


GSM MS-Test AUTORUN

Software Option 897 078

Operating Instructions

41_gsm.au Doc. Version: 9804-340-A

Acterna Muenchen GmbH, Gutenbergstr. 2 – 4, D-85737 Ismaning

 +49 (89) 9 96 41-0

Fax: +49 (89) 9 96 41-160

Contents

Introduction	10-5
Tests with GSM MS Test AUTORUN	10-5
Requirements	10-5
Test Setup	10-6
Preparing to Test	10-7
Channel Setup	10-8
Select test channels	10-8
Select system	10-9
Cable loss (preattenuation)	10-9
QUICK Test	10-10
Starting test	10-10
Test procedure	10-10
MS CALL	10-10
AF loopback	10-13
BS CALL	10-14
STANDARD Test	10-15
Starting test	10-15
Test procedure	10-15
FULL Test	10-16
Starting test	10-16
Test procedure	10-16
MS CALL	10-16
AF loopback	10-16
BS CALL	10-17
RX SENS	10-18
Result mask	10-20
Test Report	10-21
Printer as output medium	10-21
Memory card as output medium	10-22



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

Introduction

The option GSM MS Test AUTORUN (AUTORUN option) allows automatic tests on a mobile station (MS) of the GSM 900 network.

With the FEX option installed, tests of DCS 1800 and DCS 1900 mobiles are enabled in addition.

During all the tests, STABLOCK simulates a base station (BS).

The test results can be

- observed on the monitor of STABLOCK,
- output on a printer,
- stored on a memory card.

Tests with GSM MS Test AUTORUN

The following tests are possible:

- QUICK test**
- MS CALL (call proceeding from MS) with entry of call number by user
 - Readout of MS-specific data
 - Measurement report of MS
 - BS CALL (call to MS) with measurement of three different levels on TCH (traffic channel)
 - Evaluation of power/time template
- STANDARD test**
- As QUICK test
 - BER (bit error rate) measurement on all tested channels
- FULL test**
- As Standard test (with or without RX SENS measurement)
 - Graphic display of power/time template
 - RX SENS Test if desired (test of MS receiver)
 - BER (bit error rate) measurement on all tested channels

Requirements

- STABLOCK 4031 with firmware version ≥ 4.10 or STABLOCK 4032 with firmware version ≥ 6.10 (for older STABLOCK 4031 ≥ 2.59)
- Hardware option 248 274 (GSM module)
- Software option 897 077 (GSM MS test) in version ≥ 4.00

Test Setup

Connect the test item (MS) via the RF socket (N type) to STABILOCK (see Fig. 10.1).

While testing, always power the MS from a charger to avoid any false results through a drop in battery voltage.

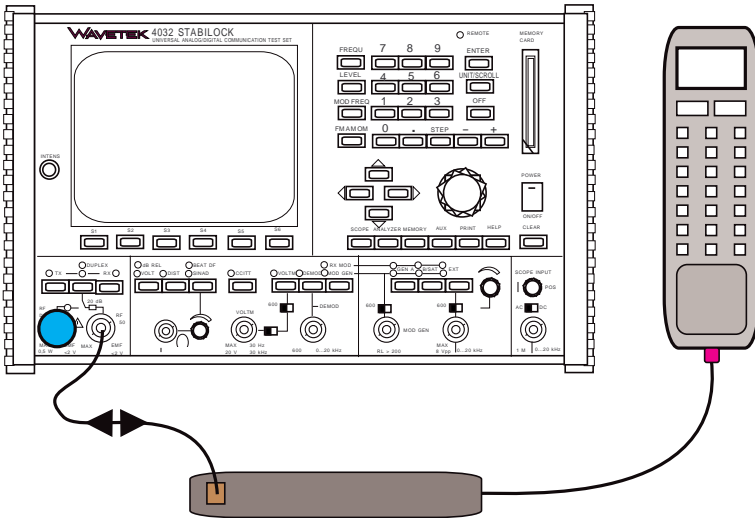


Fig. 10.1: Test setup.

Preparing to Test

1. Insert the system card of the GSM MS Test option in the slot (front panel) and load the GSM system program with **(AUX)** + **(DATA)**.
2. Remove the system card and insert the memory card of the AUTORUN option in the slot. The memory card must be left in STABILOCK for the entire test because STABILOCK writes data to it.
3. Start the AUTORUN option: **(MEMORY)**, look for entry **GSM . EXE**, **(RECALL)** + **(AUTORUN)** + **(RUN)**
4. Select the output medium (see **Fig. 10.2**).

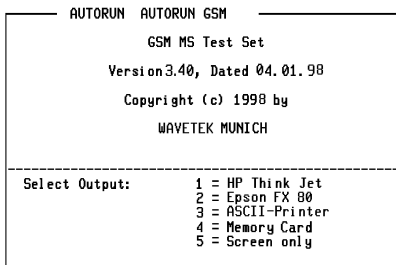


Fig. 10.2: Choosing output medium:

- (1)** Output on HP Think Jet compatible printer
- (2)** Output on EPSON FX 80 compatible printer
- (3)** Output on ASCII printer without graphics capabilities
- (4)** Output on memory card
- (5)** Output on monitor
- (EXIT)** Back to AUTORUN mask



5. Set test parameters with **(SETUP)** (see **Fig. 10.3**). See following section for details.
6. Insert the SIM card in the slot in the MS. This must be one of the SIM cards that you received with the GSM MS-Test option.
7. Switch MS on and off again. This is necessary to ensure a defined state at each test.
8. Switch on the MS. Enter the PIN number of the MS and confirm by pressing #.
9. Start the test: **(QUICK)** starts the QUICK test, **(STANDARD)** starts the STANDARD test. **(FULL-RXS)** or **(FULL+RXS)** starts the FULL test with or without RX-SENS test. **(EXIT)** takes you back to the AUTORUN mask.

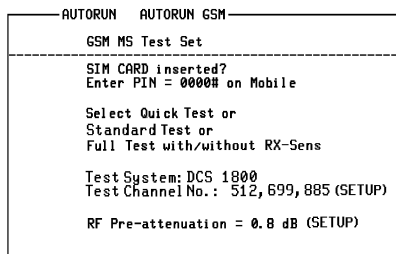


Fig. 10.3: Starting test:

- (QUICK)** Starts QUICK test
- (STANDARD)** Starts STANDARD test
- (FULL-RXS)** Starts FULL test without RX-SENS test
- (FULL+RXS)** Starts FULL test with RX-SENS test
- (SETUP)** To Channel Setup mask
- (EXIT)** Back to AUTORUN mask



Channel Setup

In the Channel Setup mask, you select the system, the test channel and set the preattenuation value (see Fig. 10.4).

Fig 10.4: Channel Setup mask:

<input type="button" value="LOW"/>	Lowest test channel
<input type="button" value="MID"/>	Middle test channel
<input type="button" value="HIGH"/>	Highest test channel
<input type="button" value="SYSTEM"/>	To Select Test System mask
<input type="button" value="ATTEN"/>	Set cable loss compensation (preattenuation)
<input type="button" value="EXIT"/>	Back to the calling mask

```

AUTORUN  AUTORUN GSM
-----
Channel Setup
-----
Test Channel Low = 512
Test Channel Mid  = 699
Test Channel High = 885

Test System: DCS 1800

RF Pre-attenuation = 0.7dB (ATTEN)
  
```

- ☞ The altered values can be saved to memory card after quitting the mask (select at the following prompt).
- ☞ Without the FEX option being installed, STABLOCK tests in the GSM 900 system only. Softkey 4 then shows instead of . resets the channels to their default values.

Select test channels

With , and in the Channel Setup mask, you select the three channels for the STANDARD test and FULL test (see Fig. 10.5).

Fig 10.5: Selecting LOW channel.

```

AUTORUN  USER INPUT
-----
Enter Test Channel No. Low

5.0000
  
```

C O N T I N U E

- ☞ The QUICK test uses the middle channel (selected with).

Select system

(SYSTEM) in the Channel Setup mask calls up the Select System mask. Here you select the tested system (see Fig. 10.6)

```

AUTORUN  AUTORUN GSM
-----
Select Test System

1 = GSM 900
2 = DCS 1800
3 = DCS 1900

(Channel No. will be set back to default)
  
```

1 2 3

Fig 10.6: Select System mask.

- ☞ After quitting the mask, all channels are reset to their default values (stored on the memory card).
- ☞ The Select System mask can be called up only if the FEX option is installed.

Cable loss (preattenuation)

With (ATTEN) in the Channel Setup mask you can compensate the loss of the RF cable (see Fig. 10.7). This increases measuring accuracy. A guideline figure is 0.8 dB per meter.

```

AUTORUN  USER INPUT
-----
Enter RF Preattenuation

    dB

CONTINUE
  
```

Fig 10.7: Compensating cable loss.

QUICK Test

The QUICK test checks whether the MS

- can initiate a call by itself,
- transmits speech with sufficient quality,
- executes the measurement report properly,
- can accept a call from the BS,
- transmits within the prescribed power/time template.

Starting test

1. Configure the equipment as described in the "Test Setup" section.
2. Make your preparations and start with **QUICK** as described in the "Preparing to Test" section.

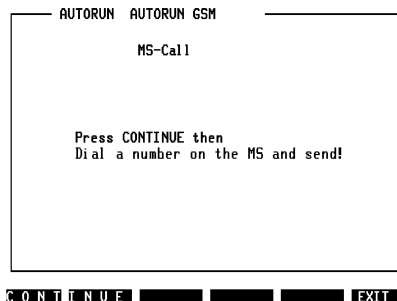
Test procedure

MS CALL

For MS CALL the AUTORUN option will tell you to enter a call number on the MS and then send the call (**Fig. 10.8**).

Fig 10.8: MS CALL.

First press **CONT** or **INUE**, then enter call number on MS and send call. MS and STABLOCK will then set up connection. **EXIT** halts the test. The Pass/Fail results of the tests performed so far, are shown in the Result mask (**Fig. 10.17**). Then, STABLOCK shows the Starting test mask (**Fig. 10.3**) again.



As soon as the connection is set up, STABLOCK measures the specific data of the MS and evaluates its measurement report (**Fig. 10.9**).

Measured figures

MS-Class	Indicates what power class the MS belongs to, ie what its maximum transmitter power is.
IMSI:	International mobile subscriber identity (telephone number of the subscriber in the network).
IMEI:	International mobile equipment identity (electronic "serial number" of the MS). Coded in the IMEI are: producer, country where manufactured, location of type inspection and the producer's own serial number.
Rev Lev	States, according to GSM specifications, whether the MS supports phase 1 or 2.
SMS/EXT	Indicates whether the MS supports short message services (SMS) and whether it can use the extended frequency band. Example 0/1: no SMS but extended frequency band is supported.
A5 (123)	Shows as a bit mask what A5 algorithms the MS can use for cyphering.
Dialed Number	The number you dialed when asked to do so (MS CALL).
BS Pwr Level	The level at which STABLOCK transmits to the MS.
RX Level	The level at which the MS receives the signal from the BS (STABLOCK). The figure is sent with the measurement report.
RX QUAL	The quality with which the MS receives the signal from STABLOCK. This is judged by the bit-error rate of the received signals. Refer to the table to see how this is coded. The figure is sent with the measurement report.

RX QUAL	0	1	...	k	...	7
% BER	< 0.2	0.2 to 0.4	...	$0.1 \cdot 2^k$ to $0.1 \cdot 2^{(k+1)}$...	>12.8

Results

The results of the tests appear on the STABLOCK monitor. The AF loopback function (see following section) is switched on at the same time.

```

-----AUTORUN  AUTORUN  GSM-----
-----
Mobile Call
-----
MS-Class          2
IMSI:            001011234567890
IMEI:            4423451191146350
Rev Lev          0
SMS/EXT          0/0
AS (123)         000
Dialed Number    1234567890
BS Pwr Level    -104.0   dBm
RX Level        -104.0   dBm  PASS
RX QUAL         1 <= 0.4%  FAIL
-----
To stop AF-Loopback mode
press CONTINUE and hang up !

```

Fig 10.9: Test results.

Data that MS transmits to set up connection are shown here.

MS passes test if

- Dialed Number corresponds to number you entered,
- RX Level is rated PASS (close to RF Level),
- RX QUAL is rated PASS.

C O N T I N U E **E X I T**

If a printer is chosen as the output medium, the figures will also be output in print.

If your output medium is a memory card, the figures will additionally be stored on it.

(CONT) or **(INUE)** stops the loopback function and continues the QUICK test with the BS-CALL.

(EXIT) halts the test. The Pass/Fail results of the tests performed so far, are shown in the Result mask (**Fig. 10.17**). Then, STABLOCK shows the Starting test mask (**Fig. 10.3**) again.

AF loopback

What is important is what comes out, in this case the human voice, which a mobile must be able to transmit without corrupting it. This is how the loopback function in STABLOCK works (see Fig. 10.10).

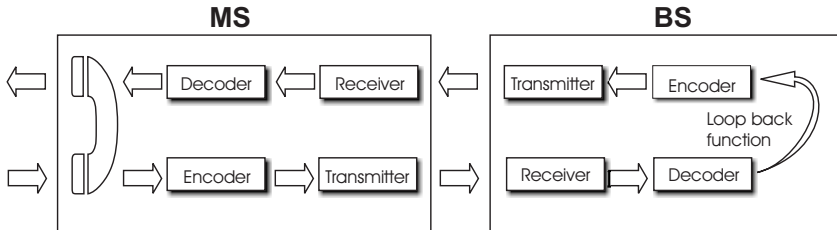


Fig. 10.10: AF loopback

Speech signals are transmitted from MS to BS (STABLOCK), STABLOCK immediately feeds signals into its transmitter and sends them back to MS. Result: you hear your own voice with delay of about half a second and thus judge the quality of the mobile's speech transmission.

(CONT) or (INUE) stops the loopback function and continues the QUICK test with the BS-CALL.

BS CALL

In BS CALL STABLOCK calls the MS. As soon as you accept the call, STABLOCK will measure the power/time template of the MS at three different levels (low, medium and high level of the MS power range, here the levels are 39 dBm, 25 dBm and 13 dBm, Fig. 10.11).

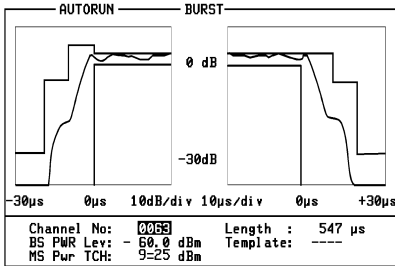


Fig 10.11: Power/time template. Transmitted level of MS must be within template for entire duration of burst. Peak value is given by MS Pwr TCH.

GRID-ON RUN RETURN

Results

The results of the tests appear on the STABLOCK monitor. The test will only be a PASS if the transmitted power stays within the template, otherwise FAIL is entered in the mask.

Power Level/Class 2		Tol. +/-		Burt shape	
Lev 2	PkPwr 37.7 dBm	39	PASS	PASS	
Lev 9	PkPwr 25.2 dBm	25	PASS	PASS	
Lev 15	PkPwr 13.6 dBm	13	PASS	PASS	

Fig 10.12: Test results of power/time template.

Coding of MS levels to GSM specifications

Associated MS level (peak value)

Measured MS level (peak value)

CONTINUE

If a printer is chosen as the output medium, the figures will also be output in print.

If your output medium is a memory card, the figures will additionally be stored on it.

This concludes the QUICK test. The Pass/Fail results of the tests are shown in the Result mask (Fig. 10.17). Then, STABLOCK shows the Starting test mask (Fig. 10.3) again.

STANDARD Test

The STANDARD test is basically the same as the QUICK test, with the following exceptions:

- The base station call (see section "BS CALL") tests on the three channels selected with LOW, MID and HIGH in the Setup.
- In BS CALL the bit error rate (BER) is tested additionally on each of the selected channels.

Starting test

1. Configure the equipment as described in the "Test Setup" section.
2. Make your preparations and start with (STANDARD) as described in the "Preparing to Test" section.

Test procedure

The STANDARD test runs much the same way as the QUICK test (see section "QUICK Test"). In BS CALL, the bit error rate additionally is displayed.

FULL Test

The FULL test checks whether the MS

- can initiate a call by itself,
- transmits speech with sufficient quality,
- executes the measurement report properly,
- exhibits good receiver sensitivity,
- can accept a call from the BS on three different channels,
- transmits within the prescribed power/time template at all levels.

Starting test

1. Configure the equipment as described in the "Test Setup" section.
2. Make your preparations and start with (FULL-RXS) or (FULL+RXS) as described in the "Preparing to Test" section.

Test procedure

MS CALL

This is exactly as described in the "QUICK Test" section.

After output of the results, (CONT) or (INUE) will continue the FULL test with AF loopback.

AF loopback

See "AF loopback" in the "QUICK Test" section.

After (CONTINUE) and replacement of the receiver on the MS, the FULL test is continued with BS CALL.

BS CALL

Channel MID

First STABLOCK calls the MS on the channel MID (see section "Channel Setup"). As soon as you accept the call, STABLOCK measures the transmitter characteristics of the MS on the traffic channel (TCH). The results appear on the monitor (**Fig. 10.13**).

Fig. 10.13: Transmitter characteristics on TCH. Measured figures: as described in section "QUICK Test", "Paging"

Exception:

Bursts on TCH (so-called normal bursts) are longer than on control channel (access bursts).

Typical length: 543 to 563 μ s.

The bit error ratio (BER) is measured on the TCH.

(CONT) or (INUE) continues test.

		AUTORUN AUTORUN GSM					
FULL-Test BS-Call		Channel No:		63			
		Min	Avg	Max			
TX Peak Pwr	25	25.1	25.2	dBm	PASS		
RMS Pha.Err	3.67	4.29	4.43	deg	PASS		
Peak Pha.Err	8.58	10.76	12.16	deg	PASS		
Freq.Error	-13	4	24	Hz	PASS		
Burst Length	552	552	552	μ s	PASS		
BER	0.45	0.58	0.59	%	PASS		

C O N T I N U E [] [] [] [] E X I T

Following this, STABLOCK measures all transmitted levels of the MS from 2 to 15 (corresponding to 39 through 13 dBm). The results for all levels are shown in a mask (**Fig. 10.14**).

Fig. 10.14: Measurement of all power levels. At all levels possible for MS, shape of burst is measured and judged (power/time template) (cf **Fig. 10.12** and **10.11**).

		AUTORUN AUTORUN GSM					
Power Level/Class 2		Tol.+/-		Burst shape			
Lev 2	PKPwr 37.7 dBm	39	PASS	PASS			
Lev 3	PKPwr 35.8 dBm	37	PASS	PASS			
Lev 4	PKPwr 34.7 dBm	35	PASS	PASS			
Lev 5	PKPwr 32.5 dBm	33	PASS	PASS			
Lev 6	PKPwr 30.9 dBm	32	PASS	PASS			
Lev 7	PKPwr 28.7 dBm	29	PASS	PASS			
Lev 8	PKPwr 26.9 dBm	27	PASS	PASS			
Lev 9	PKPwr 25.2 dBm	25	PASS	PASS			
Lev 10	PKPwr 23.1 dBm	23	PASS	PASS			
Lev 11	PKPwr 20.9 dBm	21	PASS	PASS			
Lev 12	PKPwr 19.6 dBm	19	PASS	PASS			
Lev 13	PKPwr 17.4 dBm	17	PASS	PASS			
Lev 14	PKPwr 15.2 dBm	15	PASS	PASS			
Lev 15	PKPwr 13.5 dBm	13	PASS	PASS			

C O N T I N U E [] [] [] [] E X I T

If a printer is chosen as the output medium, the figures will also be output in print.

If your output medium is a memory card, the figures will additionally be stored on it.

If Screen only is chosen as the output medium, then (CONT) or (INUE) continues the FULL test. Otherwise this happens automatically. STABLOCK interrupts the connection and performs the RX-SENS test (receiver sensitivity), if the test was started with (FULL+RXS).

(EXIT) halts the test. The Pass/Fail results of the tests performed so far, are shown in the Result mask (**Fig. 10.17**). Then, STABLOCK shows the Starting test mask (**Fig. 10.3**) again.

RX SENS

The RX SENS test runs automatically. First STABLOCK tries to page the MS. It calls the MS at the lowest level that it must be able to receive in its power class according to GSM specifications.

If the MS fails to respond, the test is failed, ie the receiver is not sensitive enough.

When the MS responds, STABLOCK calls it at a level 1 dB lower. As long as the MS answers the paging calls, this step is repeated.

The lowest level at which the MS can still answer the paging call of STABLOCK is the sensitivity of its receiver. This is indicated as the test result.

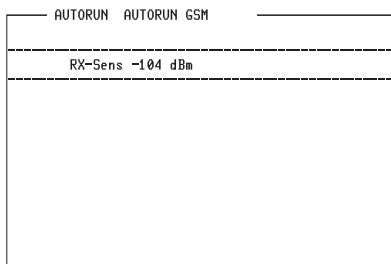


Fig 10.15: RX SENS measurement. Lowest level at which MS responds to paging call is sensitivity of MS receiver (here -104 dBm).

CONTINUE continues the test.

C O N T I N U E

If a printer is chosen as the output medium, the figures will also be output in print.

If your output medium is a memory card, the figures will additionally be stored on it.

If Screen only is chosen as the output medium, then **CONT** or **INUE** continues the FULL test. Otherwise this happens automatically. STABLOCK interrupts the connection and calls the MS on channel 1 (BS-CALL).

Channels LOW and HIGH

In this case STABLOCK calls the MS on the channel LOW (see section "Channel Setup"). As soon as you accept the call, the transmitter characteristics are measured on the TCH (see preceding section and **Fig. 10.13**).

Then the power/time template at three different levels is measured and displayed (low, medium and high part of the mobiles power range). Here, the levels are 2, 9 and 15 (corresponding to 39 dBm, 25 dBm and 13 dBm).

Fig 10.16: Power/time template in FULL test, channel 1.

Meaning of columns is explained in caption to **Fig. 10.12**.

(CONT) or **(INUE)** continues test.

(EXIT) halts the test. The Pass/Fail results of the tests performed so far, are shown in the Result mask (**Fig. 10.17**).

AUTORUN		AUTORUN GSM			
Power	Level/Class 2		Tol. +/-	Burst shape	
Lev 2	PkPwr 37,8 dBm	39	PASS	PASS	
Lev 9	PkPwr 25,1 dBm	25	PASS	PASS	
Lev 15	PkPwr 13 dBm	13	PASS	PASS	

C O N T I N U E ████████ ████████ ████████ E X I T

If a printer is chosen as the output medium, the figures will also be output in print. The power/time template is also printed out for each of the three levels measured.

If your output medium is a memory card, the figures will additionally be stored on it.

(CONT) or **(INUE)** continues the test. STABLOCK interrupts the connection and tests the MS on the channel HIGH (see section "Channel Setup").

(EXIT) halts the test. The Pass/Fail results of the tests performed so far, are shown in the Result mask (**Fig. 10.17**). Then, STABLOCK shows the Starting test mask (**Fig. 10.3**) again.

After the test on channel 124, the FULL test is concluded. The Pass/Fail results of the tests are shown in the Result mask (**Fig. 10.17**).

Result mask

After all the QUICK test, STANDARD test and FULL test STABLOCK displays the Result mask (**Fig. 10.17**).

This mask is also shown, if the test was interrupted with **(EXIT)**.

If the MS passed every single measurement during the test, then the Result mask displays **PASS**.

If the MS failed at least one single measurement, then the Result mask displays **FAIL**.

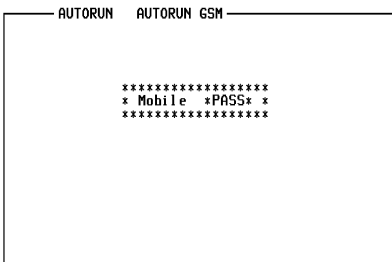


Fig 10.17: Result mask.

The MS passed all single measurements. This is why the Result mask displays **PASS**.

If a printer is chosen as the output medium, the figures will also be output in print.

If your output medium is a memory card, the figures will additionally be stored on it.

(CONTINUE) takes you back to the Starting test mask (**Fig. 10.3**).

Test Report

The results measured in the QUICK test and FULL test are not lost. While testing you can

- either read them out straight to the printer,
- or store them on the memory card of the AUTORUN option so that they can be printed out later.

Printer as output medium

If you chose HP Think Jet or EPSON FX 80 as the output medium when starting the AUTORUN option (see Fig. 10.2), the results will be read out on the printer while the test is running.

WAVETEK STABLOCK 4032
 SERIAL NO. 1288009
 QUICK-Test
 MS-Modell:
 Name :
 Date :
 Note: RF Preattenuation = 0.8 dB

 QUICK-Test Paging Channel No: 63
 MS Pwr Lev 9 = 25 dBm
 Min Avg Max
 TX Peak Pwr 25.6 25.8 25.6 dBm PASS
 RMS Pha.Err 3.35 3.74 3.82 deg PASS
 Peak Pha.Err 8.83 10.89 11.51 deg PASS
 Freq.Error -18 7 14 Hz PASS
 Burst Length 330 330 330 us PASS

 Mobile Call on Channel 63
 MS Class 2 Rev Lev 0
 IMSI: 001011234567890 SMS/EXT 0/0
 IMEI: 442351191146250 AS (123) 000
 Dialed Number: 58965896
 BS Pwr Level: -104.0 dBm
 RX Level -103.8 dBm PASS
 RX Qual 4 <= 3.22 *FAIL*

 Base Station Call on Channel 63
 Power Level/Class 2 Tol. +/- Burst shape
 Lev 2 PkPwr 38.2 dBm 39 PASS PASS
 Lev 3 PkPwr 25.7 dBm 25 PASS PASS
 Lev 15 PkPwr 14.2 dBm 13 PASS PASS

 * Mobile *FAIL* *

Information on MS and date of test
 Compensation of cable loss
 Transmitter characteristics of MS on CCH
 MS data and measurement report
 Power/time template on TCH
 Result mask

Bild 10.18: Report of QUICK test printed on HP ThinkJet.

Memory card as output medium

If you chose `Memory Card` as the output medium when starting the AUTORUN option (see **Fig. 10.2**), the results will be stored on the memory card of the AUTORUN option while the test is running (see also Chapter 8, "AUTORUN Test Reports").

Fig. 10.19: Memory card as output medium. Test results are stored on memory card of AUTORUN option in `RESULT.RES` file, which can be output on printer with `(RECALL)`.

```
MEMORY 2
EXECUTABLE PROGRAMS
GSM .EXE
GSM OPTIION.SYS Ver.: 2.11
FILES ON MEMORY CARD 32 KB
ERASE .SET
      .SET
      .SET
      .SET
      .SET
      .SET
      .SET
      .SET
      .SET
      .SET
      .SET
MOVE CURSOR TO SELECT FILE
ETC STORE RECALL AUTORUN RENAME RETURN
```

- ☞ If you output the `RESULT.RES` file on the printer with `(RECALL)`, only pure text will be seen in the printout. Graphics, like power/time templates for instance, will not appear.
- ☞ Erase the `RESULT.RES` file after each printout. Otherwise new test results will be added to the file and old results will be printed out with each printout.

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	9407-100-A	no		First edition of manual.
2.03	9503-203-A	some	NF	BER implemented. Full-Test sequence changed (RX sensitivity now before test at different power levels). Result mask induced.
2.04	9506-204-A	10-8	NF	Fig. 10.3 changed. FULL test can now be performed with or without RX-SENS test.
3.00	9602-300-A	some	NF	DCS-1800 and DCS-1900 testing included.
3.01	9609-301-A	no	NF	Audio mask adapted to system program 4.20.
3.30	9707-330-A	no	C	Always waits 1000 ms when changing power levels in all tests.
		no	C	Write to memcard now works with host software versions 4.xx and 6.xx.
3.40	9804-100-A	some	C	Paging in Quick Test cancelled.

