STABILOCK 4031 4032

GSM BS-Test

Software Option 897 076
Hardware Option 248 274

Operating Instructions

Doc. Version 9701-200-A

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Supplement to operating manual; file under chapter 10

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☞ **Differences to former software versions: see the Lifeline at the end of this supplement.**

Introduction

You can start testing right away if you stick to the following checklist:

- The GSM BS-Test option must be in place in **slots 5/6**. Socket Bu 103 of the GSM option has to be connected to socket Bu 103 of the IF unit. Use the BNC cable delivered with the GSM kit for that purpose. If you encounter compatibility problems, refer to the section "Compatibility with other options".
- **Connect the test item** as described in the section "Before Testing", "Test setup".
- **Prepare unit under test and STABILOCK** as described in section "Preparing MS and STABILOCK for testing".
- Set the **parameters** of the BS. There are more details of this in the section "Before Testing", "Setting test parameters".
- **Start the test** with the appropriate softkey.

What can the GSM BS-Test option do?

The GSM BS-Test option can perform the following tests:

- Peak power (TX test) and burst length
- Power/time template (TX test)
- Phase error and frequency error (TX test)
- Graphic Phase error display
- Modulation spectrum

Software requirements

STABILOCK 4031: Firmware ≥3.832, RF/AF-MCU version ≥2.5S.
STABILOCK 4032: Firmware ≥5.032.

Hardware requirements

STABILOCK 4031 from serial number 1188 000 (serie 1188) onwards, or STABILOCK 4032. Earlier models (from serial number 0788 000 onwards) can be fitted with an upgrade kit (ordering code 248281) to produce the same status as the 1188 000 series. **This has to be done in the factory**.

☞ In the event of compatibility problems, refer to the section "Compatibility with other options".

Before Testing

This section tells you about the test setup, presettings, how to start the GSM test software, set parameters for BS, and how a test report is produced.

☞ You can perform the tests without detailed knowledge about GSM. But if you do want to find out more, there is a brief introduction in the section "Basics".

Test setup

Levels of < –110 dBm appear during tests, so the entire setup must be guarded against stray pickup. The following precautions are recommended:

- Terminate the RF DIRECT socket of the test setup with 50 Ω.
- Make sure that all plug-ins of the test setup (back panel) are screwed in tight.
- Close up vacant slots on the test setup (back panel) with dummy panels.

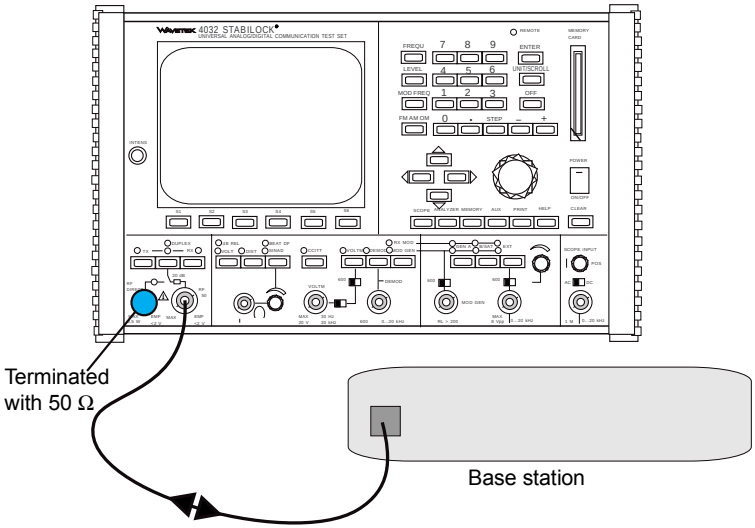


Fig. 10.1: Measurement setup.

Preparing STABILOCK and BS for testing

STABILOCK

- Connect test equipment as shown in **Fig. 10.1**.
- Switch on STABILOCK.
- Insert the supplied memory card in its slot on the STABILOCK.
- Start test software with AUX+DATA. STABILOCK then shows the GSM BS-Test mask on the screen (**Fig. 10.2).**
- Set up test parameters as described in the following section.
- The Communication Test Set has to be synchronized externally for measurements of frequency error with accuracy of <0.05 ppm (eg. by a 10 MHz rubidium frequency standard).

BS

- During an ongoing test, only one signal may be fed into the Communication Test Set. (ie only one transmitter of the BS may be active, or the frequencies of all BS transmitters must be separated by at least 10 MHz).

Attention for Power measurements below 20 dBm (100 mW)

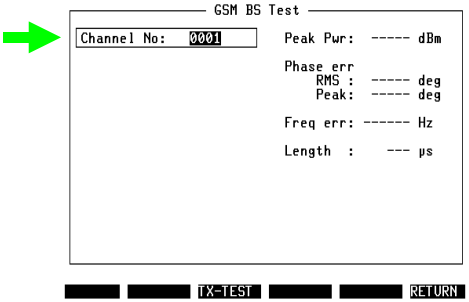
If you intend to measure power levels below 20 dBm (100 mW), a sample measurement is necessary before getting valid results.

Therefore, during an ongoing test, you feed a power level >+20 dBm into the STABILOCK.

Every time the `Peak Power` field displays --------, this sample measurement has to be performed.

Setting test parameters

Fig. 10.2: This parameter determines the frequency channel on which the Communication Test Set listens in to the BS.



`Channel No` The frequency channel on which the the test is executed. Permissible range: 0 to 124 and 975 to 1023.

This parameter determines the frequency channel on which the Communication Test Set listens in to the BS.

TX TEST

The TX TEST checks the transmitter characteristics of the BS. This enables measuring bursts and coninuous signals.
STABILOCK hereby measures frequency offsets of up to ±100 kHz from the preset channel.

Why?

A BS must not disturb general radiocommunication in the GSM network. So the transmitter of the BS must have precisely the characteristics defined in GSM Specifications.

How?

- Prepare measurement as described in section "Before testing".
- Start test with (TX-TEST). The labelling of the softkeys changes (**Fig. 10.3**). Continous measurements are performed and the results are displayed.

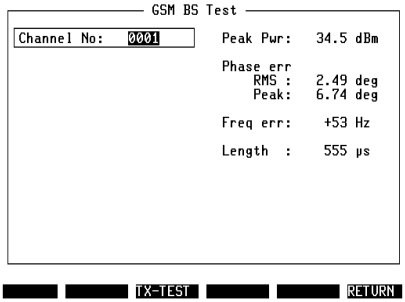


Fig. 10.3: After (TX-TEST), STABILOCK measures the transmitter characteristics of the BS and shows the figures in the righthand half of the GSM BS-Test mask.

- (PHA-ACC) for measurements below 20 dBm (100 mW): Switches to maximum measuring accuracy for phase error, frequency error and power/time tmeplate.
  (PHA-ACC) switches back to maximum accuracy for peak power measuring.
- (MIN-MAX) leads to the MIN-MAX mask. See section "Result display", "MIN-MAX mask".
- (BURST) displays the power/time template. See section "Result display", "Burst and Zoom".
- (FREEZE) freezes the display. The STABILOCK then displays the the results of the most recently performed single measurement. (RUN) continues the measuring.
- (STOP) stops the measuring.

☞ During an ongoing test, only one signal may be fed into the Communication Test Set (ie only one transmitter of the BS may be active).

Result

The transmitter characteristics of the BS are measured continuously and shown anew after each test. In the MIN-MAX mask the results may be traced over many single measurements (see section "Result display", "MIN-MAX mask"). In the BURST and ZOOM masks the results are shown graphically (see section "Result display", "Burst and Zoom"). The following BS properties are measured:

`Peak Power` The peak power of the BS transmitter during the burst in cw mode.

`Phase err` Phase error

`RMS` Averaged phase error. This must not exceed 5°.

`Peak` Maximum phase error. This must not exceed 20°.

`Freq.err` Frequency error. This must not be more than ±45 Hz.

`Length` Burst duration in µs. Typical duration (6 dB below peak level):
normal burst: 543 µs to 563 µs

continuous signal: Here a `?` is displayed

Result display

MIN-MAX mask

In the MIN-MAX mask the properties of the BS transmitter are displayed over a desired measuring period. Call-up of the mask with (MIN-MAX) during the ongoing TX test.

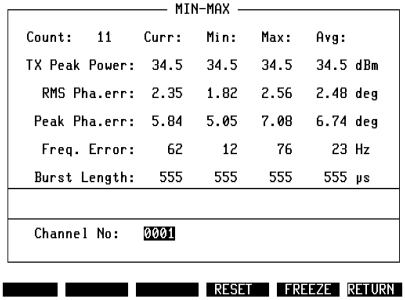


Fig. 10.4: MIN-MAX mask

`Count` Number of performed single measurements.

`Curr` Test result of the most recently performed single measurement.

`Min` Minimum value over all single measurements, since count=0.

`Max` Maximum value over all single measurements, since count=0.

`Avg` Average value over the ca. 30 most recent single measurements. The value is calculated by using the following formula:

New = (Act - Old) * 0.03 + Old, where

New: New average value
Act: Actual Test result
Old: Old average value.

(RESET) Resets all output fields to 0 and starts a new series of measurements.

(FREEZE) Freezes the display, until the measurement is continued with (RUN).

(RETURN) Takes you back to the GSM BS-Test mask (**Fig. 10.3).**

Power versus time

In the BURST mask the power is displayed as a function of time. Call-up of the mask with (BURST) during the ongoing TX test.

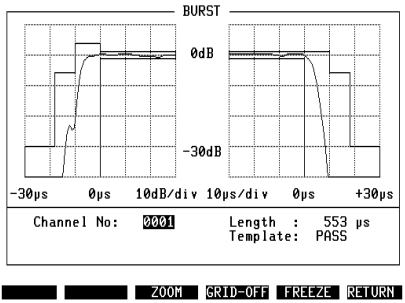


Fig. 10.5: BURST mask

The power/time template shows at a glance, whether the transmitted power of the BS meets the specifications during a burst. If the test has been passed, then PASS is displayed beside Template, otherwise FAIL.

☞ A continuous BS signal is shown as a flatline.

(ZOOM) Zooms into the graphic display of the BS power. The softkey is renamed to (PHASE). If you repeat striking the softkey, then phase error and modulation spectrum (resolution band width RBW = 4 kHz) with current value, peak value and average value will be displayed one after another (see **Figures 10.6** to **10.10**).

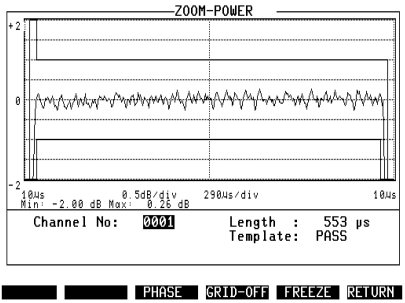


Fig. 10.6: ZOOM-POWER mask

(GRID-OFF) Blanks out the grid. (GRID-ON) blanks it in again.

(FREEZE) Freezes the display, until the measuring is continued with (RUN).

(RETURN) Takes you back to the BURST mask (**Fig. 10.5).**

☞ The signal must contain training sequence number 0 in order to produce a correct burst measurement (**Fig. 10.14**).

Fig. 10.7: ZOOM-Phase mask

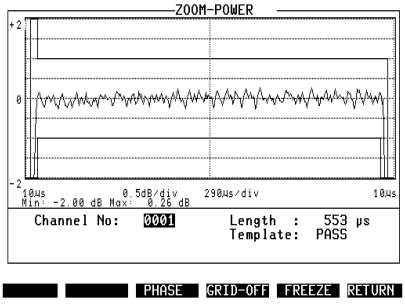


Fig. 10.8: ZOOM-SPECTRUM mask

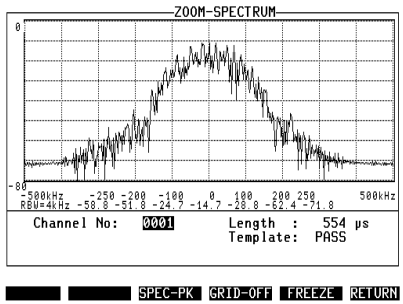


Fig. 10.9: ZOOM-SPEC PK mask

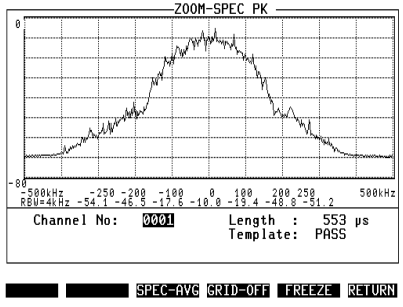
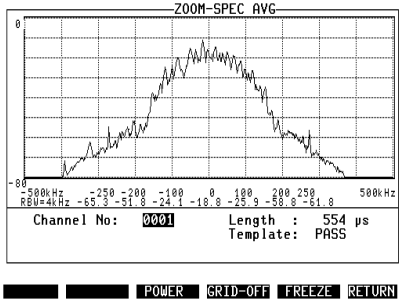


Fig. 10.10: ZOOM-SPEC AVG mask



Polling results via IEEE controller

Polling results from MIN-MAX mask

Result	IEEE command	Position in string 0123456789012345678 9
TX peak power (current and MIN)	RESULt1	ccccc;llllll;******
TX peak power (MAX, average and unit)	RESULt2	hhhhhh;aaaaaa;uuu;**
RMS phase error (current, MIN, MAX)	RESULt3	ccccc;lllll;hhhhh;**
RMS phase error (average), Peak phase error (current and MIN)	RESULt4	aaaaa;ccccc;lllll;**
Peak phase error (MAX and average)	RESULt5	hhhhh;aaaaa;********
Frequency error (current and MIN)	RESULt6	cccccc;llllll;****;*
Frequency error (MAX and average)	RESULt7	hhhhhh;aaaaaa;******
Length of burst (all)	RESULt8	ccc;lll;hhh;aaa;****

Meaning of the entries

*	Reserved
c	Current
l	Lowest (MIN)
h	Highest (MAX)
a	Average
u	Units in dBm, µW, mW, W
;	Used to separate the string entries from each other.

Polling results from other test masks

Result	IEEECommand	Position in string 0123456789012345678 9
a = TX peak power b = TX power-/time template * = reserved	RESULt1	aaaaaaaaaa;bbbb;***;
d = RMS phase error e = Peak phase error	RESULt2	ddddddddd;eeeeeeeee;
f = Frequency error g = Burst length * = reserved	RESULt3	fffffffff;ggggggg;***;

; separates the entries from each other.

Basics

This section is a brief introduction to the GSM system. The following points will be looked at:

- Anatomy of a GSM network
- Basic specifications of radiocommunication
- Signalling
- Technical requirements and measured figures

This is as much as can be done at this point, because detailing GSM in full is the work of a lifetime. For interested people who may want to more than this short overview can present, here is a hint:

☞ A comprehensive, detailed and yet easily understandable introduction to theory and practice of GSM technology is given in the book "Introduction to GSM" by Siegmund Redl, Matthias Weber and Malcolm W. Oliphant, Artech House, Boston, London,
Tel.: +44 1 71 9 73 80 77, Fax: +44 1 71 6 30 01 66
ISBN 0-89006-785-6, available April 1995

Anatomy of a GSM network

GSM is a cellular network. The cells are theoretically organized in an hexagonal honeycomb structure (**Fig. 10.11**). **A mobile station (MS) that is located in any cell can be reached from the network and later it will be possible to reach it worldwide from any other cell.**

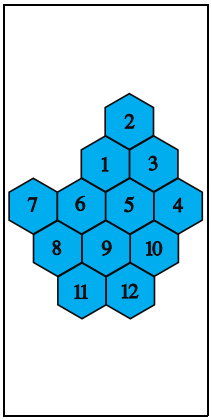


Fig. 10.11: Honeycomb structure of cellular network.

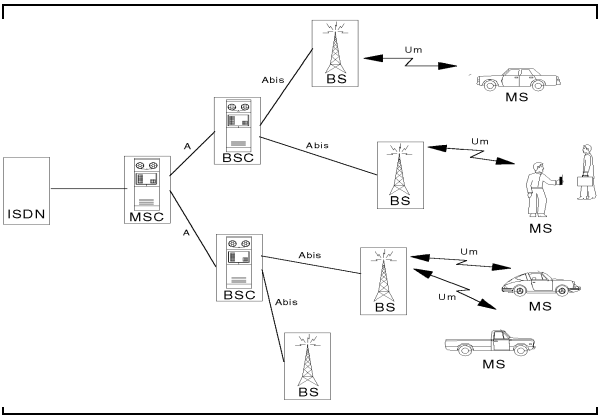


Fig. 10.12: Components in GSM network.

In each cell there is a base station (BS), the link between the wired network and any MS of its cell. The BS talks to the MS over the radio interface (Um interface). There is nothing else very special about it. It finds out what it has to talk about with each MS from its own controlling instance, the BSC, via the Abis interface (cabled).

The base station controller (BSC) coordinates the radio traffic of its BS with their MS, assigning traffic channels for instance. Its own "big boss" is the MSC.

The mobile station switching center (MSC) administers all calls in its region, it can pass information "to the top" about what MS are located in its region and check their authentication (see below). The MSC is linked directly to the wired network.

With each call that an MS makes, all the instances (BS, BSC, MSC) are involved. Going for a call, checking authorization, assigning traffic channels, changing cells - this all requires an intensive exchange of information between each of these instances and the next one up or down. This exchange of information is what is called signalling (see below).

Basic specifications of radiocommunication

Frequency band	MS → BS: 880.2 to 915.0 MHz BS → MS: 925.2 to 960.0 MHz
Duplex spacing	45 MHz
Channel spacing	200 kHz
Channels	0 to 124 and 975 to 1023
Channel utilization	TDMA (time-division multiple access). A channel is split into eight time slots. This allows eight calls simultaneously on one frequency. Following introduction of the half-speech codec, 16 calls will be possible at the same time on one frequency.
Length of time slot	577 µs. Eight time slots form a frame (4.615 ms).
Modulation	GMSK (Gaussian minimum-shift keying). Phase shifts of ±π/2 on symbol transitions.

Time slot and burst

An MS or BS may only transmit data during the time slot assigned to it. Apart from this it must not emit any power. So it must increase transmitted power very fast (about 30 µs) from zero to nominal. And once it has transmitted data, it must abruptly decrease the power again. This radio pulse is what is called a burst.

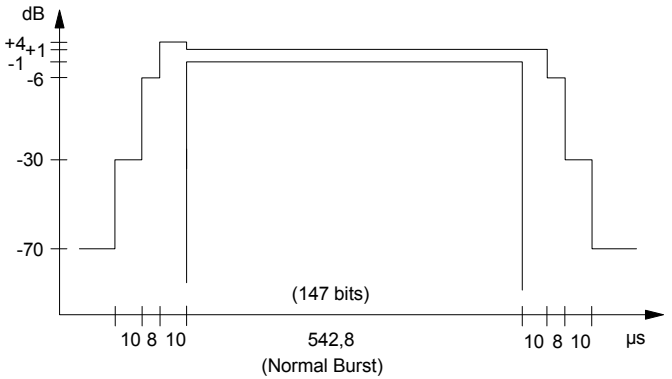


Fig. 10.13: The radiated power must be within the power/time template for the entire duration of a time slot.

A time slot transmits 148 bits. 114 of these are useful data. **Fig. 10.14 shows the structure of a time slot.**

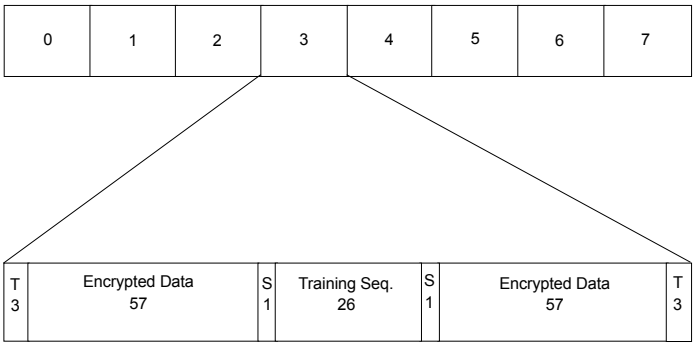


Fig. 10.14: A frame consists of eight time slots. One time slot is accompanied by tail bits (T) and includes stealing flags (S), the training sequence (26 bits) and 114 data bits.

`T` (tail bits)	Bear no information so that no data are lost if the burst does not exactly "catch" the time slot.
`S` (stealing flag)	Only with bursts in the traffic channel. If the stealing flag is set, the burst will contain no call data but signalling.
`Training Seq.`	A bit sequence known to the transmitter and receiver. The receiver looks for this bit sequence in the burst. If it finds it, it can work out exactly where the useful data are in the burst.
`Encrypted data` (data bits)	What is actually to be transmitted in the time slot. The data are ❍ encrypted to guard against interception, ❍ cleverly encoded so that incorrectly transmitted bits can be corrected.

Signalling

Signalling could be thought of as the red tape in radiocommunication. So it is no wonder if the term strikes you as being somewhat mysterious and obscure. Here is an example to shed some light on the subject.

MS-CALL

A subscriber is called by an MS that is already registered. The signalling necessary to set up the call is shown schematically below.

MS BS	Message	Meaning
→	Channel_Request	I want something from you.
←	Immediate_Assignment	Speak out! On channel 44, time slot 3.
→	Service_Request	I want to make a call.
←	Authentication_Command	The MSC says you must prove your identity. What's the result of authentication procedure x.?
→	Authentication_Completed	I'm OK. The answer is 42.
←	Ciphering_Command	Correct. Let's continue speaking encrypted. The parameter for encryption is 12345.
→	Ciphering_Completed	✡■❄▌✧❑❑❄❂❑❄▌✎ Encryption is on.
→	Setup	Dialled number xy.This is what I can do: I can fax, but sorry no half rate.
←	Call_Proceeding	Understood. MSC and the others are trying to get in touch with the person at the other end.
←	Assign_Command	It works. Your TCH is channel 16, full rate.
→	Assign_Completed	Thanks a lot. I told my RF parts.
←	Alert	It's ringing. Wait till he picks up the receiver.
←	Connect	The call is through. Now he's there.
→	Connection_Acknowledged	Thanks. See you at the next measurement report.

☞ The righthand column of the table is a "personalization" of the MS and BS. The numbers that are used are just examples, ie there is no guarantee of correctness.

The signalling in the example is exchanged - in appropriate form - in the MS-CALL test between STABILOCK and the test item.

Technical requirements and measured figures

Radiocommunication in a GSM network is quite different from that in analog networks, so testing is also different. Some of the reasons for this are:

- Because of the GMSK modulation, new ways are needed to measure phase and frequency error.
- The transmitters do not work continuously but in a burst mode, so the peak power has to be measured.
- All information transmitted is digital. So the signal/noise ratio is no longer a criterion for judging a receiver.
- The software also enters into radiocommunication. The signalling is involved in call setup. A test of connection setup also tests the correctness of the software in the sets.

What the CCITT is for analog radiocommunication, the GSM Specifications are for GSM. These tell you what figures a GSM set must produce for successful type approval.

Phase error Quality feature of modulator
The peak phase error is the maximum phase error in a burst.
The RMS phase error is the mean phase error for the duration of a burst.
According to GSM Specifications, the maximum phase error must not exceed 20 ° and the mean phase error 5°.

Frequency error This tells you how well an MS can synchronize to a BS.
The frequency error is computed as the change with time of the phase error.
Example: the phase drifts for the duration of a burst by 2,3 °. So the frequency error is 70 Hz.
GSM Specifications specify a maximum permissible frequency error of 90 Hz.

Transmitted power In GSM the transmitted power is divided into classes. An MS in the vicinity of a BS must transmit at lower power than one at the boundary of a cell.
An MS transmits in burst mode, so the peak power is measured. It may not deviate from nominal power by more than 3 dB, and in some power classes by more than 2 dB.

Power/time response

Power/time response is the decisive criterion for interference-free transmission.
According to GSM Specifications the power of an MS must remain precisely within the socalled power/time template. This ensures that the MS does not disturb adjacent time slots or the transmission power goes down
(**Fig. 10.15).**

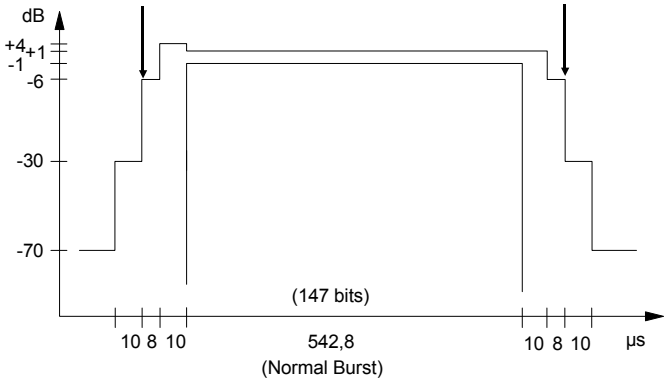


Fig. 10.15: Power/time template of a normal burst. The transmitted power of the MS must be within the template for the entire duration.Burst length is the time, while the signal is above -6 dB (arrows).

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Appendix

Ordering information and equipment supplied

Available GSM software options	
897 076 GSM BS-Test	memory card for base-station tests
897 077 GSM Mobile Test 2	memory card for mobile radiophones with extended test capabilities
248 274 GSM Package. This option consists of:	
253 001 GSM Unit	for slots 5+6
229 063 Duplex Meter DAMPS	GSM duplex module
897 075 GSM Mobile Test 1	memory card for the major tests on mobile radiophones
860 185	GSM test plug in SIM card
860 184	GSM test SIM card

Compatibility with other options

Slot	**Unit**
1	AF DETECTOR
2	MOD GENERATOR B **or** OPTION CARD **or** CONTROL INTERFACE A **or** CONTROL INTERFACE C
3	IF UNIT with/without **Tracking**
4	MOD GENERATOR A
5/6	**GSM Option**
7	SLAVE COMPUTER
8	DATA MODULE **or** RS 232/Centronics Interface
9	MONITOR CONTROL (CRT)
10	HOST COMPUTER

Table: Equipment required in setup for testing GSM mobiles. Slot 2 and slot 8 can accept one of the options named, although they are not necessary for using the GSM option.

The following can be incorporated at the same time without compatibility problems:

- Tracking IF Stage
- Keyboard

The following are incompatible with the GSM option:

- ACPM Option
- SSB Option
- Duplex FM/ΦM Stage
- DAMPS module

Device data

Hardware interfaces on back panel	
The hardware interfaces are not supported by the software of the GSM option!	
IF input (Bu 103)	R_i approx. 2.8 kΩ, ±12 V (connection to IF stage)
AF input (Bu 104)	R_i approx. 1 kΩ, ±5 V
synchr. input (Bu 107)	TTL
synchr. output (Bu 108)	TTL
Socket Bu 106, sub D, 25 pins	
Ext TX anal I/Q inputs (pins 1+2)	R_i approx. 1 kΩ, ±5 V
TX demod I/Q outputs (pins 7+8)	load > 5 kΩ, ±5 V
RX mod I/Q outputs (pins 13+14)	load > 5 kΩ, 2.5 V_{dc}, 5 V_{pp}
Ext RX anal I/Q inputs (pins 15+16)	R_i approx. 1 kΩ, +2.5 V_{dc}, 5 V_{pp}
RX mod I/Q outputs (pins 18+19)	load > 5 kΩ, 2.5 V_{dc}, 5 V_{pp}
Power supply (pin 21)	+5 V, max. 50 mA
Power supply (pin 23)	+15 V, max. 50 mA
Power supply (pin 25)	-15 V, max. 50 mA
Ground (pins 3,4,5,6,9,10,11,12,17,20,22,24)	
Socket Bu 105, sub D, 9 pins	
RS232 interface	pin1 DCD, pin 2 RXD, pin 3 TXD, pin 4 DTR, pin 5 Gnd, pin 7 RTS, pin 8 CTS, pin 6,9 free

Masks, fields, softkeys - overview

Screen masks	Brief description of all screen masks of GSM option
Entry fields **Output fields**	Alphabetic list of all entry and output fields
Display of test results	Meaning of the display `----`, `<<<<`, `>>>>`, `!` and `?`
Softkeys	List of all softkeys with explanation

Masks

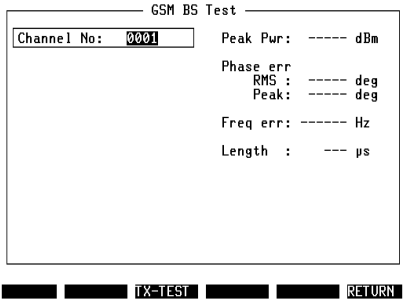

Fig. 10.16: GSM BS-Test mask
Entry of all test parameters
Output of transmitter test figures and receiver sensitivity
Callup of mask:
by calling up GSM option with (AUX)+(DATA))
Quitting mask at end of GSM test:
with (RETURN) to the calling mask.

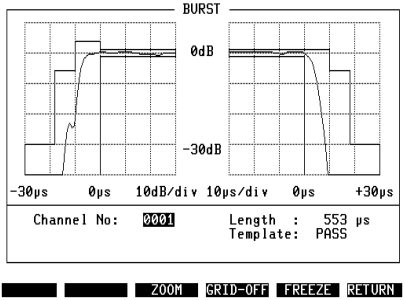

Fig. 10.17: BURST mask
Alteration of parameters BS Pwr TCH, BS Power Lev and Channel No during test
Output of peak power and power/time- template
Callup of mask:
by softkey (BURST) during test is running, or if a call has been set up with (BS-CALL) or (BS-CALL).
Quitting mask:
with (RETURN) to GSM BS-Test mask.
(GRID-OFF) hides the grid, (GRID-OFF) shows it.

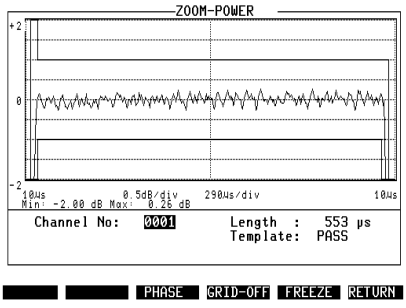

Fig. 10.18: ZOOM masks
Enlarged display of power, phase error and spectrum
Callup of mask:
(BURST) + (ZOOM) during an ongoing TX test
Quitting mask:
With (RETURN) back to the BURST mask.
(GRID-OFF) blanks out the grid, (GRID-ON) blanks it in again.

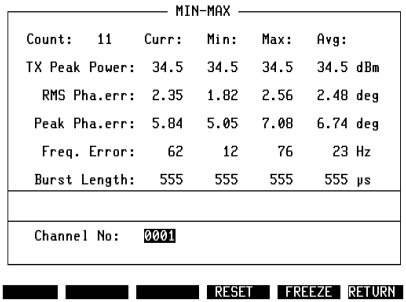

Fig. 10.19: MIN-MAX mask
Trace of ongoing measuring (peak power, phase error, frequency error and burst length)
`Count:` Number of the single test
`Curr:` Current test result
`Min:` Minimum error of all single tests
`Max:` Maximum error of all single tests
`Avg:` Average error over the last approx. 10 single tests
Callup of mask
by softkey (MIN-MAX) during TX test is running
Quitting mask:
with (RETURN) to calling mask.

Entry fields and output fields

Field name	Field type	Mask	Meaning
Channel No	Entry field	GSM BS-Test	Frequency channel on which BS (test item) and BS (STABILOCK) "converse". Channels on the normal GSM band: 0 (890.2 MHz UL, 925.2 MHz DL) to 124 Channels on the extended band: 975 (880.2 MHz UL, 925.2 MHz DL) to 1023 (889.8 MHz UL, 934.8 MHz DL) Two adjacent channels differ by 200 kHz. The assignment may be changed in the Def Parms menu of the basic mask. Channel No also affects the channel of a simulated neighbouring cell (see section "Setting test parameters").
Freq.Error	Output field	GSM BS-Test	Frequency error of BS transmitter. Is measured and displayed continuously as long as a TX test is running.
(Burst) Length	Output field	GSM BS-Test ZOOM masks	Burst duration. Is measured and displayed continuously as long as a TX test is running.
(Peak) Pha.err	Output field	GSM BS-Test	Phase error of BS transmitter, maximum for duration of burst. Is measured and displayed continuously as long as a TX test is running.
(RMS) Pha.err	Output field	GSM BS-Test	Phase error of BS transmitter, averaged over duration of burst. Is measured and displayed continuously as long as a TX test is running.
Template	Output field	BURST ZOOM masks	Shows whether power/time response of BS during burst is within power/time template (`PASS`) or not (`FAIL`). Is evaluated and displayed continuously as long as a TX test is running.

----, >>>>, ! and ?

In the output fields for the test results there are sometimes special entries, the meaning of which is described here.

----	The value has not been measured, or the measured value is below the measuring range (signal too small), or (in the Peak Power output field) no sample measurement has been made yet.
>>>>	The measured value is above the measuring range (signal too big).
<<<<	The measured value is below the measuring range (signal too small).
!	The measured value may be inaccurate, if the RX level at BS Pwr is greater than –60 dBm.
?	The measured value is exact, but the training sequence has not been detected, so the measured value is possibly not according to the GSM Specifications.

Softkeys

Softkey	Mask	Meaning
(BURST)	GSM BS-Test	When call has been set up with (BS-CALL) or (BS-CALL): calls up measurement of power/time template for normal bursts.
	GSM BS-Test	When transmitter tests have been called up with (TX-TEST): calls up measurement of power/time template for access bursts.
(FREEZE)	all	Display of current test result is "frozen". (RUN) reactivates display.
(GRID-OFF)	BURST ZOOM masks	Hides the grid.
(GRID-ON)	BURST ZOOM masks	Shows the grid.
(MIN-MAX)	GSM BS-Test	Only visible if a TX test has been called up or a call has been set up and second labelling of softkeys has been called up with (-ETC-): Calls up MIN-MAX mask.
(PHA-ACC)	GSM BS-Test	Switches to maximum measuring accuracy for phase error, frequency error and power/time template.
(POW-ACC)	GSM BS-Test	Switches to maximum measuring accuracy for peak power.
(RESET)	MIN-MAX	Sets `Count` and all counters for test results `Curr`, `Min`, `Max` and `Avg` to zero.
(RETURN)	GSM BS-Test	Only visible when no test is running: quits GSM mode and calls up OPTION CARD mask.
	BURST	Calls up GSM BS-Test mask.
	GSM BS-Info	Calls up GSM BS-Test mask.
	MIN-MAX	Calls up GSM BS-Test mask.
(STOP)	GSM BS-Test	Only visible when call has been set up with (BS-CALL) or (BS-CALL), or transmitter tests have been called up with (TX-TEST): stop ongoing test.
(TX-TEST)	GSM BS-Test	Starts transmitter test of BS.
(ZOOM)	BURST	Displays power, phase error and spectrum graphically.

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RS-232 interface

The GSM module has a fully functional RS-232 interface (socket Bu 105).

Requirements for operation

The RS-232 interface of the GSM module will only work if your Communication Test Set satisfies the following requirements:

STABILOCK 4031	HOST-MCU ≥ 3.832
STABILOCK 4032	HOST-MCU ≥ 5.032
RS-232 driver software	DIG-MCU ≥ 1.20

If the STATUS mask (called up with [AUX]+[DEF.PAR]+[STATUS]) shows an older status, a software update will be necessary.

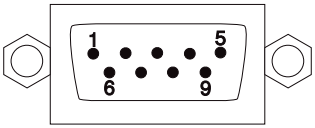
☞ **Do not start the GSM BS-Test system program:** the RS-232 interface of the GSM module will *not* work properly if the GSM BS-Test system program is called up at the same time.

Control commands and transmission protocol

The RS-232 interface of the GSM module offers exactly the same functions as the RS-232 interface of the hardware option "RS-232/Centronics Interface". All control commands for the interface are explained in Chapter 8 under the IEEE section "Special commands". Setting the transmission protocol (baud rate, number of data bits, parity, handshake, etc) is explained in Chapter 4, section "General Parameters".

Special features Special operating parameters for the RS-232 interface are normally assigned with the commands WRITE[3000...] or SLAVE3000... (see Chapter 8). Replace control sequence 3000 by control sequence **2010** if you want to assign the RS-232 interface of the GSM module special operating parameters.
Example: not WRITE[300012...] but WRITE[201012...].

Pinning of RS-232 interface



Bu 105					
Pin 1	=	DCD	Pin 5	=	GND
Pin 2	=	RXD	Pin 6	=	nc
Pin 3	=	TXD	Pin 7	=	RTS
Pin 4	=	DTR	Pin 8	=	CTS
			Pin 9	=	nc

Lifeline

The chronological lifeline tells you what modifications have been made to the software (SW) and the operating instructions. After a software update the lifeline helps you to find out quickly about all major changes (see code) in the updated operating instructions that are supplied.

Code: C = Correction, IN = Important Note, NF = New Feature

SW	Doc. Version	Δ pages	Code	Changes
1.00	9503-100-A	none	–	First edition.
2.00	9701-200-A	7	C	Transmitters must be separated by at least 10 MHz.
		12	NF	Burst mask shows flatline for continuous signal.