.
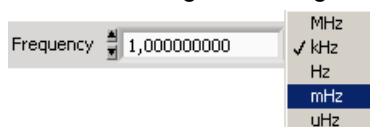
And/or enter numeric parameters in the input field, e.g. **300**.
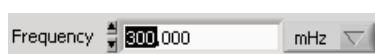
7.6   Overview of all Menus and Functions (Shortcuts)

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.

CH<u>1</u>	▶	Configuring the output signal CH1
CH<u>2</u>	▶	Configuring the output signal CH2
<u>S</u>weep	▶	Sweep settings
Tri<u>g</u>ger/Gate	▶	Trigger settings
<u>C</u>oupling	▶	Setting the depedence between the channels

7.6.4.1   CH1 (CH2)

Main function display (always visible)

```
1 ──  Channel 1 □ ON        Sine    ── 7

2 ──      Frequency  1kHz
3 ──      Amplitude  2V         Vpp  ── 6
4 ──      DC Offset  0V
5 ──      Start Phase  0,0deg
```
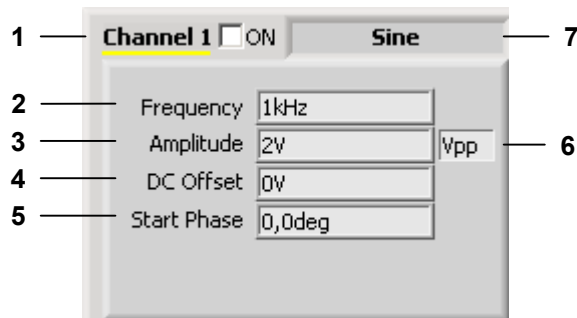
Pull down menu

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)**

1 —

Modulation Channel 1 ▲▼	AM	— 2
☐	Frequency 100Hz	— 3
ON	Depth 50,0%	— 4
	Waveform Sine	— 5
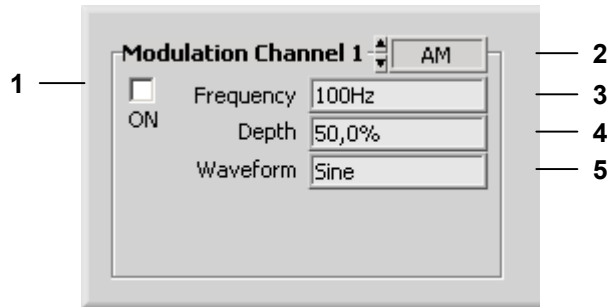
Pull down menu

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	

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)

Output Channel 1

1	Filter Out	Off
2	Filter	Auto
3	☐ Sync	Comparator — Norm
4	Load	50Ohm

CH1= CH1+CH2 ☐ — 7

6 (Norm)

5 (50Ohm)

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)
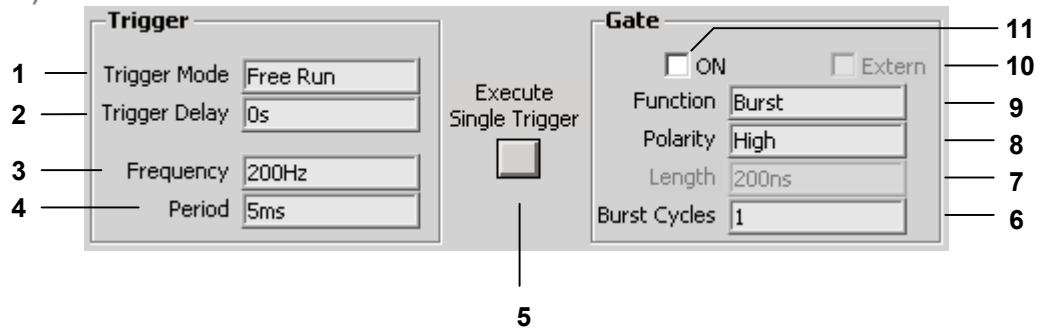
Pull down menu

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)
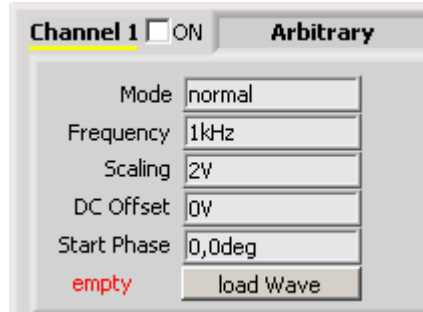
Function

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)
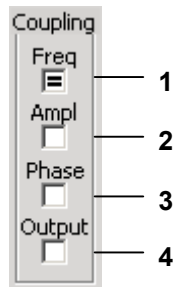
Pull down menu

✓ 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)**
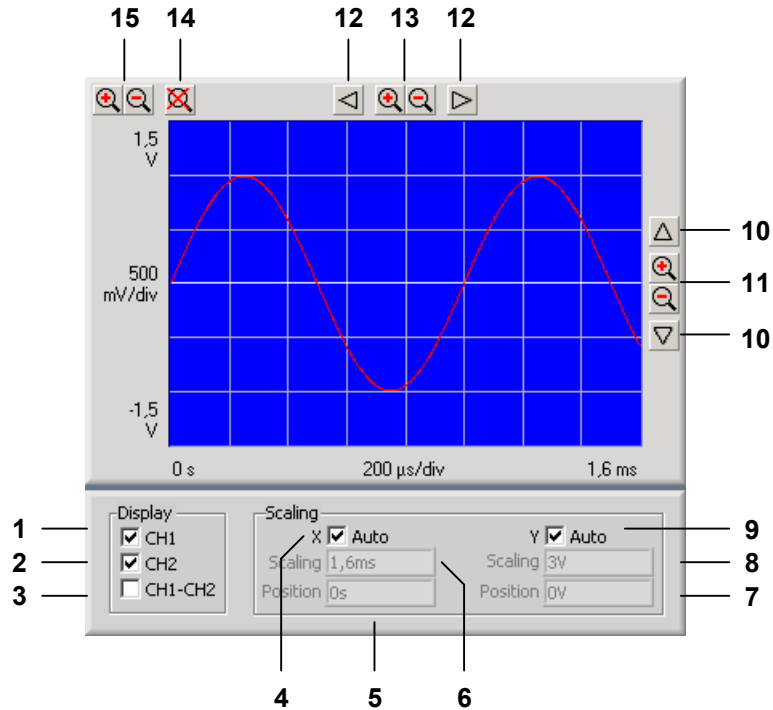
Functions

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   The address of our Support Center and a list of Rohde & Schwarz service
information   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**)
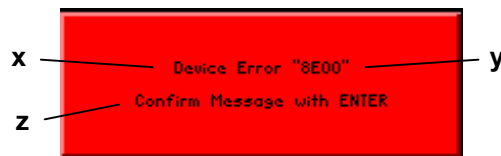
The error number allows the service shop to determine the type of error. In the event of an system message, please write down the error number and proceed according to the following steps.

Device Error "Error number"   A system error was detected in the instrument.

1. Please write down the error number and the corresponding instrument settings.
2. Contact your nearest Rohde & Schwarz representative (0-23). 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 an system message occurs, an entry is made under SYSTEM MESSAGES (↗ 6-217).

10   Index