ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

SIGNAL GENERATOR

SMT

1039.2000.02/03/06

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Republic of Germany

Tabbed Divider Overview

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Tabbed Divider

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Safety Instructions

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

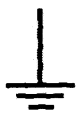
Weight indication for units >18 kg

PE terminal

Ground terminal

Danger! Shock hazard

Warning! Hot surfaces



Ground

Attention! Electrostatic sensitive devices require special care

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:

   Pollution severity 2, overvoltage category 2, IP degree of protection 2X, altitude max. 2000 m.

   The unit may be operated only from supply networks fused with max. 16 A.

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 (eg 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).

continued overleaf

Safety Instructions

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. Any additional safety instructions given in this manual are also to be observed.

Patent Information

This product contains technology licensed by Marconi Instruments LTD. under US patents 4609881 and 4870384 and under corresponding patents in Germany and elsewhere.

Certified Quality System

ISO 9001

DQS REG. NO 1954-04

Qualitätszertifikat

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz-Qualitätsmanagementsystem ist nach ISO 9001 zertifiziert.

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.

Certificat de qualité

Cher client,

Vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.
Le système de gestion qualité de Rohde & Schwarz a été homologué conformément à la norme ISO 9001.

095.1000 Bl. 0-0796

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Für technische Fragen zu diesem Rohde & Schwarz-Gerät steht Ihnen ab sofort unsere Hotline der Rohde & Schwarz Vertriebs-GmbH, Support Center, zur Verfügung.

Unser Team bespricht mit Ihnen Ihre Fragen und sucht Lösungen für Ihre Probleme.

Die Hotline ist Montag bis Freitag von 8.00 bis 17.00 Uhr besetzt.

Bei Anfragen außerhalb der Geschäftszeiten hinterlassen Sie bitte eine Nachricht oder senden Sie eine Notiz per Fax oder e-mail. Wir setzen uns dann baldmöglichst mit Ihnen in Verbindung.

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

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

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

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

ROHDE&SCHWARZ

1007.8684

ROHDE&SCHWARZ

EC Certificate of Conformity

CE

Certificate No.: 960011

This is to certify that:

Equipment type	Order No.	Designation
SMTxx	1039.2000.xx	Signal Generator

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 : 1991
EN50081-1 : 1992
EN50082-1 : 1992

Affixing the EC conformity mark as from 1996

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Munich, 08.02.96

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Supplement B
to Operating Manual
SIGNAL GENERATOR
SMT

Correction of Data Sheet, Number 0196

Spectral purity

Harmonics

With pulse modulator on:
Level ≤ 5 dBm ..... < -30 dBc
Level without overrange ..... < -26 dBc

Model SMT03

Amplitude modulation:

AM distortion factor at 1 kHz
Applies to levels ≤ 7dBm

1 Preparation for Use

1.1 Putting into Operation

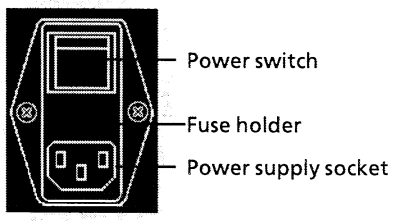
Before putting the SMT into operation, please make sure that
- the covers of the casing are put on and screwed,
- the ventilation openings are free,
- no signal voltage levels exceeding the permissible limits are applied at the inputs,
- the outputs of the instrument are not overloaded or connected incorrectly.

If these points are not observed, the instrument might be damaged.

1.1.1 Supply Voltage

The SMT can be operated at a.c. systems from 90 to 132 V and 180 to 265 V at system frequencies from 47 to 440 Hz. The power supply socket is situated at the rear of the instrument. The instrument automatically sets itself to the voltage applied within the permissible voltage ranges. It is not necessary to set the instrument to a certain supply voltage.

1.1.2 Switching On/Off the Instrument

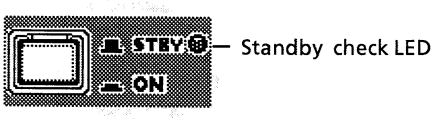


Power switch at the rear of the instrument

Switch on/off: ▸ Press power switch at the top/bottom

When the instrument is switched off, the marking "○" is visible at the top of the power switch.

The power switch can remain switched on permanently. Switching off is only necessary when the instrument is to be completely disconnected from the mains.



On/off switch at the front of the instrument

Switch on: ▸ Press switch.

The instrument is ready for operation.

Switch off: ▸ Release switch.

The instrument assumes the STANDBY mode.

1.1.3 Initial Status

Upon switching on, the instrument either automatically assumes the status set when it was switched off (parameter POWER-ON STATE PREVIOUS SETTING in LEVEL-LEVEL menu) or the RF output is disconnected (POWER-ON STATE RF OFF).
If the instrument need not be operated from the initial status any further, a defined default status should be established by pressing the [PRESET] key prior to making further settings.

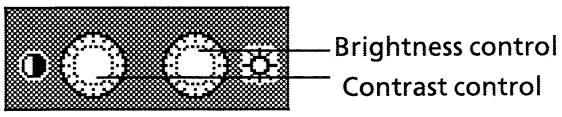
STANDBY Mode

In the STANDBY mode the optional reference oscillator (option SM-B1) remains switched on, which increases frequency accuracy.

Frequency accuracy after switching on when the oven-controlled reference oscillator is fitted (option SM-B1)

When switching on from the STANDBY mode, the specified frequency accuracy is reached immediately. If the power switch was switched off, the reference oscillator needs some minutes of warm-up time to reach its nominal frequency. During this period of time, the output frequency does not yet reach its final value either. In the status line in the header field of the display the message "OVEN COLD" is displayed for this time.

1.1.4 Setting Contrast and Brightness of the Display



Contrast and brightness of the display can be set by means of the contrast and brightness controls situated below the display.

1.1.5 RAM With Battery Back-Up

The SMT has a static read-write memory (CMOS-RAM) with battery back-up, in which 50 different complete settings of the instrument can be stored (cf. Chapter 2, section "Storing and Calling of Instrument Settings"). In addition, all data and/or lists the user enters himself, such as for memory sequence and user correction of the level, are stored in the RAM. Further, all data of the calibrations running within the instrument in the SMT are stored in the RAM (cf. Chapter 2, section "Calibration").

A lithium battery with a service life of approx. 5 years serves to supply the RAM with power. When the battery is discharged, the data stored will be lost. Exchanging the battery is described in service manual.

1.1.6 Preset Setting

A defined setting status is achieved by pressing the [PRESET] key.

Preset Status:

RF frequency	100 MHz
RF level	–30 dBm
Reference frequency	internal, adjustment off
Offsets	0
Modulations	switched off
Transient-free level setting	switched off, level attenuator mode: AUTO
Internal level control	level ALC: ON
User correction	level Ucor: OFF
LF output	switched off
Sweep	switched off
Memory sequence	switched off
Suppression of indications	system security: unaltered
Protection of calibration data	protection lock: unaltered
Settings stored	unaltered
Data, lists etc. stored	unaltered
IEC-bus address	unaltered
Beeper	unaltered
Power-on state	unaltered

All parameters and circuit states, even those of operating modes which are not activated, are preset by means of Preset.

The presettings going beyond the above list can be seen from the menu representations as of Section 2.4 which each indicate the Preset setting status.

1.2 Functional Test

On switching on the instrument and permanently during operation, the SMT carries out a selftest. The ROM contents as well as the battery of the non-volatile RAM are checked on switching on the instrument and the RAM contents with every calling the memory. The most important instrument functions are automatically monitored during operation.

If an error is detected, the message "ERROR" is displayed in the status line. For further identification of the error, press the [ERROR] key. Thereupon a description of the error/s is displayed (cf. Chapter 2, Section "Error Messages"). Return to the menu exited by pressing the [RETURN] key.

If required, the selftests can be induced purposefully. See Chapter 2, Section "Functional Test".
Further, internal test points can be polled by the user and the results be read out and displayed. See Chapter 2, Section "Voltage Display of Test Points".

1.3 Fitting the Options

Due to its variety of options, the SMT offers the possibility of providing the instrument with the equipment exactly corresponding to the application. Newly fitted options are automatically recognized and the relevant parameters added in the menu.

After every change of the instrument configuration, the CMOS RAM has to be cleared as the storage data shift:

- Switch off the instrument
- Switch the instrument on again with the [PRESET] key pressed

The internal calibration routines VCO SYN, LEV PRESET, PULSE GEN and FM now have to be called up again to restore the cleared calibration values.
These routines are accessible via menu UTILITIES-CALIB (see also Chapter 2, section "calibration"). The calibration routines have to be carried out in the following order:

1. VCO SYN (synthesizer)
2. LEV PRESET
3. PULSE GEN (if installed)
4. FM (synthesizer)

1.3.1 Opening the Casing

Caution: *Prior to opening the SMT unplug the power connector.*

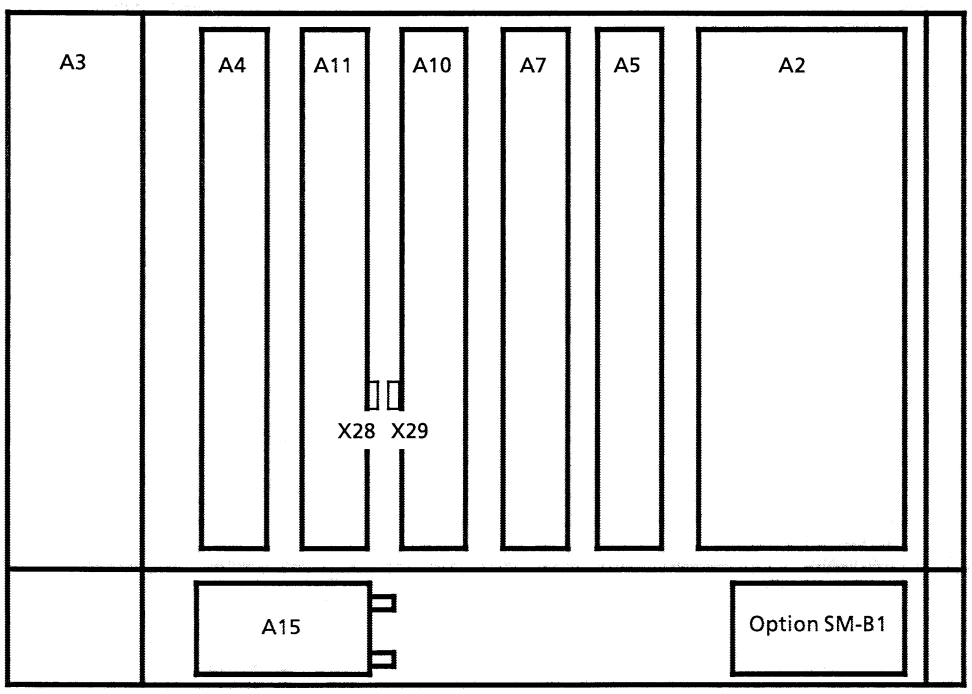
Remove paneling

- Remove four screws in the two tilt feet at the rear of the instrument.
- Remove the upper paneling towards the top and rear.
- Turn the instrument.
- Remove the lower paneling towards the top and rear.

Open ventilation ducts

When an option is fitted at a slot which has not been used up to now, the appropriate ventilation duct of the plexiglass plate at the left in the casing frame must be opened. The openings are pre-punched so that the respective part is easy to break out.

1.3.2 Overview of the Slots



A2 = power supply
A3 = front unit
A4 = option
A5 = option
A7 = synthesizer
A10 = output unit, 1.5 GHz
A11 = output unit, 3 GHz/6 GHz
A15 = attenuator

Fig. 1-1 SMT – View from the top

1.3.3 Option SM-B1 – Reference Oscillator OCXO

Fitting the option

- Fasten the option at the back end of the lateral opening by means of the screw threads provided there.
  If slots A5 and A6 are both occupied, one of these modules must be removed temporarily.
- Feed ribbon cable W710 through the rear square cut-out to the motherboard, insert into connector X22 and snap in the locking.
- Feed coaxial cable W710 from socket X711 of the option through the second cut-out along the rear transverse panel to connector X74 at the A7 module, synthesizer, via the motherboard and insert there. Fasten the cable at the transverse panel using the cable ties attached.

Set tuning voltage and calibrate OCXO

The crystal oscillator was factory-tuned to nominal frequency and the appropriate tuning voltage indicated on the cover of the module. The calibration value now has to be calculated from this value and transferred to the memory of the signal generator.

Calculate calibration value

The tuning voltage is generated by a 12b-bit-D/A converter which is scaled such that a tuning voltage of 12 volts is generated with calibration value (CALIBRATION DATA) 4000. The calibration value is thus calculated from the tuning voltage (V_{tun}) as follows

$$\text{CALIBRATION DATA} = V_{tun} \times 4096 \ / \ 12$$

For checking purposes, the voltage at pin 16 of plug X22 on the motherboard can be remeasured and corrected if necessary. A check by means of frequency measurement may only be made after a warm-up of 2 hours and against a calibrated reference.

Store calibration value

- Call menu UTILITIES-CALIB-REF OSC.
- Enter the calculated calibration voltage with CALIBRATION DATA by means of the rotary knob or keypad.
- Select STORE CALIBRATION DATA
- Terminate entry using the [SELECT] key
  The new calibration value is stored in the EPROM.

Note: *The flash EPROM does not permit the deletion of individual data. Thus new memory space is occupied for each calibration. If there is no memory space available any more, the EPROM must be cleared by an authorized service shop and be written into anew. Thus a calibration should only be made if necessary.*

1.3.4 Option SM-B2 – LF Generator

Fitting as 1st generator

As 1st generator, the LF generator is fitted at one of the rear slots A5.

- Withdraw jumper X29 at the front top of the motherboard.
- Plug jumper X3 at position 2-3 (on the right) on the option (to the right of multipoint connector X50).

Fitting as 2nd generator

If there already is a generator at one of the slots A5, the LF generator is mounted at slot A4.

- Withdraw jumper X28 on the motherboard.
- Plug jumper X3 at position 1-2 on the option.

1.3.5 Options SM-B3, SM-B8, and SM-B9 – Pulse Modulator 1.5, 3, and 6 GHz

When fitting this option, the RF characteristics of the instrument change to such an extent that the output level has to be calibrated. This requires calibrated test instruments , a control processor and service kit SM-Z2. For this reason, fitting should be carried out at an authorized R&S service shop. Fitting is described in the service manual (stock number 1039.3359.24).

1.3.6 Option SM-B4 – Pulse Generator

The pulse generator is fitted within module A4, pulse modulator.

Fitting the option

- Open module A4.
- Fasten the pulse generator board by means of 4 screws.
- Plug in connectors W10 and W11.
- Screw on cover again.
- Establish the following RF connections at the pulse generator:

Cable	From	To	Signal
W43	A4-X43	Rear panel	VIDEO
W44	A4-X44	Rear panel	SYNC

- Cable 50-MHz reference, cf. Section 1.3.12

Calibrating pulse generator

- Call menu UTILITIES/ CALIB /PULSE GEN
- Select action CALIBRATE ▸ and activate using the [SELECT] key
  The start and end of the calibration are displayed. Calibration only takes a few seconds.

  Note: *The calibration data are stored in the RAM, thus the calibration can be repeated as often as required.*

1.3.7 Option SM-B6 – Multifunction Generator

The multifunction generator is fitted at slot A5.
Remove jumper X29 at the motherboard.
For cabling the 50-MHz reference, cf. Section 1.3.9.

1.3.8 Option SMT-B19 – Rear Panel Connections for RF and LF

The SMT can be retrofitted to match rear panel connections for RF and LF for mounting into a 19" rack by means of option SMT-B19. The mounting instructions are attached to the option.

1.3.9 Cabling of the 50-MHz Reference (REF50)

Instrument with option multifunction generator

Cable	From	To
W172	A7-X72	A5-X53

Instrument with option pulse generator

Cable	From	To
W41	A7-X72	A4-X41

Instrument with options multifunction generator and pulse generator

Cable	From	To
W172	A7-X72	A5-X53
W41	A5-X51	A4-X41

1.4 Mounting into a 19" Rack

Caution: *Ensure free air inlet at the perforation of the side walls and air outlet at the rear of the instrument in rack mounting.*

The SMT can be mounted into a 19" rack by means of rack adapter ZZA-94 (stock no. 396.4905.00). The mounting instructions are attached to the adapter.