Errata

Title & Document Type: E6392B GSM MS Test Set User's Guide

Manual Part Number: E6392-90051

Revision Date: November 2001

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

About this Manual

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Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available

Agilent Technologies

Agilent Technologies

E6392B GSM MS Test Set

User's Guide

Serial Numbers
This manual applies directly to instruments with serial number prefix JP5MG, or firmware revision B.03.00 and above.

Agilent Technologies

Agilent Part No. E6392-90051
Printed in Japan

Manual Part Number
E6392-90051

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All Editions and Updates of this manual and their creation dates are listed below.

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Notices

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Agilent Technologies Japan, Ltd.
Kobe Wireless Test Development
1-3-2, Murotani, Nishi-ku, Kobe-shi,
Hyogo, 651-2241 Japan

Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. *Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.*

NOTE: The Agilent Technologies E6392B complies with INSTALLATION CATEGORY II and POLLUTION DEGREE 2 in IEC61010-1. Agilent E6392B is an INDOOR USE product.

Ground the Instrument

To minimize electric shock hazard, the instrument chassis and cabinet must be connected to an electrical protective earth ground. The instrument must be connected to ac power through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

DO NOT Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT Service Or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT Substitute Parts Or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to an Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Safety Symbols

General definitions of safety symbols used on equipment or in manuals are listed below.

Refer to the instruction manual when you see this symbol.

Alternating current.

Direct current.

| On (Supply).

O Off (Supply).

In position of push-button switch.

Out position of push-button switch.

WARNING: **This WARNING notice denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.**

CAUTION: This CAUTION notice denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

NOTE: *NOTE* denotes important information. It calls attention to a procedure, practice, condition or the like, which is essential to highlight.

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies Japan, Ltd.

Manufacturer's Address: 1-3-2, Murotani, Nishi-ku, Kobe-shi,
Hyogo, 651-2241 Japan

Declares that the product:

Product Name: GSM Mobile Station Test Set

Model Number: E6392A, E6392B

Product Options: This declaration covers all options of the above product

Conforms to the following product standards:

EMC: IEC 61326-1:1997 +A1:1998 / EN 61326-1:1997 +A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011:1991 / AS/NZS 2064.1/2	Group 1, Class A [1]
IEC 61000-4-2:1995 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1996	3 V/m 80% AM 27 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV signal lines, 1 kV power lines
IEC 61000-4-5:1995 / EN 61000-4-5:1995	0.5 kV line-line, 1 kV line-ground
IEC 61000-4-6:1996 / EN 61000-4-6:1996	3 V 80% AM 0.15 - 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1994	1 cycle, 100%

Safety: IEC 61010-1:1990 +A1:1992 +A2:1995 / EN 61010-1:1993 +A2:1995
CAN / CSA C22.2 No. 1010.1-92

Conformity / Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

LEDs in this product are Class 1 in accordance with EN 60825-1:1994.

[1] The product was tested in a typical configuration.

Kobe, Japan 1 February 2000
Date

Name Teruo Takeda / Quality Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

ACOUSTIC NOISE EMISSION

LpA < 70 dB
operator position
normal operation
per ISO 7779

GERXUSCHEMISSION

LpA < 70 dB
am Arbeitsplatz
normaler Betrieb
nach DIN 45635 T. 19

In this Book

This guide describes how to use the Agilent Technologies E6392B GSM MS Test Set. This Test Set provides a variety of test functions to validate the performances of GSM900, E-GSM, DCS1800, and PCS1900 mobile phones.

Throughout this manual the term "Test Set" is used to refer to the Agilent E6392B.

This guide contains the following information:

Chapter 1, "Preparing for Use"

This chapter provides a quick overview on the fundamentals required before starting actual tests with the Test Set.

Chapter 2, "Using Functions"

This chapter explains some of basic test procedures for the first time users to become familiar with the Test Set.

Chapter 3, "Screen Reference"

This chapter provides detailed information on each function of the screen displays and activated softkeys.

Chapter 4, "Functionality/Operation"

This chapter introduces the typical block diagram of a GSM mobile phone to relate some blocks with each test item done by the Test Set, especially from the perspective of incoming inspection and repair for GSM mobile phones.

Chapter 5, "Specifications"

This chapter lists the performance characteristics of the Test Set.

Appendix A, “General Information on the GSM System”

This appendix describes some major information on the GSM system for your reference.

Appendix B, “Input Fields and Allowable Ranges”

This appendix summarizes the allowable ranges and corresponding choices for the parameter input fields.

Appendix C, “Manual Changes”

This appendix provides a manual change history.

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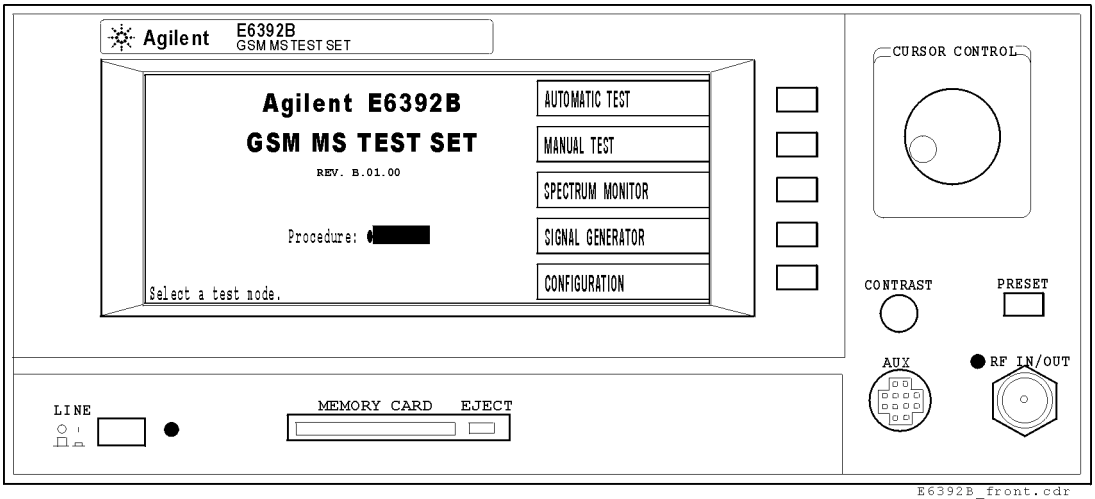
Contents

1 Preparing for Use

This chapter is an overview of the Test Set’s major functions. It also describes the fundamental requirements that must be met before starting your actual tests with the Test Set.

Major Functions

Figure 1-1 Agilent E6392B GSM MS Test Set



The Agilent E6392B GSM MS Test Set has many desirable features such as multi-band test capability, fast test speed, easy-to-use operation, flexibility, programmability and low cost ownership. These features allow the Test Set to be utilized at GSM/DCS mobile phone service stations and shops to test mobile phones with a short turn-around-time. This easy and quick testing ensures customers' satisfaction.

The Test Set acts as both a base station, to make a call with the mobile under test, and a measurement system to carry out testing. The Test Set is designed to provide the following function modes for testing GSM900, E-GSM, DCS1800 and PCS1900 mobile phones:

- The AUTOMATIC TEST mode automatically executes a test sequence that is configured properly for individual testing requirements. Testing on six different traffic channels or dc power voltages is allowed to test the overall operational characteristics of a mobile phone. Multi-band mobile phones such as GSM900 with DCS1800 and E-GSM with DCS1800 can be quickly tested with this feature. Pass/Fail test results are obtained for the call sequences from Location Update to BS/MS Release of a test flow, and for the test items in Table 1-1 on page 15.
- The MANUAL TEST mode is designed to make real-time tests and measurements that facilitate troubleshooting and adjusting mobile phones, even with multi-band capability.

There are three test modes for the MANUAL TEST mode:

- o Synchronous mode: Tests are made while the Test Set and the mobile are networked to communicate with each other. This is used to test mobile phones during the Talk/RF Test step of a test flow, in a real-time manner.
- o Asynchronous mode: (requires Option 002) Tests are made without networking the Test Set and the mobile phone with each other. This is used to test the RF transmission characteristics of mobile phones in a real-time manner. Therefore, the receiver related characteristics such as sensitivity, RX quality and level are not measured.
- o GPRS mode: (requires Option 040) General Packet Radio Service (GPRS) is a GSM data service that provides higher data transfer rates. Tests are made while the Test Set and the mobile are attached to communicate with each other. This is used to test mobile phones during the Attached step of a test flow, in a real-time manner.

Table 1-1 Test Items available for Test Modes

Test Item	AUTOMATIC TEST	MANUAL TEST			
		Synchronous Mode	Asynchronous Mode		GPRS Mode
			Signal: Burst	Signal: CW	
Peak TX Power	×	×	×	×	×
Burst Timing	×	×			Power vs Time
Power Ramp	×	×	×		
Phase Error	×	×	×		×
Frequency Error	×	×	×	×	×
Sensitivity in BER and FER	×	×			× in BLER
RX Quality	×	×			
RX Level	×	×			
DC Current	×	×	×	×	×
Spectrum Monitor		×	×	×	×

- The SPECTRUM MONITOR mode (requires Option 002) allows you to measure each radio channel's spectrum transmitted from a mobile phone. The spans for 0 to 400 kHz and ±100 kHz, relative to the traffic channel frequency, are provided.
- The SIGNAL GENERATOR mode (requires Option 002) generates an RF signal with or without modulation by a PN9 pseudo-random binary sequence or all-zero data.

NOTE

The MANUAL TEST Asynchronous mode, the SPECTRUM MONITOR and the SIGNAL GENERATOR functions are available for the Test Sets with Option 002.

The MANUAL TEST GPRS mode is available for the Test Sets with Option 040 .

Installing the Test Set

This section contains the following procedures for properly installing the Test Set:

- Checking the shipment
- Meeting electrical and environmental requirements
- Adjusting the display

Checking the Shipment

1. Inspect the shipping container for damage.

   Look for any signs of damage such as a dented or torn shipping container, or cushioning material that shows signs of unusual stress or compacting given on the way of shipment.

2. Carefully remove all items contained in the shipping container and verify if your order is complete. Refer to Table 1-2, “Shipment Verification List,” for the items that are shipped standard with the Test Set. Table 1-3, “Additional Option List,” is the optional items you may also have ordered.

Table 1-2 Shipment Verification List

Item	Qty	Part Number
Memory Card (PCMCIA SRAM 512 kbyte)	1	E6392-85001
Universal DC Power Adapter	1	E6392-60001
CDR Manual	1	E6392-90500
Quick Start Guide Set	1	E6392-96020
AC Power Cord[a]	1	

a. The part number depends on where the instrument is used, see “Power Cable” on page 18.

Table 1-3 Additional Option List

Option	Description	Part Number
001	Antenna Coupler	E6392-60002
002	Add Asynchronous Test Capability	
007	Test SIM	08922-80029
008	Test SIM micro	08922-80030
010	Delete Memory Card	

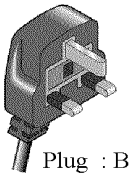
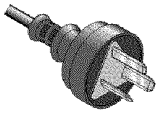
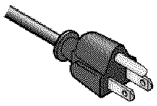
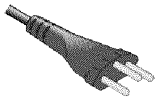
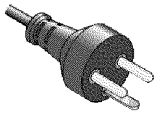
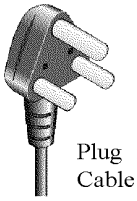
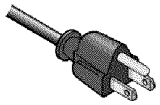
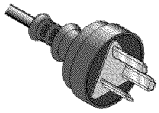
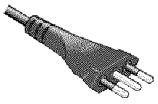
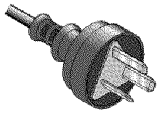
Option	Description	Part Number
011	Delete Universal DC Power Adapter	
040	Add GPRS Test Capability	
0B0	Delete Manual Set	
0B1	Add Manual Set Programmer's Guide User's Guide	 E6392-90042 E6392-90051
150	PoST Software for GSM/DCS/PCS Mobile Phones	Agilent E8292A
202	RF Cable for Nokia 51xx, 61xx, 71xx mobile phones	E6392-61603
203	RF Cable for Ericsson mobile phones	E6392-61601
AB0	Taiwan - Chinese localization (User's Guide; Traditional Chinese)	E6392-96631
AB2	China - Chinese localization (User's Guide; Simplified Chinese)	E6392-96531
UK6	Test Report	

Power Cable

In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate ac power outlet, this cable grounds the instrument frame. The type of power cable shipped with each instrument depends on the country of destination. Refer to Figure 1-2, "Power Cable Supplied," for the part number of the power cables available.

WARNING **For protection from electrical shock, the power cable ground must not be defeated. The power plug must be plugged into an outlet that provides a protective earth ground connection.**

Figure 1-2 Power Cable Supplied

OPTION 900 United Kingdom  Plug : BS 1363/A, 250V, 10A Cable: 8120-1351	OPTION 901 Australia/ New Zealand  Plug : AS 3112, 250V, 10A Cable: 8120-1369
OPTION 902 Continental Europe Plug : CEE 7 Standard Sheet VII, 250V, 10A Cable: 8120-1689	OPTION 903 U.S./ Canada  Plug : NEMA 5-15P, 125V, 10A Cable: 8120-1378
OPTION 904 U.S./ Canada Plug : NEMA 6-15P, 250V, 6A Cable: 8120-0698	OPTION 906 Switzerland  Plug : SEV Type 12, 250V, 10A Cable: 8120-2104
OPTION 912 Denmark  Plug : SR 107-2-D, 250V, 10A Cable: 8120-2956	OPTION 917 India/ Republic of S.Africa  Plug : IEC 83-B1, 250V, 10A Cable: 8120-4211
OPTION 918 Japan  Plug : JIS C 8303, 125V, 12A Cable: 8120-4753	OPTION 920 Argentina  Plug : Argentine Resolution 63, Annex IV, 250V, 10A Cable: 8120-6870
OPTION 921 Chile  Plug : CEI 23-16, 250V, 10A Cable: 8120-6978	OPTION 922 China  Plug : GB 1002, 250V, 10A Cable: 8120-8376
NOTE: Each option number includes a 'family' of cords and connectors of various materials and plug body configurations (straight, 90° etc.).	

OPT9XXE

Meeting Electrical and Environmental Requirements

Line Settings

The available ac power source must meet the following requirements:

CAUTION This product has an autoranging line voltage input. Be sure that the supply voltage is within the specified range.

Voltage:

- 100 to 240 volts nominal (90 to 264 volt range)

Frequency:

- 50/60 Hz (47 to 63 Hz range) nominal for 100 to 240 volts

Power:

- 135 VA maximum

Verify that the power cord is not damaged and that the power source socket outlet provides a protective earth contact.

WARNING **This is a Safety Class 1 product provided with a protective earthing ground incorporated in the power cord. The main plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

CAUTION Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.

Environment

This product is designed for use in the following environmental conditions:

- Indoor use
- 0° to 40°C operating temperature unless specified differently
- EMI: Complies with EN55011, EN61000-3-3, EN50082-1: 1992
- Safety: Certified to CSA C22.2 No.1010.1. Complies with IEC 1010-1, Amendment 1 and 2
- Altitude less than 2000 meters
- 80% maximum relative humidity for temperature up to 31°C, decreasing linearly to 50% relative humidity at 40°C

Providing Adequate Ventilation

Cooling holes are located on the bottom of the instrument cover and the rear panel of the instrument. Do not allow these holes to be obstructed as they facilitate air flow through the product.

CAUTION Ventilation Requirement: When installing the product in a system cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4°C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be applied.

Instructions for Cleaning

For cleaning the surface of the instrument, gently wipe with soft, damp cloth.

Replacing the Line Power Fuse

The line power fuse holder is located on the right side of the Agilent E6392B's rear panel. Before replacing the fuse, disconnect the Agilent E6392B's line power. To replace the fuse, use a small flat blade screwdriver to push in on the fuse cap and rotate it counterclockwise. Remove the fuse cap and replace the fuse with the appropriate type. Reinstall the fuse cap and apply power.

The type and rating of this fuse are as follows.

UL/CSA type, time delay, 2 A, 250 Vac

Warm-Up Time

In order for the Test Set to meet its specifications, allow the Test Set to warm up for 30 minutes after being turned on before attempting to make any measurements.

Preparation for Each Test

The following procedures need to be executed before starting each test.

System Requirement

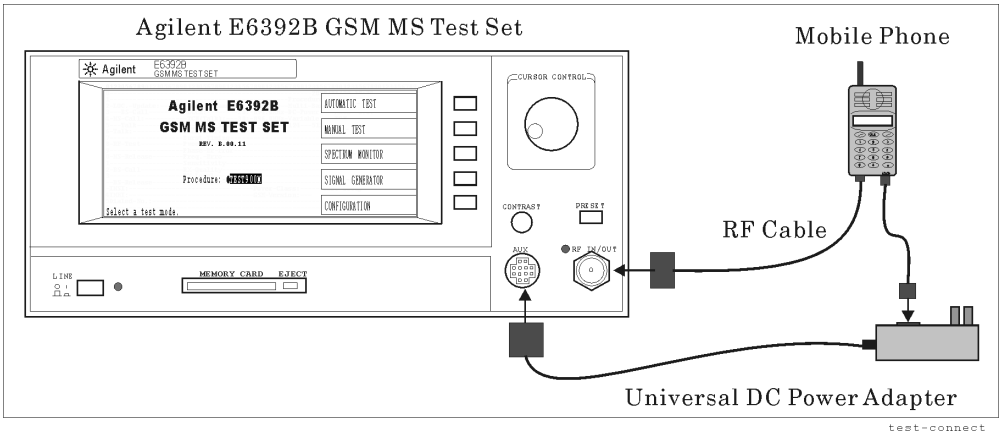
The following equipment is required to construct a test system:

- The Agilent E6392B GSM MS Test Set
- An RF cable to connect RF signals from/to the mobile phone under test,

  An RF antenna coupler to connect RF signals from/to the mobile phone under test, or

  A shield box (Agilent N4678A) to connect RF signals from/to the mobile under test
- Universal DC Power Adapter (P/N: E6392-61001) and appropriate cables between the adapter and the mobile phone under test (optional)
- A printer and a printer cable (optional)

Figure 1-3 Typical Test Setup for a Mobile Phone



Installing the Test SIM

Insert the test Subscriber Identity Module (SIM) in the mobile phone before performing any test, because the Test Set will attempt to perform measurements which are not generally permitted by normal SIMs.

Adjusting the Display Contrast

You can adjust the display contrast by controlling the CONTRAST knob located on the front panel.

Rotate the CONTRAST knob clockwise to cause the display background to gradually brighten in comparison to the text on the display. If the background does not appear to change, it is possibly set to the maximum contrast.

Rotate the CONTRAST knob counterclockwise to cause the display background to gradually darken in comparison to the text on the display. The minimum contrast setting is not a complete dark or black display, therefore some contrast between the background and the text will still be visible.

UUT Connections

Connect the mobile phone under test (UUT) to the Test Set using either of the following methods:

Using the RF Cable

Connect the RF cable, which is available as one of the options, to the RF IN/OUT port on the front panel of the Test Set. Insert the other end connector to the mobile phone's RF port.

Using the Antenna Coupler

Connect the Antenna Coupler connector to the RF IN/OUT port on the front panel of the Test Set. Insert the antenna of the mobile phone into the hole of the Antenna Coupler as deep as possible.

Using a User-Supplied Cable

If you have the cable which connects between the mobile phone's RF port and the RF IN/OUT port of the Test Set, use it instead of the Antenna Coupler.

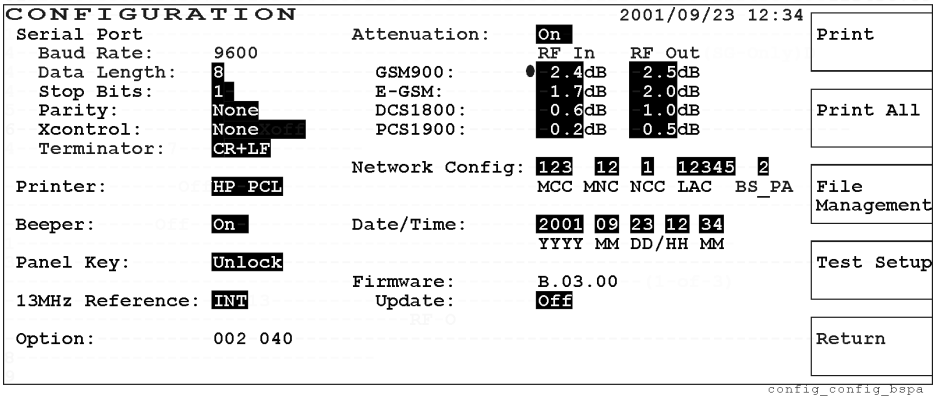
Using the Shield Box

Connect the Antenna Coupler In/Out connector of the shield box (Agilent N4678A) to the RF IN/OUT port on the front panel of the Test Set. Place the mobile phone on the antenna coupler board inside the shield box using the horizontal and vertical holders.

Entering Attenuations

Determine and enter the appropriate attenuation values caused by the antenna coupler, RF cable, or shield box that you use to connect the mobile phone under test to the Test Set.

Step 1. By pressing the CONFIGURATION softkey, obtain the following CONFIGURATION screen:



Step 2. Set the Attenuation field to On by rotating and pressing the CURSOR CONTROL knob.

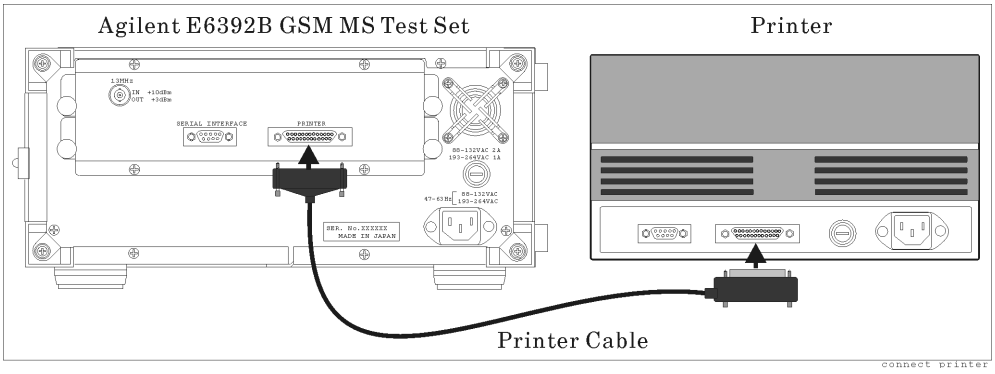
Step 3. Enter the appropriate loss values, depending on the radio systems, in the RF In and RF Out fields with the CURSOR CONTROL knob. These values are also used in other function modes.

Step 4. Press the Return softkey to reveal the initial screen with function modes.

Connecting a Printer (optional)

For obtaining screen hardcopies, connect a printer to the Test Set as follows using an appropriate interface cable between the PRINTER connector on the rear panel of the Test Set and the input connector of a printer:

Figure 1-4 Connecting a Printer



Troubleshooting

No Measurement after Start

Check if the 13 MHz Reference field of the CONFIGURATION screen is set to INT (internal). Press the **PRESET** key for the default settings and try once more. If your trouble still remains, contact your nearest Agilent Technologies service office.

Out of Order Internal Clock, Lost Settings, or Both

The internal battery may have run out. Contact your nearest Agilent Technologies service office.

2 Using Functions

In this chapter, a few testing examples are discussed. This may help the first time user get familiar with the basic testing techniques for using the Test Set.

Testing a Mobile Phone with the Test Set

In this chapter, the following testing examples are described for users to become familiar with the overall functions of the Test Set:

- "Testing a Dual Band Mobile with AUTOMATIC TEST" on page 29
- "Testing a Dual Band Mobile with MANUAL TEST (Synchronous mode)" on page 34
- "Testing a Mobile with MANUAL TEST (Asynchronous mode)" on page 40
- "Testing a Mobile with MANUAL TEST (GPRS mode)" on page 44
- "Testing a Mobile with SPECTRUM MONITOR" on page 48

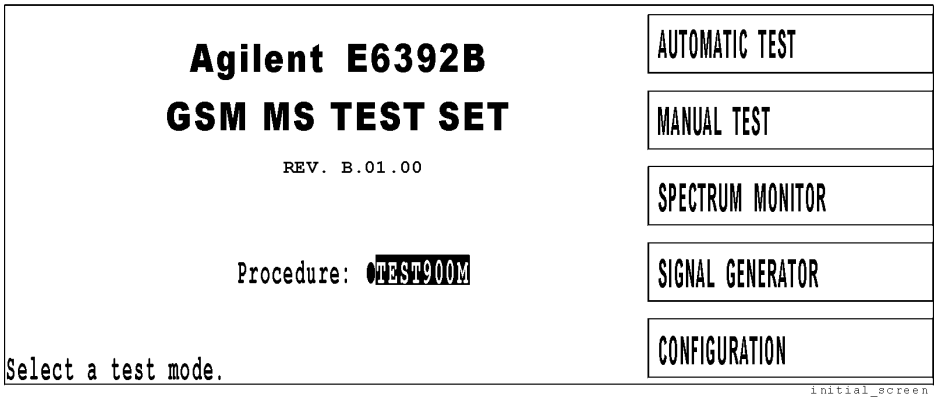
Testing a Dual Band Mobile with AUTOMATIC TEST

The next procedure explains a test on a dual band (GSM900 and DCS1800) mobile phone with the AUTOMATIC TEST mode.

Step 1. Turn the Test Set on and wait for its selftest routine to finish.

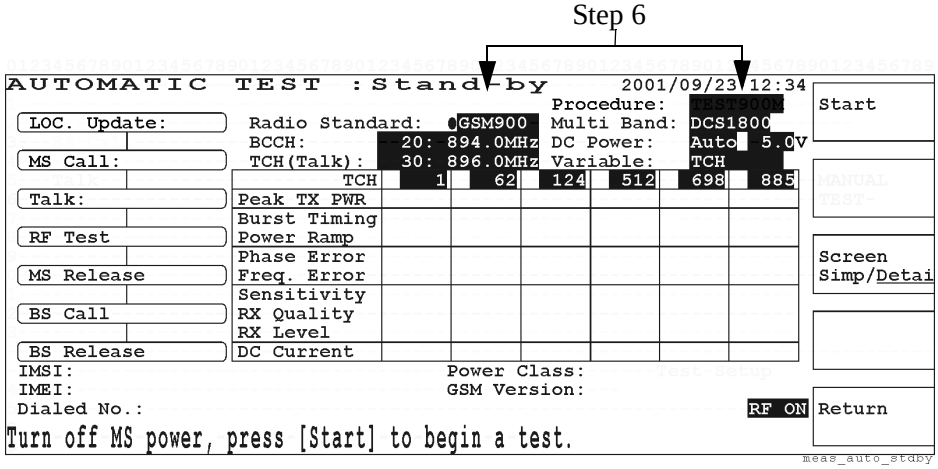
Step 2. Refer to "Preparation for Each Test" on page 22 for the procedures required before starting the test.

Step 3. Press the AUTOMATIC TEST softkey in the initial screen.



Step 4. Press the Screen Simp/Detai softkey to select Detai (detailed screen).

The AUTOMATIC TEST: Stand-by detailed screen should be displayed as shown below.



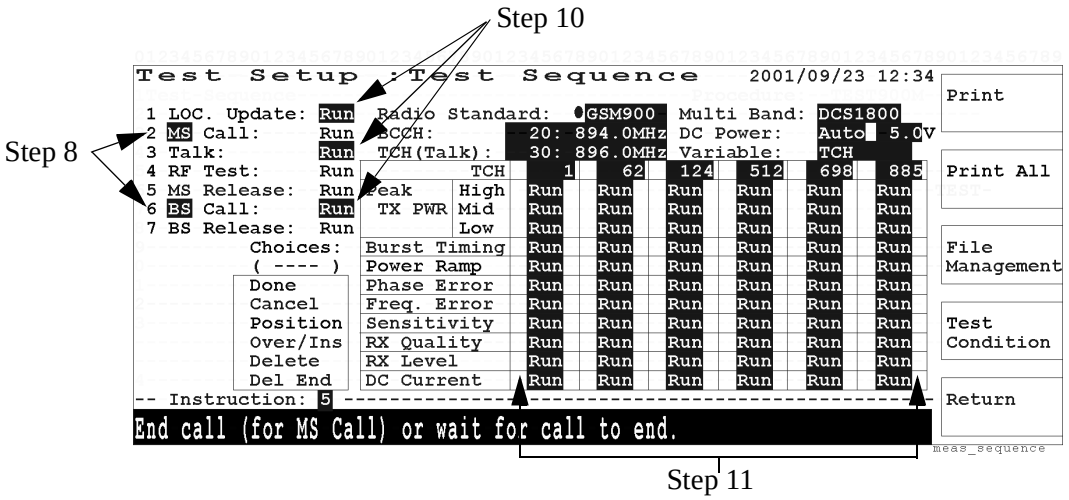
Step 5. Rotate the CURSOR CONTROL knob and see how the circular cursor changes its position.

At one field, press the CURSOR CONTROL knob, then rotate it. You see that field changes its values. Press the CURSOR CONTROL knob to enter that value.

Step 6. Set the highlighted fields of the test parameters as shown in the above screen. The first three traffic channels in TCH are for GSM900 and the last three for DCS1800, respectively.

If you want to supply dc power from the Test Set to the mobile, set the DC Power field to Auto or On and enter your desired voltage value. To do this, use the Universal DC Power Adapter and an appropriate dc power cable to connect between the AUX connector of the Test Set and the mobile.

Step 7. Press Return, CONFIGURATION, Test Setup, then Test Sequence to obtain the Test Setup: Test Sequence screen shown below.



Step 8. Enter BS in the second step of the test flow, then notice that the fifth step changes to BS Release, the sixth to MS Call, and the seventh to MS Release.

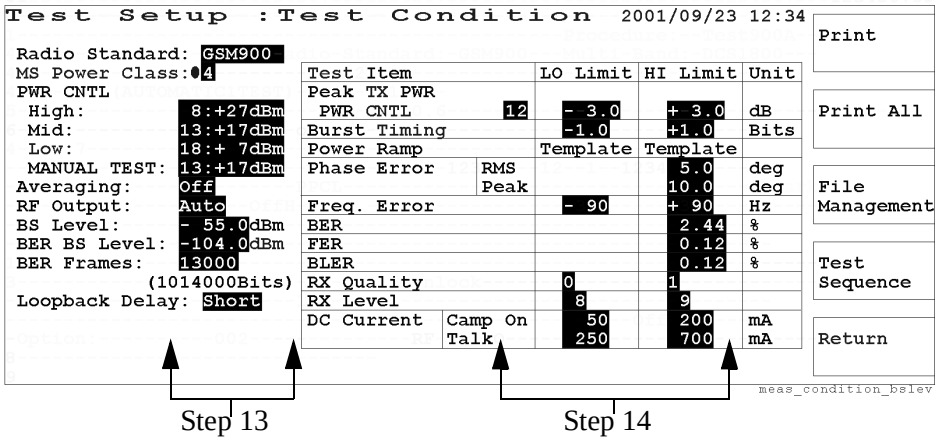
Enter MS in the second step of the test flow again.

Step 9. Enter GSM900 and DCS1800 in Radio Standard and Multi Band, respectively, and set other fields as shown in the illustration in Step 7.

Step 10. Enter Run in each field of the LOC. Update, Talk and BS Call steps.

Step 11. Enter Run in each cell of the test item table.

Step 12. Press the Test Condition softkey to go to the next screen to set the detailed test condition including high and low test limits as shown below.

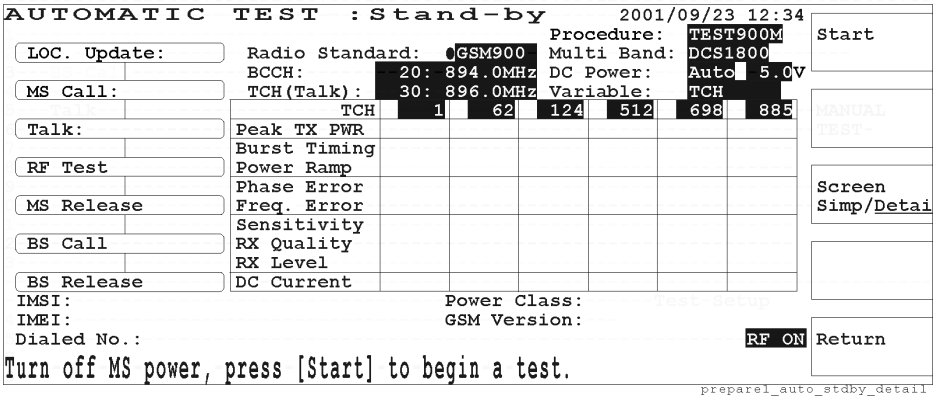


Step 13. Set the fields of the test parameters as shown in the left side of the above screen moving the circular cursor accordingly.

Step 14. Enter the appropriate limits in the cells of the test item table above.

Step 15. Repeat Step 13 to Step 14 to set the Test Condition screen by replacing GSM900 with DCS1800 in Radio Standard.

Step 16. After you have set all parameters as needed, press the Return, Return again, then AUTOMATIC TEST softkeys to obtain the AUTOMATIC TEST: Stand-by detailed screen shown below.



Step 17. Turn the mobile phone on. Wait for the mobile to camp on and display 001-01.

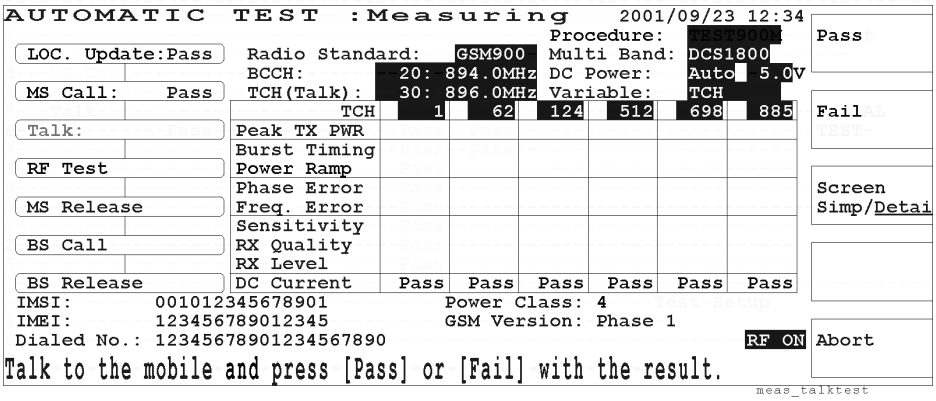
If you set DC Power or RF Output in the Test Sequence screen to Auto, turn the mobile on after pressing the Start softkey.

Step 18. Press the Start softkey to begin your test.

The DC Current measurement at Camp On stage is measured at the LOC. Update step and its pass/fail result is displayed in the DC Current cells of the table, when DC Power is supplied from the Test Set to the mobile.

Step 19. At the MS Call step, you are asked to call from the mobile. For example, dial a number and press the **Call** key of the mobile.

Step 20. At the Talk step, make a talk test and press the Pass or Fail softkey according to the talk test result.

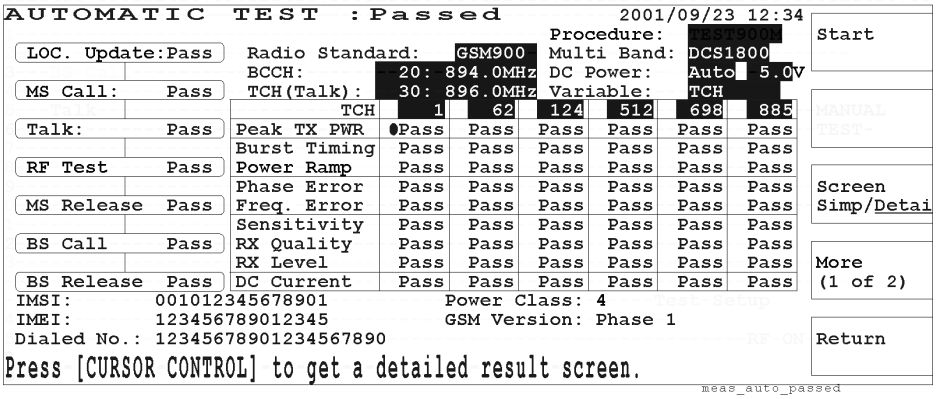


Step 21. As each step is running in the test flow, its corresponding test item field in the table will blink. While the RF Test step is blinking, each of the test items is measured. You can see how it is being done.

Step 22. At the MS Release step, you are asked to end call from the mobile. For example, press the **End** key of the mobile to terminate the call.

Step 23. At the BS Call step, you are asked to respond to the call from the Test Set. For example, respond to it by pressing the **Answer** key of the mobile.

Step 24. After completing the measurement, the next screen is displayed to show the test results. In this case there is not a failure at those channels in the GSM900 and DCS1800 bands.

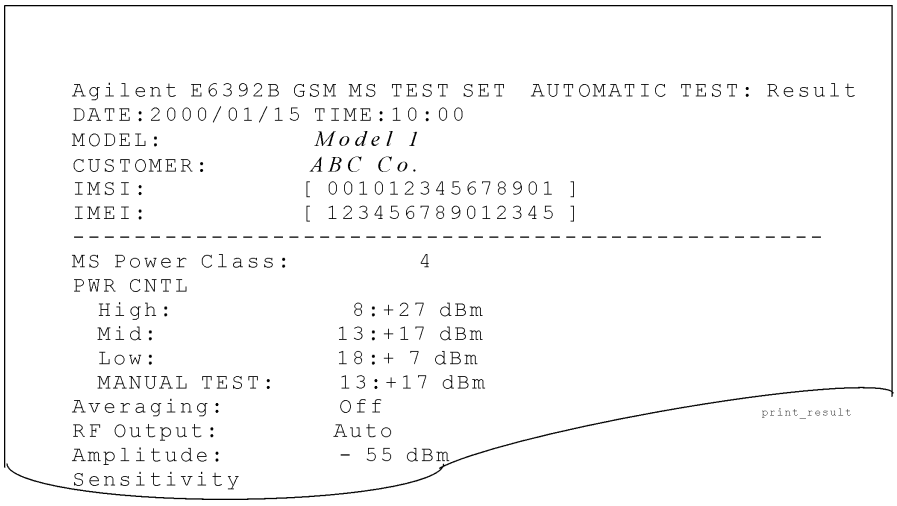


Step 25. If a printer is available, print the test results.

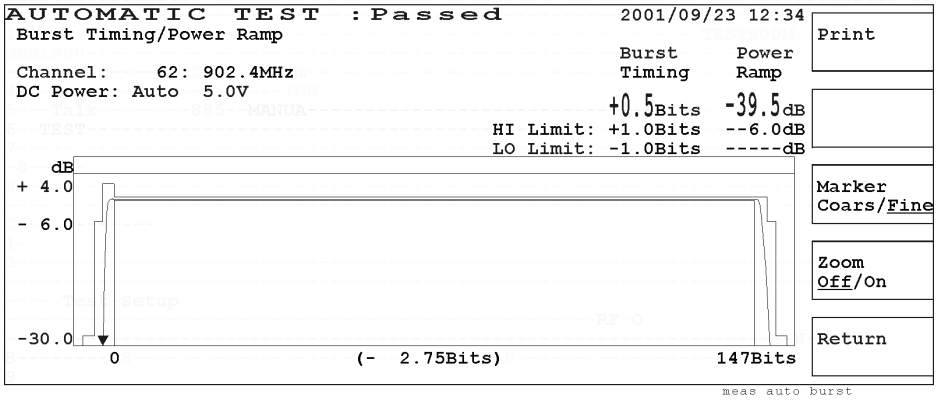
Press the More (1 of 2) softkey and print as follows:

- Press the Print softkey to make a graphic image screen hardcopy.

- Press the Print All softkey to print the detailed measurement results as follows. Write the model number or name of the mobile and the customer name on the report.



Step 26. Place the circular cursor at Pass or Fail of any channel in the Burst Timing or Power Ramp cell, then press the CURSOR CONTROL knob to obtain the next screen. See where the marker appears in the graph and the failed result data is shown if any (highlighted in this text).



Step 27. Press the Return softkey to return to the previous screen.

The detailed test results for other test items can be obtained in the same manner.

Step 28. If you want to make the same test again, press the Start softkey.

If you want to change Test Sequence and Test Condition, select the CONFIGURATION mode to obtain the Test Setup screens.

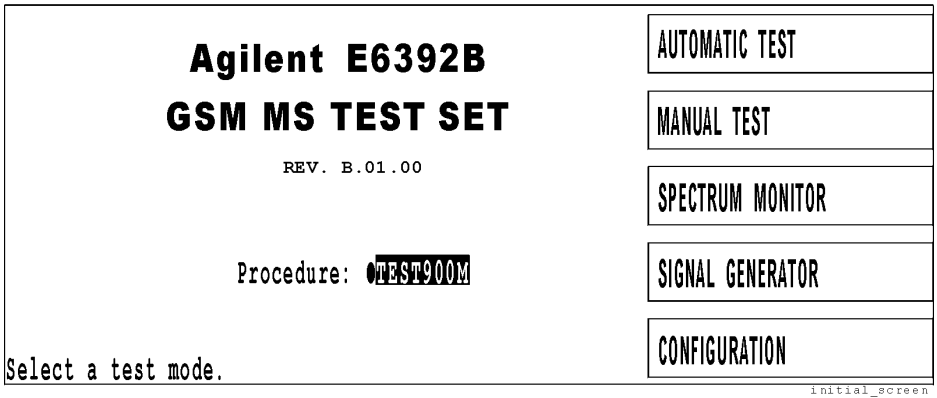
If you want to do a different test, press the Return softkey to obtain the initial screen.

Testing a Dual Band Mobile with MANUAL TEST (Synchronous mode)

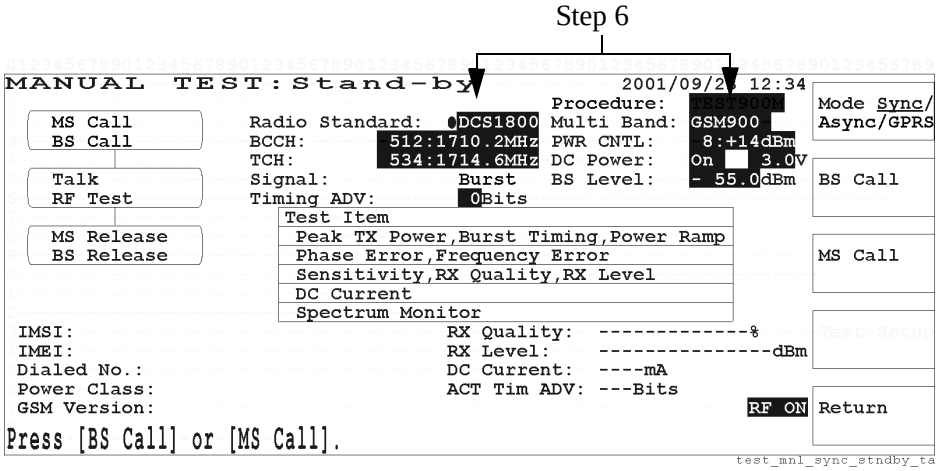
The following procedure explains a test on a dual band (GSM900 and DCS1800) mobile phone with the MANUAL TEST synchronous mode.

Step 1. Turn the Test Set on and wait for its selftest routine to finish.

Step 2. Refer to "Preparation for Each Test" on page 22 for the procedures required before starting the test.



Step 3. Press the MANUAL TEST softkey in the initial screen to obtain the MANUAL TEST: Stand-by screen shown below.



Step 4. If the Test Set is equipped with Option 002, make sure that Sync is selected (underlined) in the Mode Sync/Async softkey. (Note that this softkey is not available for the Test Set without Option 002.)

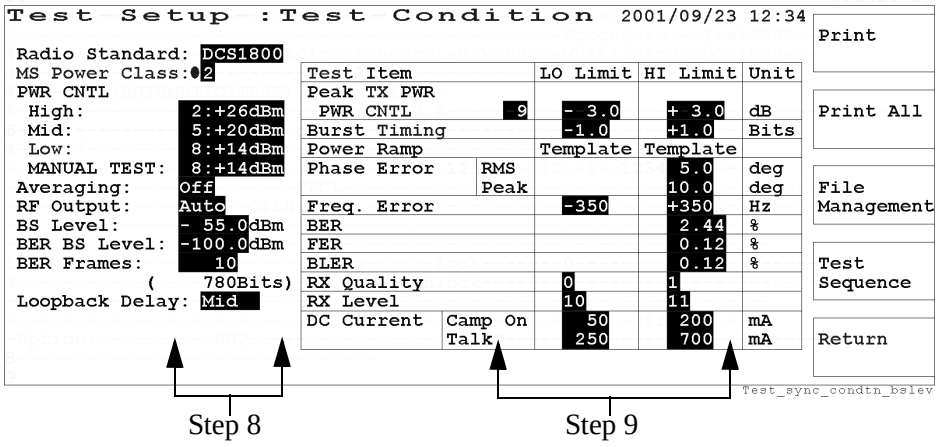
Step 5. Rotate the CURSOR CONTROL knob and see how the circular cursor changes its position.

At one field, press the CURSOR CONTROL knob, then rotate it. You see that field changes its values. Press the CURSOR CONTROL knob to enter that value.

Step 6. Specify the higlighted fields of the test parameters as shown in the above screen.

If you want to supply dc power from the Test Set to the mobile, set the DC Power field to On and enter your desired voltage value. To do this, use the Universal DC Power Adapter and an appropriate dc power cable to connect between the AUX port of the Test Set and the mobile.

Step 7. Press the Return, CONFIGURATION, then Test Setup softkeys to obtain the Test Setup: Test Condition screen shown below.

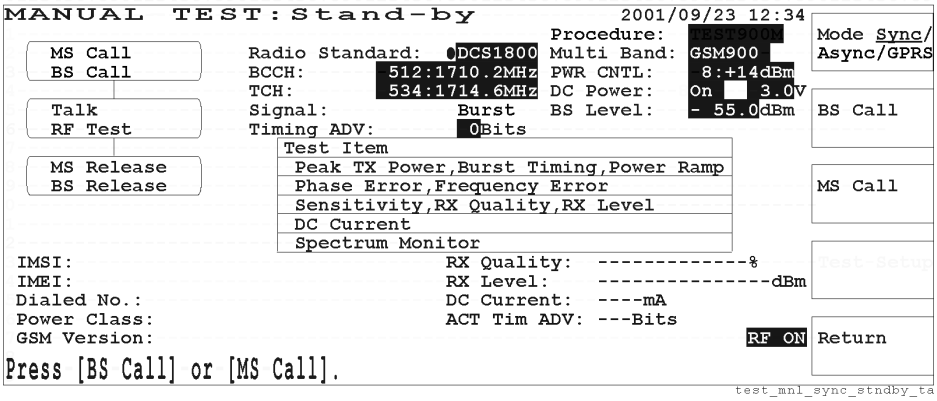


Step 8. Specify the highlighted fields of the test parameters as shown in the left side of the above screen.

Step 9. Enter the appropriate limits in the cells of the test item table above.

Step 10. Repeat Step 8 to Step 9 to set the Test Condition screen by replacing DCS1800 with GSM900 in Radio Standard.

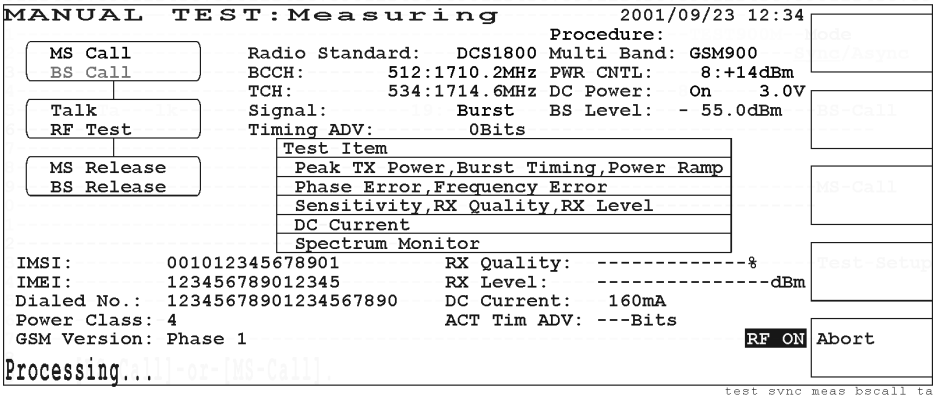
Step 11. After you have set all parameters as needed, press the Return, Return again, then MANUAL TEST softkeys to obtain the MANUAL TEST: Stand-by screen shown below. Check if the Mode Sync/Async softkey is set to Sync.



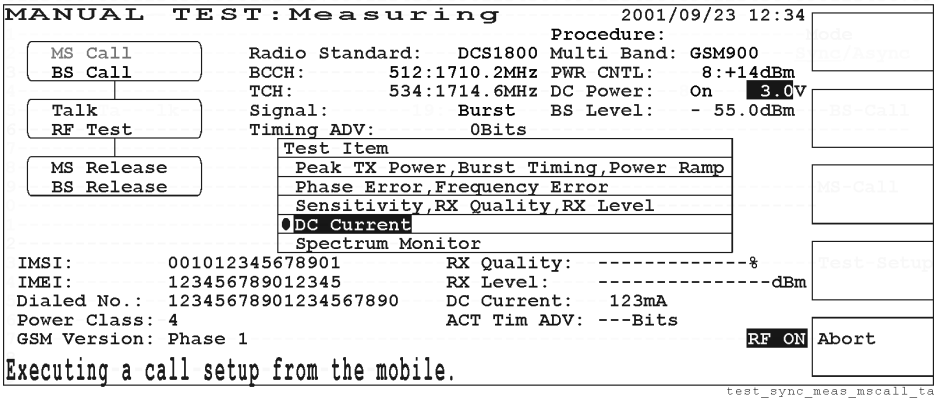
Step 12. Turn the mobile on and wait for it to camp on displaying 001-01.

Step 13. Press the BS Call or MS Call softkey, then the MANUAL TEST: Measuring screen is shown.

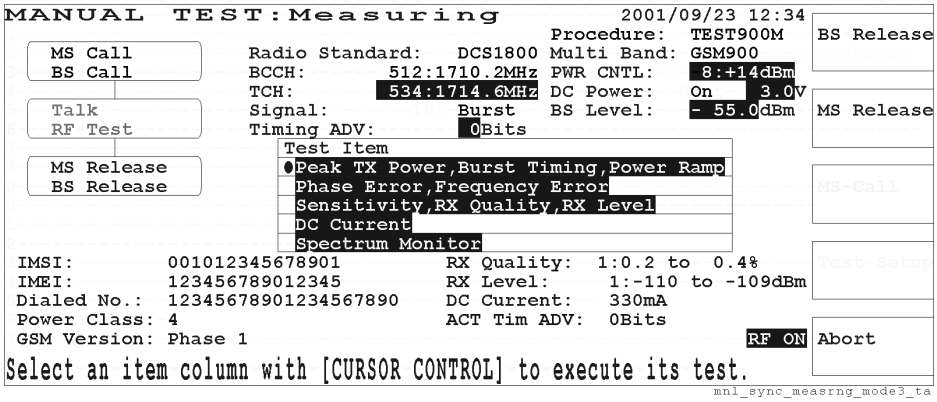
- If the BS Call softkey is pressed, you are asked to answer the call on the mobile. Then the following screen will be displayed.



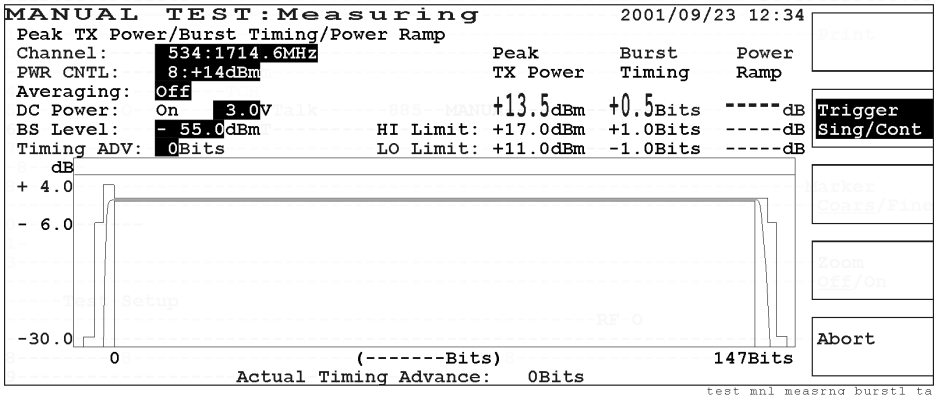
- If the MS Call softkey is pressed, the following screen is displayed. Dial and call from the mobile to proceed to the Talk/RF Test step. You can measure the DC Current at Camp On stage while the MS Call step is blinking.



Step 14. Upon setting up the call setup, the Talk/RF Test screen is displayed as shown below. IMSI, IMEI, Power Class, GSM Version, RX Quality, RX Level are shown. For MS Call, Dialed No. is also included.



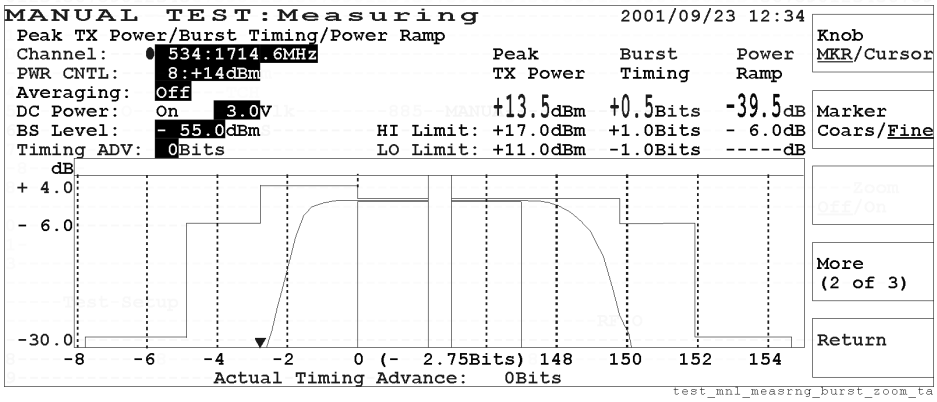
Step 15. While the Talk/RF Test step is blinking as above, you can select a test item by the CURSOR CONTROL knob to execute its test. Place the cursor at “Peak TX Power, Burst Timing, Power Ramp” and press the CURSOR CONTROL knob, for example, to obtain the next screen.



Step 16. Press the Abort softkey to get other softkey menus.

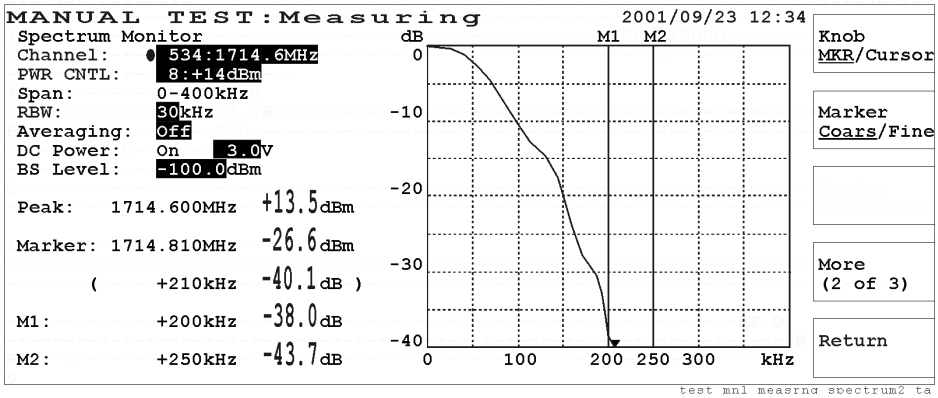
a. Press the Trigger Sing/Cont softkey to change the trigger mode to Sing (single) and the Zoom Off/On softkey to change the zoom mode to On.

b. Press the More (1 of 3) softkey to reveal another softkey menu, and press Knob MKR/Cursor to change the knob control to MKR (marker).

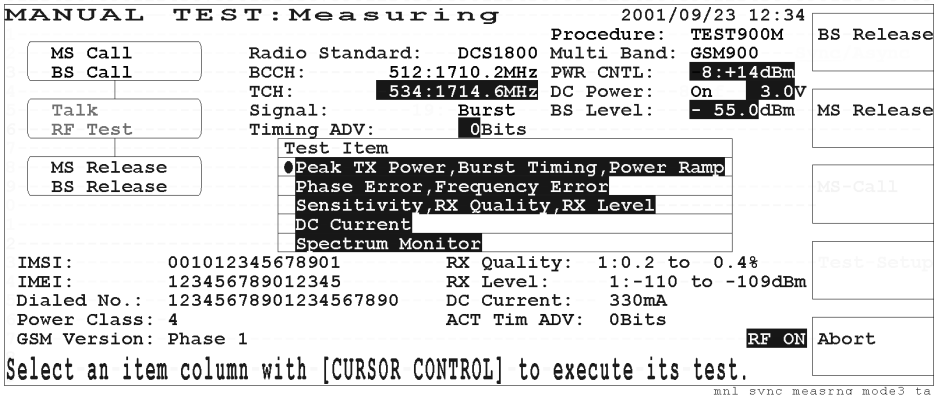


c. Press the Return softkey to return to the previous screen.

Step 17. Select Spectrum Monitor in the test item table to display the Spectrum Monitor measuring screen. Press Abort, More (1 of 3), Knob MKR/Cursor to obtain the next screen with the marker.



Step 18. Press the Return softkey to reveal the next Measuring screen.



Step 19. Press the BS Release or MS Release softkey to finish your test.

- When you press the BS Release softkey, wait until the call from the Test Set ends.
- When you press the MS Release softkey, execute a call end from the mobile phone.

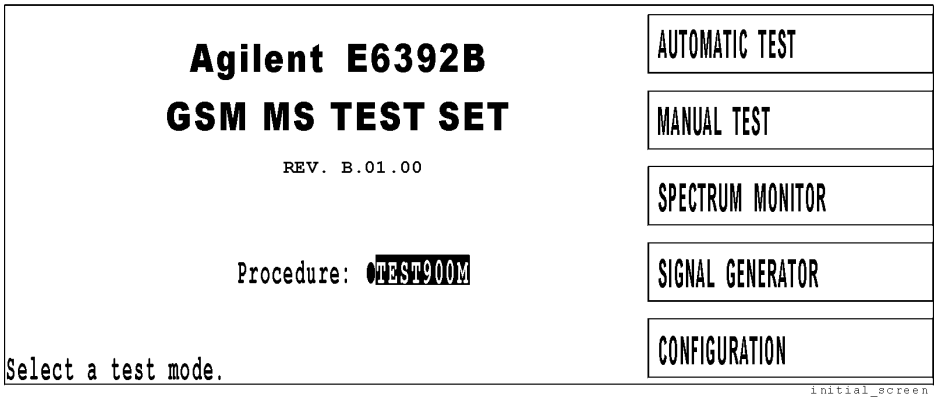
Testing a Mobile with MANUAL TEST (Asynchronous mode)

The following procedure explains a test on a dual band (GSM900 and DCS1800) mobile phone with the MANUAL TEST asynchronous mode.

NOTE This section is applicable only for the Test Sets with Option 002.

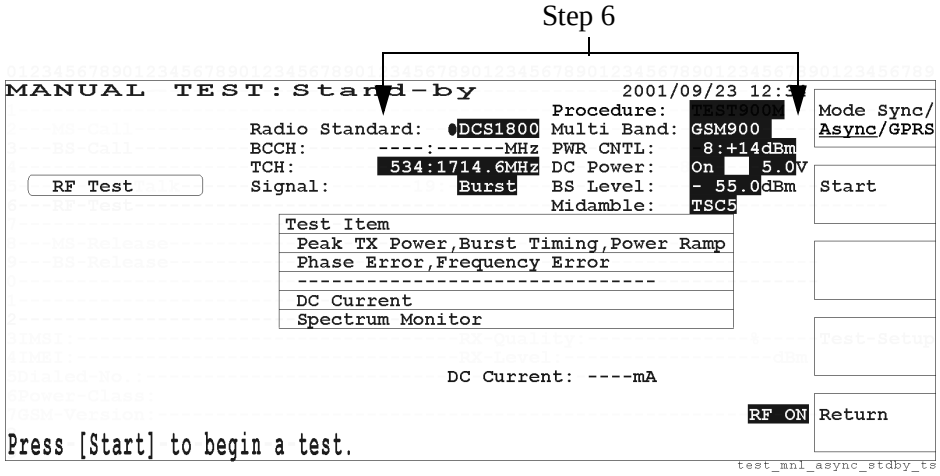
Step 1. Turn the Test Set on and wait for its self test routine to finish.

Step 2. Refer to "Preparation for Each Test" on page 22 for the procedures required before starting the test.



Step 3. Press the MANUAL TEST softkey mode in the initial screen to obtain the MANUAL TEST: Stand-by screen.

Step 4. Press the Mode Sync/Async softkey to select the Async (asynchronous) mode.



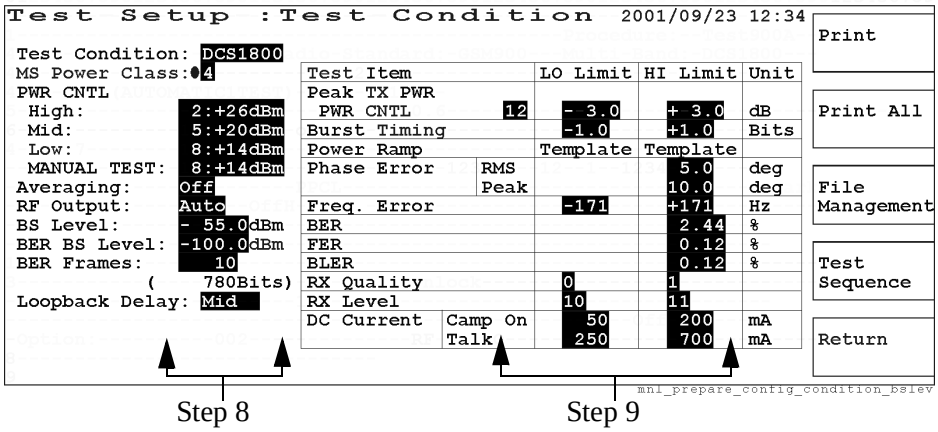
Step 5. Rotate the CURSOR CONTROL knob and see how the circular cursor changes its position.

At one field, press the CURSOR CONTROL knob, then rotate it. You see that field changes its values. Press the CURSOR CONTROL knob to enter that value.

Step 6. Set the higlighted fields of the TEST parameters as shown in the above screen.

If you want to supply dc power from the Test Set to the mobile, set the DC Power field to On and enter your desired voltage value. To do this, use the Universal DC Power Adapter and an appropriate dc power cable to connect between the AUX port of the Test Set and the mobile.

Step 7. Press Return, then CONFIGURATION, then Test Setup to obtain the Test Setup: Test Condition screen shown below.

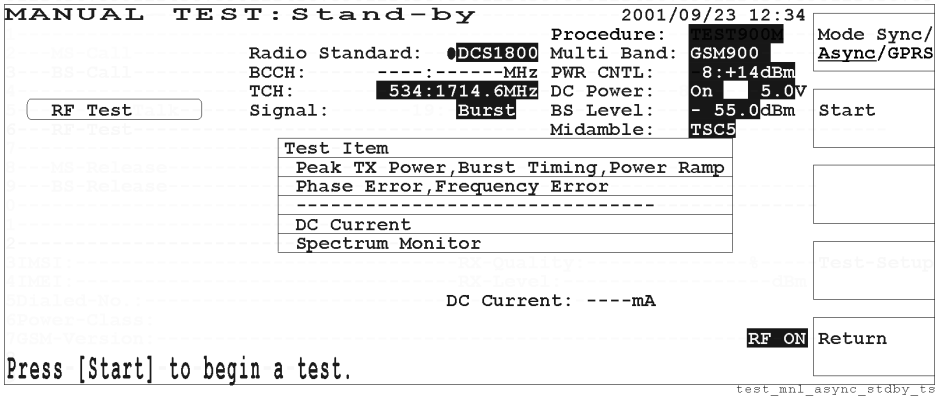


Step 8. Specify the highlighted fields of the test parameters as shown in the left side of the above screen.

Step 9. Enter the appropriate limits in the cells of the test item table above.

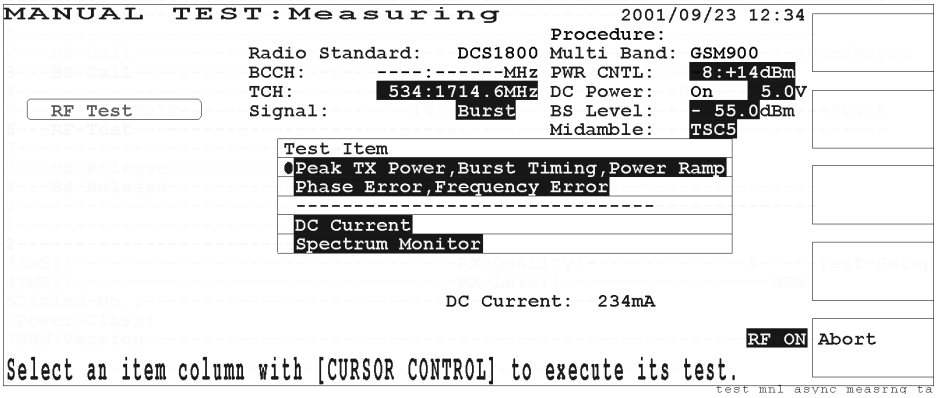
Step 10. Repeat Step 8 to Step 9 to set the Test Condition screen by replacing DCS1800 with GSM900 in Radio Standard.

Step 11. After you have set all parameters as needed, press the Return, Return again, MANUAL TEST, then Mode Sync/Async softkeys to obtain the MANUAL TEST: Stand-by screen with the asynchronous mode.

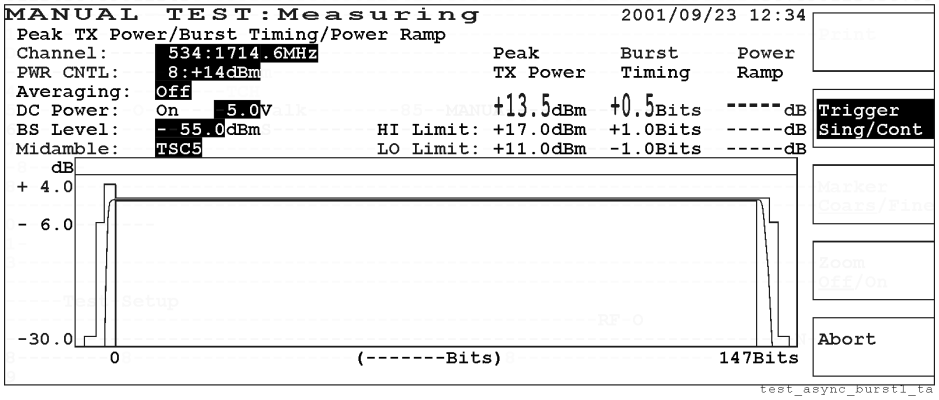


Step 12. Set the mobile phone to transmit the bursted RF power.

Step 13. Press the Start softkey, and the next MANUAL TEST: Measuring screen is shown.



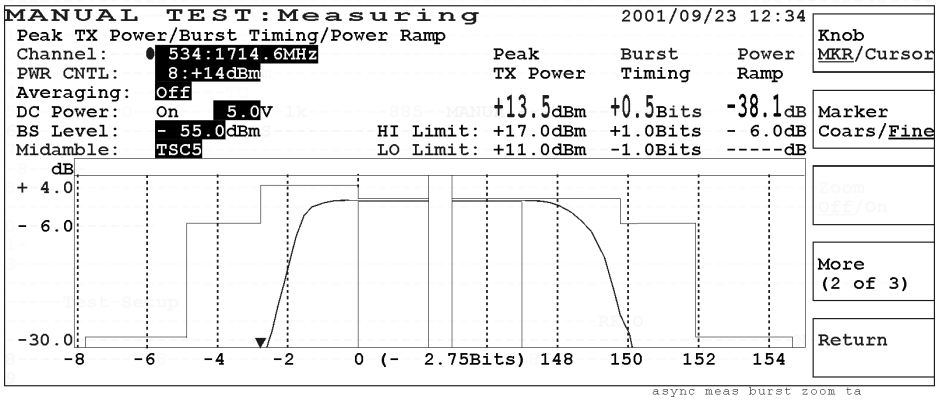
Step 14. While the RF Test step is blinking as above, you can select a test item by pressing the CURSOR CONTROL knob to execute its test. Place the cursor at “Peak TX Power, Burst Timing, Power Ramp” and press the CURSOR CONTROL knob, for example, to obtain the next screen.



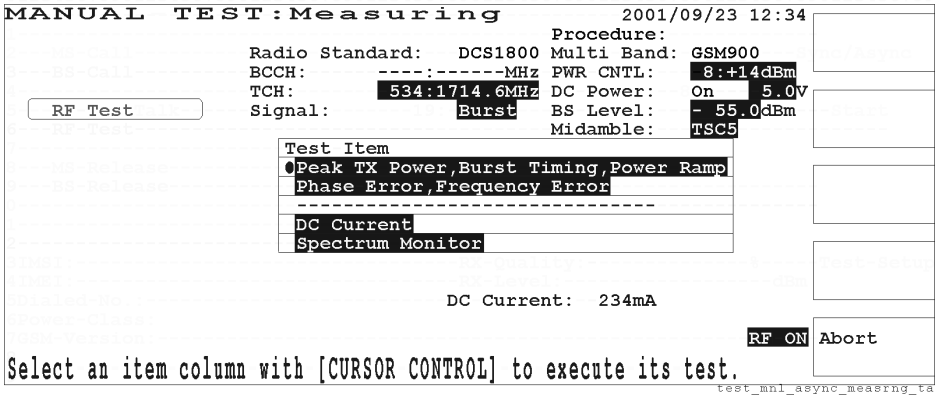
Step 15. Press the Abort softkey, to get other softkey menus.

a. Press the Trigger Sing/Cont softkey to change the trigger mode to Sing (single) and the Zoom Off/On softkey to change the zoom mode to On.

b. Press the More (1 of 3) softkey to reveal the next softkey menu, and press Knob MKR/Cursor to change the knob control to MKR (marker).



Step 16. Press the Return softkey to reveal the next Measuring screen.



Step 17. Press the Abort softkey to finish your test.

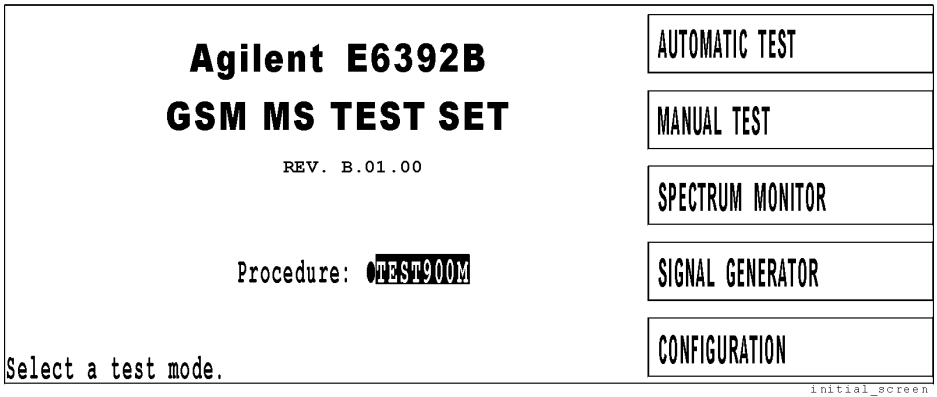
Stop transmitting RF power from the mobile phone.

Testing a Mobile with MANUAL TEST (GPRS mode)

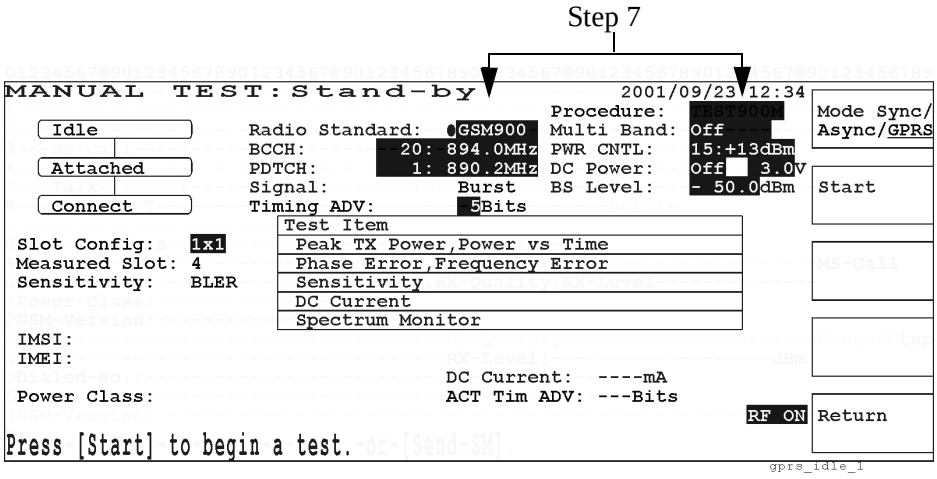
The following procedure explains a test on a GSM mobile phone with the MANUAL TEST GPRS mode, which is available with Option 040.

Step 1. Turn the Test Set on and wait for its selftest routine to finish.

Step 2. Refer to "Preparation for Each Test" on page 22 for the procedures required before starting the test.



Step 3. Press the MANUAL TEST softkey in the initial screen to obtain the MANUAL TEST: Stand-by screen shown below.



Step 4. If the Test Set is equipped with Option 040, make sure that GPRS is selected (underlined) in the Mode Sync/Async/GPRS softkey. (Note that this softkey is not available for the Test Set without Option 040.)

Step 5. Check the differences of the test flow, three more parameters for slot configurations, and less mobile related data fields from the MANUAL TEST Synchronous mode. RX Quality and RX Level are not included in the Sensitivity column in the test item table.

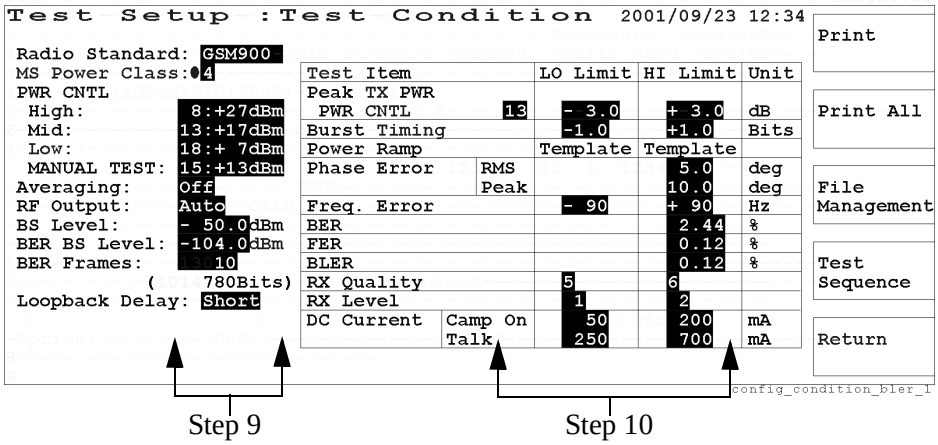
Step 6. Rotate the CURSOR CONTROL knob and see how the circular cursor changes its position.

At one field, press the CURSOR CONTROL knob, then rotate it. You see that field changes its values. Press the CURSOR CONTROL knob to enter that value.

Step 7. Specify the higlighted fields of the test parameters as shown in the above screen.

If you want to supply dc power from the Test Set to the mobile, set the DC Power field to On and enter your desired voltage value. To do this, use the Universal DC Power Adapter and an appropriate dc power cable to connect between the AUX port of the Test Set and the mobile.

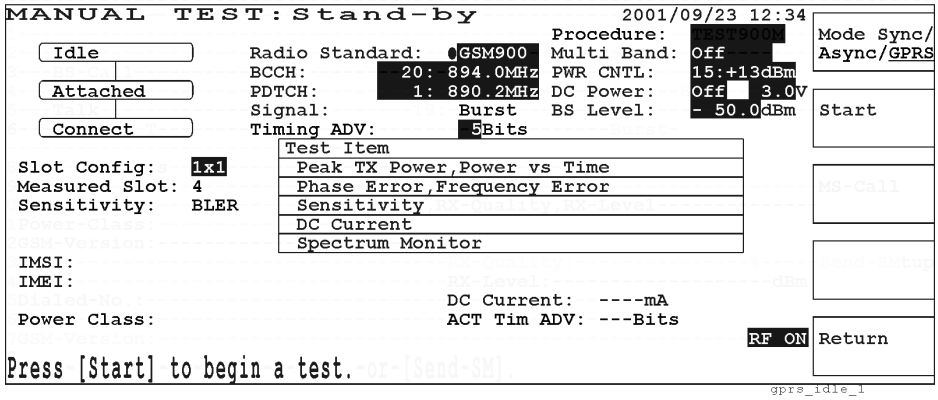
Step 8. Press the Return, CONFIGURATION, then Test Setup softkeys to obtain the Test Setup: Test Condition screen shown below.



Step 9. Specify the highlighted fields of the test parameters as shown in the left side of the above screen.

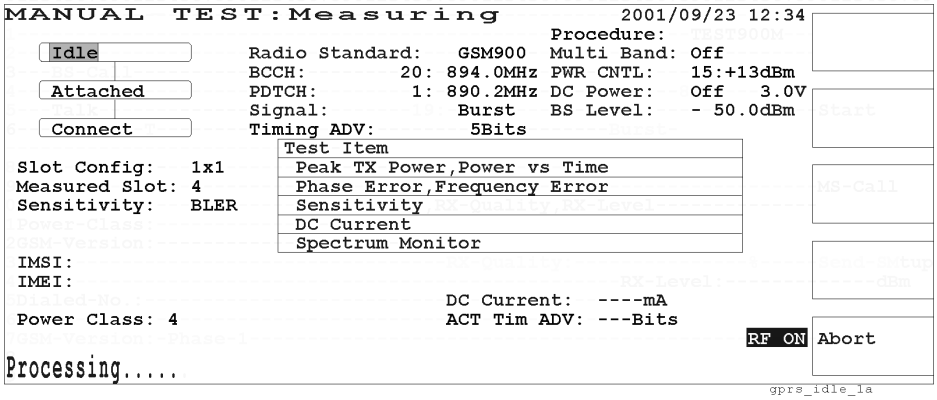
Step 10. Enter the appropriate limits in the cells of the test item table above. For testing BLER it is required to set the upper limit value.

Step 11. After you have set all parameters, press the Return, Return again, then MANUAL TEST softkeys to obtain the MANUAL TEST: Stand-by screen shown below. Check if the Mode Sync/Async/GPRS softkey is set to GPRS.

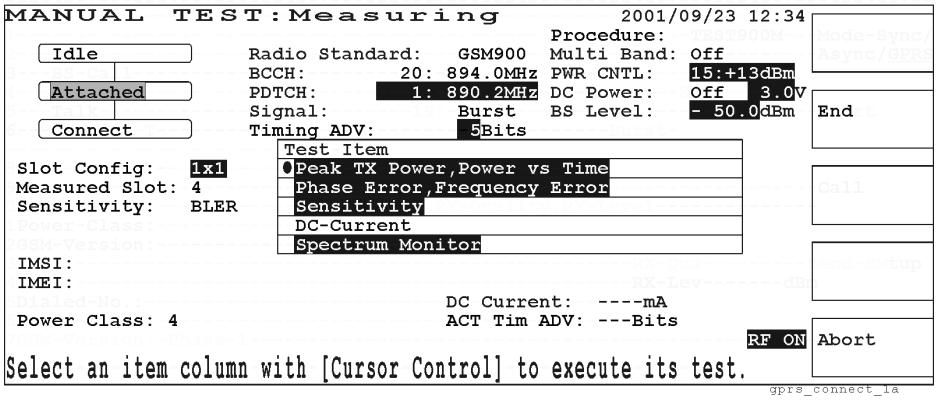


Step 12. Turn the mobile on and wait for it to camp on displaying 001-01.

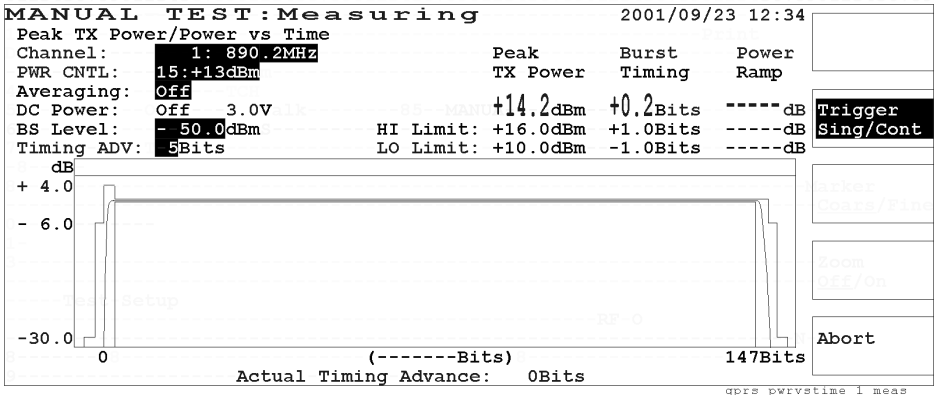
Step 13. Press the Start softkey, then the screen changes to the following MANUAL TEST: Measuring screen, while the mobile is being processed to attach to the Test Set. Power Class will be shown first.



Step 14. Upon completion of the attaching process, the MANUAL TEST: Measuring screen is displayed as shown below.



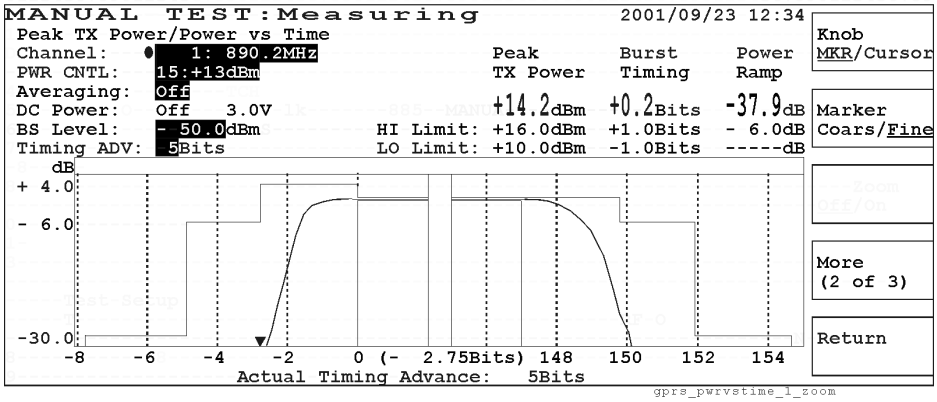
Step 15. While the Attached step is blinking as above, you can select a test item by the CURSOR CONTROL knob to execute its measurement. Place the cursor at “Peak TX Power, Power vs Time” and press the CURSOR CONTROL knob, for example, to obtain the next screen.



Step 16. Press the Abort softkey to get other softkey menus.

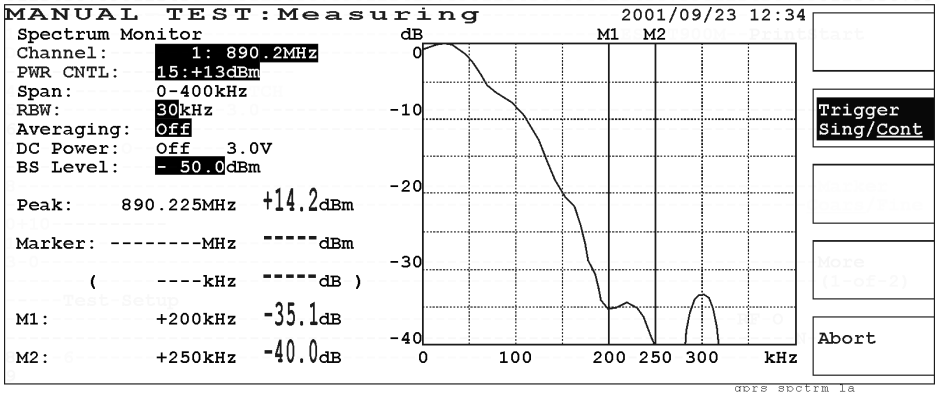
a. Press the Trigger Sing/Cont softkey to change the trigger mode to Sing (single) and the Zoom Off/On softkey to change the zoom mode to On.

b. Press the More (1 of 3) softkey to reveal another softkey menu, and press Knob MKR/Cursor to change the knob control to MKR (marker).

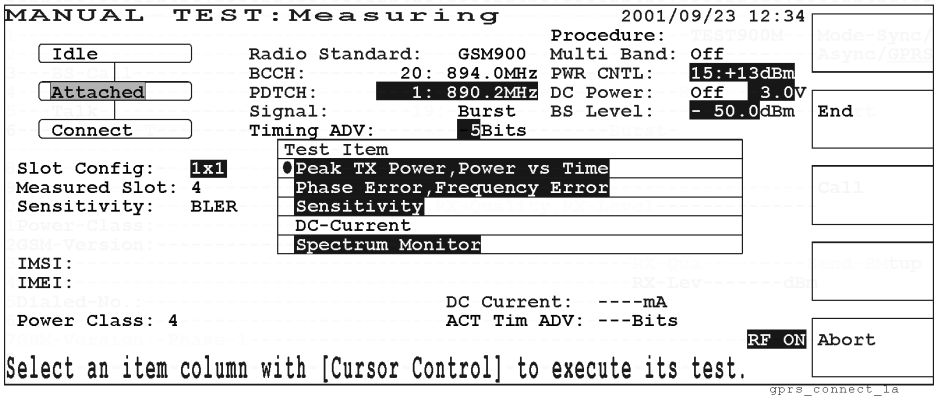


c. Press the Return softkey to return to the previous screen.

Step 17. Select Spectrum Monitor in the test item table to display the Spectrum Monitor measuring screen. Press Abort, More (1 of 3), Knob MKR/Cursor to obtain the next screen with the marker.



Step 18. Press the Return softkey to reveal the following Measuring screen to make another measurements.



Step 19. Press the End softkey to finish your test.

Testing a Mobile with SPECTRUM MONITOR

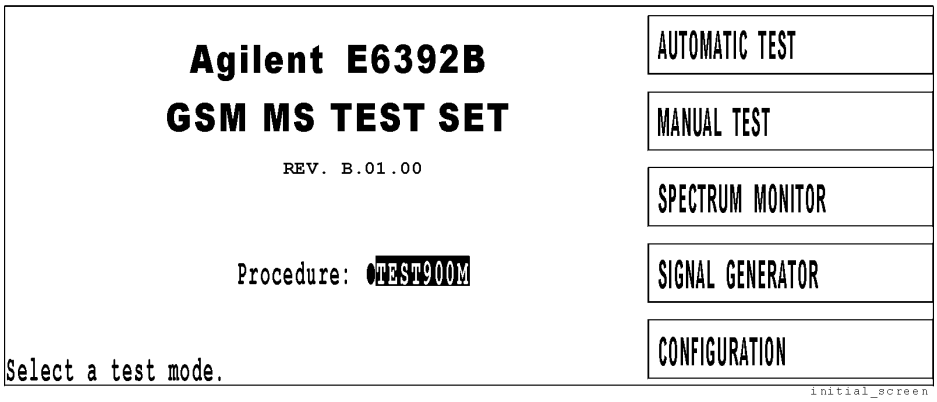
This procedure describes a test on an E-GSM mobile phone using the SPECTRUM MONITOR mode.

NOTE This section is applicable only for the Test Sets with Option 002.

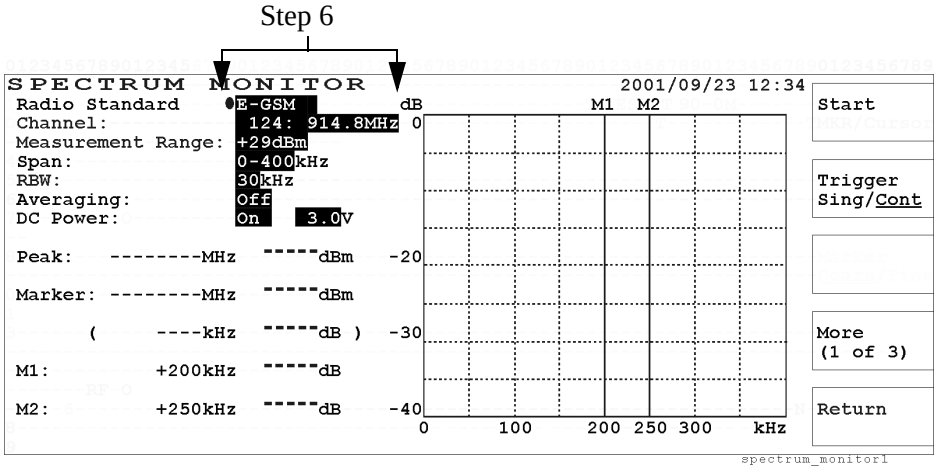
Step 1. Turn the Test Set on and wait for its selftest routine to finish.

Step 2. Refer to "Preparation for Each Test" on page 22 for the procedures required before starting the test.

Step 3. Set the mobile phone to transmit RF power.



Step 4. Press the SPECTRUM MONITOR softkey in the initial screen to obtain the next SPECTRUM MONITOR screen.



Step 5. Rotate the CURSOR CONTROL knob and see how the circular cursor changes its position.

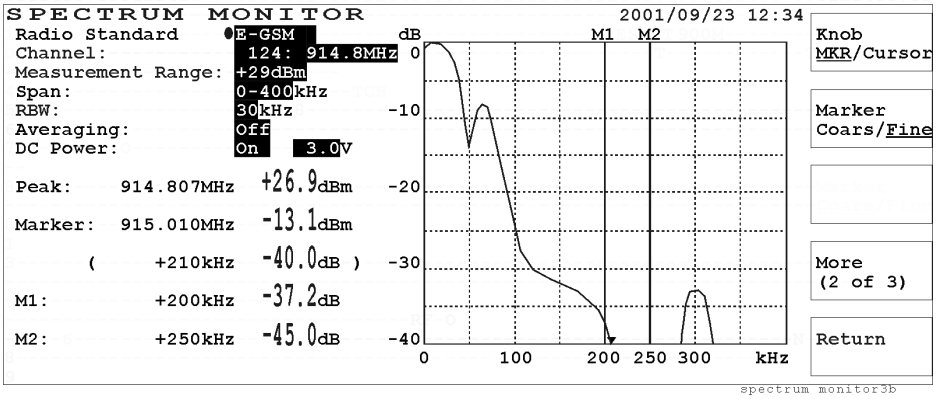
At one field, press the CURSOR CONTROL knob, then rotate it. You see that field changes its values. Press the CURSOR CONTROL knob to enter that value.

Step 6. Set the higlighted fields of the test parameters as shown in the above screen.

If you want to supply dc power from the Test Set to the mobile phone, set the DC Power field to On and enter your desired voltage value. To do this, use the Universal DC Power Adapter and an appropriate dc power cable to connect between the AUX port of the Test Set and the mobile phone.

Step 7. Press the Trigger Sing/Cont softkey to change the trigger mode to Sing (single). Press the Start softkey to begin your test.

Step 8. Press the More (1 of 3) softkey to reveal another softkey menu, then press the Knob MKR/Cursor softkey to change the knob control to MKR (marker). Notice that the marker is displayed. Use the knob to move the marker.

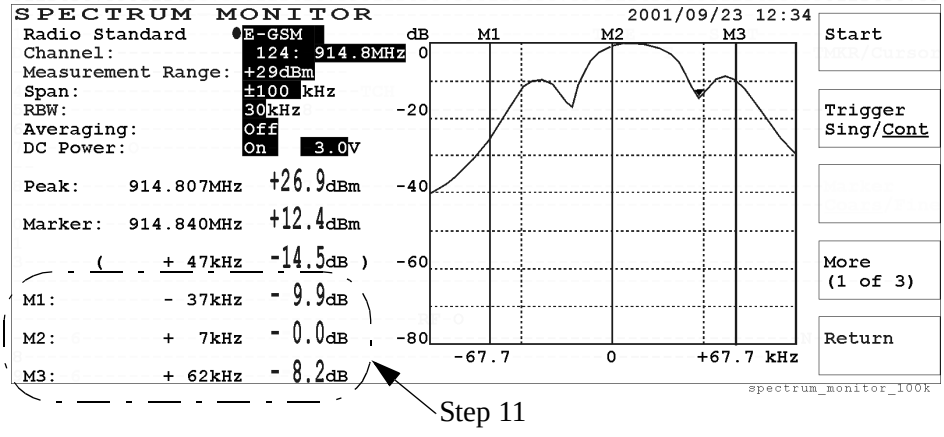


Step 9. Press the Return softkey to reveal the Spectrum Monitor screen in Step 4.

Step 10. Place the cursor in front of the Span field and change it to ±100 kHz with the CURSOR CONTROL knob.

Step 11. Press the Start softkey to view the graph with the new span setting.

See how the measured data of three peaks close to the graticules of M1, M2 and M3 are shown in the lower left screen.



Step 12. Press the Return softkey to reveal the initial screen.

Stop transmitting RF power from the mobile phone.

3 Screen Reference

In this chapter, each screen of the Test Set is explained in detail including the operational features and the functional softkeys activated for screens.

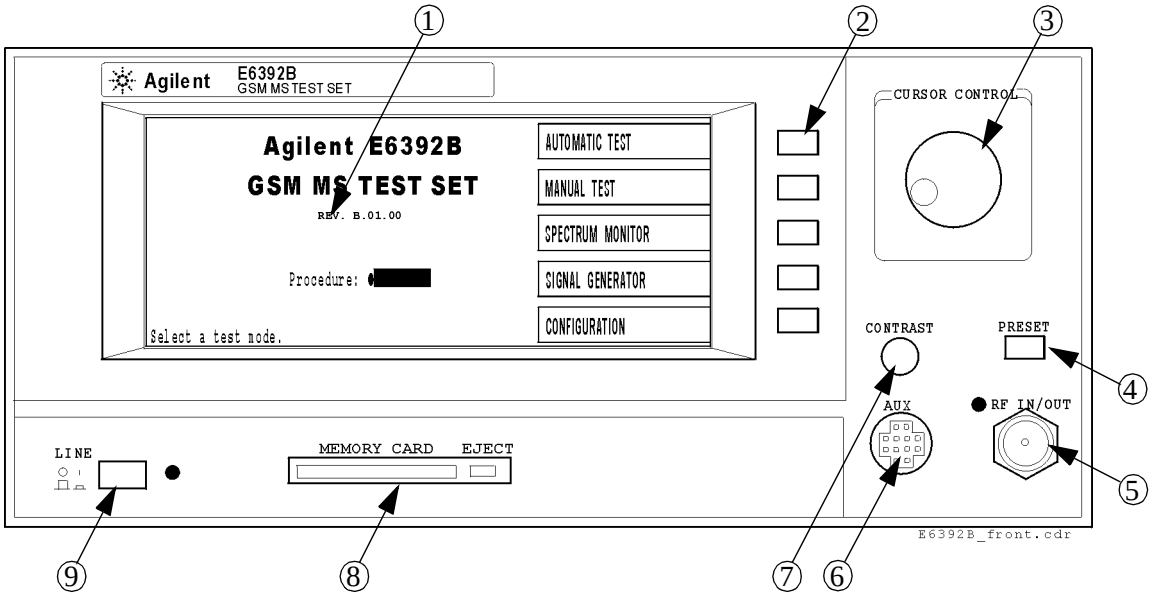
General Operation Guide

This section outlines how to operate the Test Set.

Front Panel Overview

The Test Set is designed for easy operation, flexibility, dual band mobile testing, measurement speed, and so forth with a simple front panel.

Figure 3-1 Front Panel of Agilent E6392B GSM MS Test Set



1. The LCD screen is used to display all of the testing conditions and test results.
2. Five softkeys, adjacent to the softkey labels shown in the LCD screen, are individually defined depending on each test mode and test sequence.
3. The CURSOR CONTROL knob basically has three major roles as follows:

   - **Moving the cursor:** Rotating the CURSOR CONTROL knob moves the blinking cursor from one input field to another either upward or downward, right or left, depending on the input fields arrangement. Input fields are highlighted. If a field is not highlighted, it is a read-only field.
   - **Selecting an entry for an input field:** Pressing the CURSOR CONTROL knob once at an input field causes the input field to blink.

     When the field is blinking, the CURSOR CONTROL knob is used to view the values defined for that input field by scrolling through the selections (rotating the knob).

     When the desired selection is shown in the field, pressing knob causes the selected value to enter into that input field. The cursor can then be used to move to another input field.

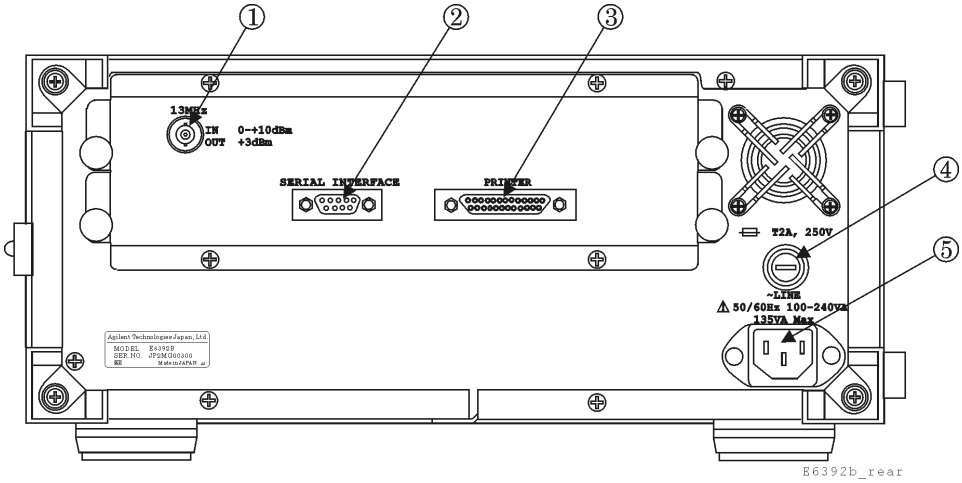
- **Controlling the marker:** For the graphic displays in the MANUAL TEST and SPECTRUM MONITOR modes, the Knob MKR/Cursor softkey is defined to select either Cursor for cursor control or MKR for marker control, whichever is underlined. If MKR is selected, this knob controls the marker position on a graphic display.

4. The **PRESET** key is provided to reset the Test Set and display the initial screen with the function mode softkey menu.
5. The RF IN/OUT N-type female connector is provided to connect the RF output signal to the mobile under test or to receive the input signal from the mobile. While the RF signal is output from this connector, the green lamp is lit. (This lamp is INSTALLATION CATEGORY I.)
6. The AUX connector is provided for Universal DC Power Adapter (P/N: E6392-60001) to supply dc power to the mobile under test through a cable.
7. The CONTRAST knob controls the brightness of the LCD screen.
8. The MEMORY CARD slot and the **EJECT** key are provided to save to or load from an SRAM memory card. Using the firmware update card, the current firmware can be updated to the new revision.
9. The **LINE** key toggles the power on and off. The green lamp is lit while the power is on. (This lamp is INSTALLATION CATEGORY I.)

Rear Panel Overview

The following illustration shows the rear panel of the Test Set:

Figure 3-2 Rear Panel of Agilent E6392B GSM MS Test Set

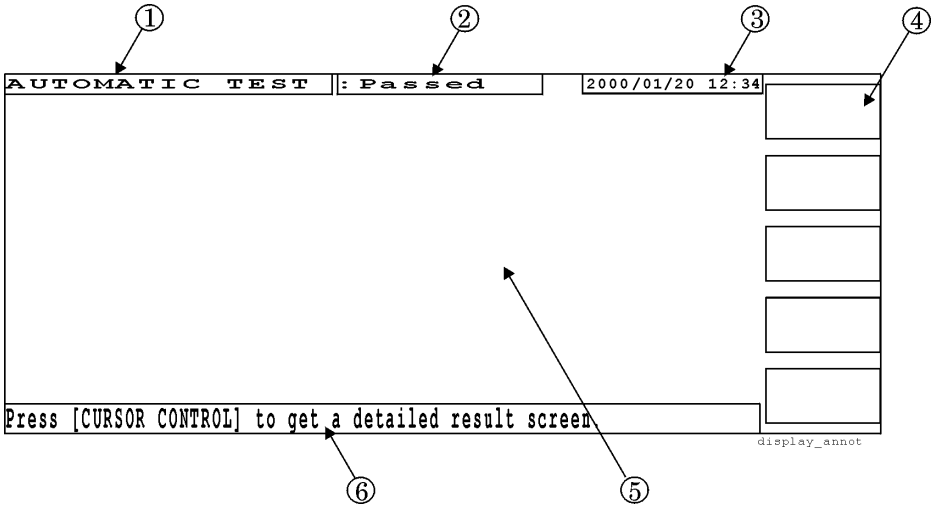


1. The 13 MHz IN/OUT BNC-type female connector is provided to input or output the 13 MHz reference frequency signal.
2. The DB-9 male connector is the RS-232 SERIAL INTERFACE port which can be used for remotely controlling the Test Set.
3. The DB-25 female connector is the PRINTER port which can be used to interface with a printer.
4. The fuseholder contains a slowblow-type line fuse.
5. The ac power receptacle accepts a three-pronged power cord which is shipped with the Test Set.

Display Annotation

Depending on functions and test situations there are several types of LCD screens. The following illustration shows the most common areas.

Figure 3-3 **LCD Display Annotation**



1. The current function mode is shown in this area.
2. The current operation status in the AUTOMATIC TEST, MANUAL TEST, and CONFIGURATION modes is shown in this place. This status includes Stand-by, Measuring, Aborted, Passed or Failed, and Test Condition and Test Sequence.
3. The current date and time are shown.
4. The softkey labels are shown in this area. Each label defines the function of the corresponding softkey immediately to the right of the label.
5. This area is used for multiple purposes to show and/or configure functions such as a test flow, a test item table, test parameters and input fields, a test result text and/or graph, and so forth.
6. Operation messages or customer configurable instruction messages for test flow steps are shown in this area.

Screen Flow Chart

The following illustrations show the screen flow charts according to each function mode. Each rectangle represents one screen with a different function mode, measuring step and status, measurement result, and so forth. Figure 3-5 on page 57 is applicable only for Test Sets with Option 002 and Option 040.

Figure 3-4 Screen Flow Chart

Standard (without options)

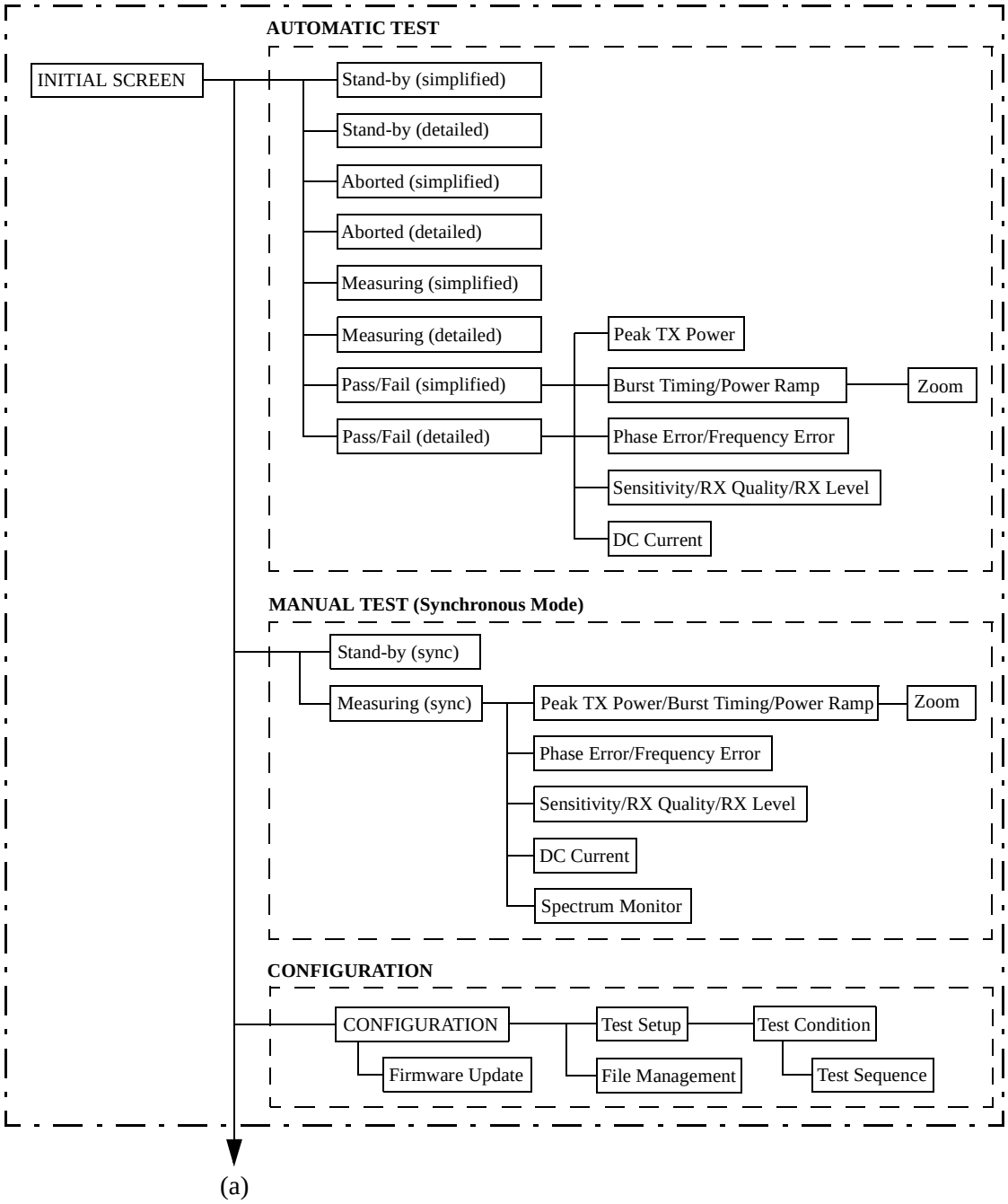
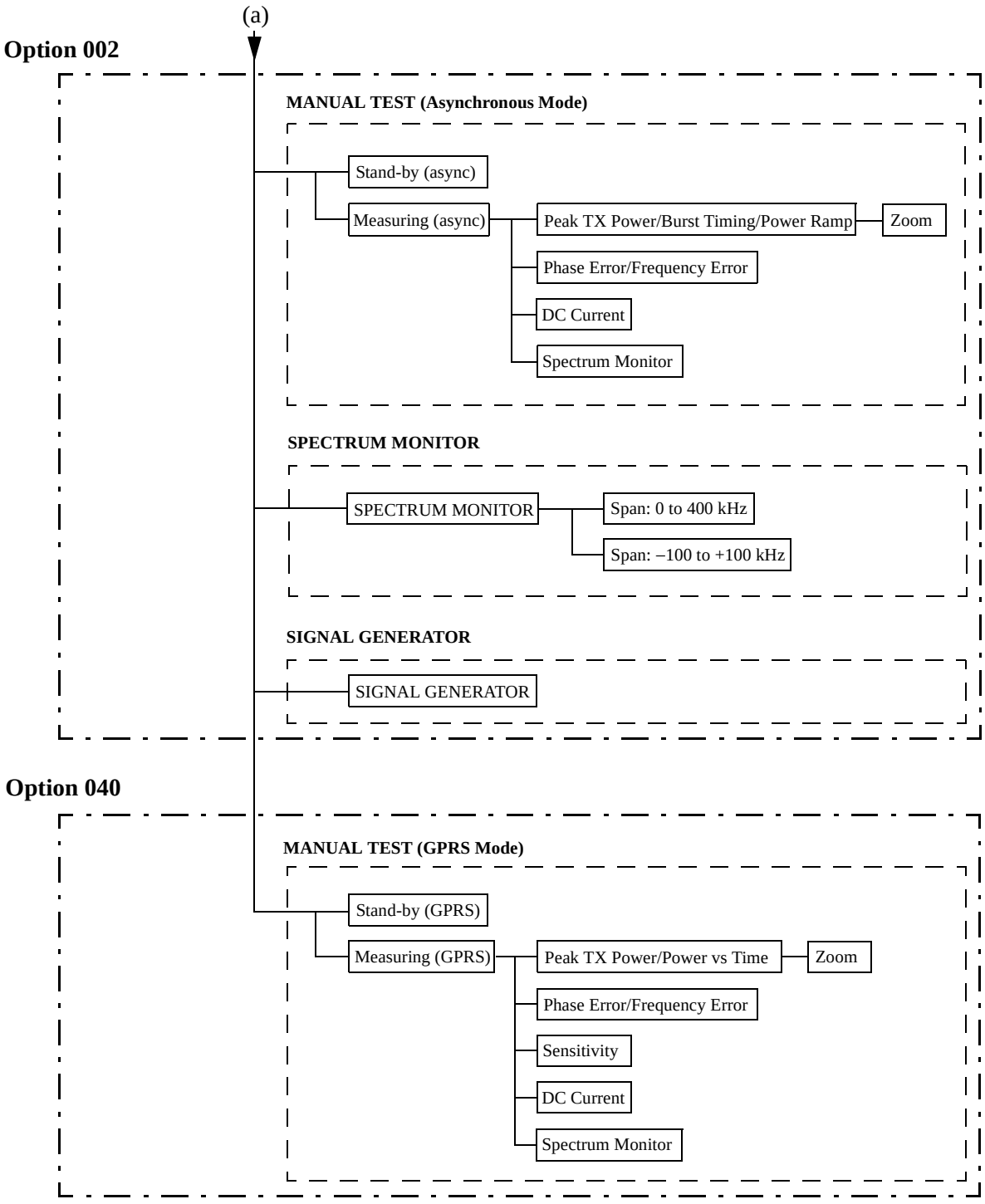


Figure 3-5 Screen Flow Chart



NOTE Refer to "MANUAL TEST (GPRS Mode)" on page 118 for Option 040.

Test Parameters, Test Items and Allowable Ranges

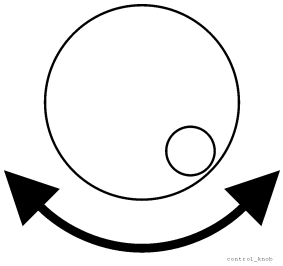
Depending on the function modes, the Test Set has a number of input fields to be specified or defined to configure a test flow, test sequence and test condition. The allowable ranges for those input fields depending on the radio standards are explained in the following parts of this guide. For a quick overview, refer to Appendix B, “Input Fields and Allowable Ranges.”

Selecting an Input Field and Specifying a Value

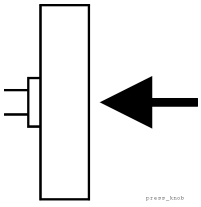
All input fields to be specified are highlighted and the circular cursor is blinking in front of one of them.

To start, first select an input field and then specify a value to that input field by the following procedure:

Step 1. Rotate the CURSOR CONTROL knob clockwise to move the cursor downward or right, or rotate it counterclockwise to go upward or left, and place it at the input field you want to change.



Step 2. Press the CURSOR CONTROL knob once. The input field blinks, while the circular cursor stops blinking.

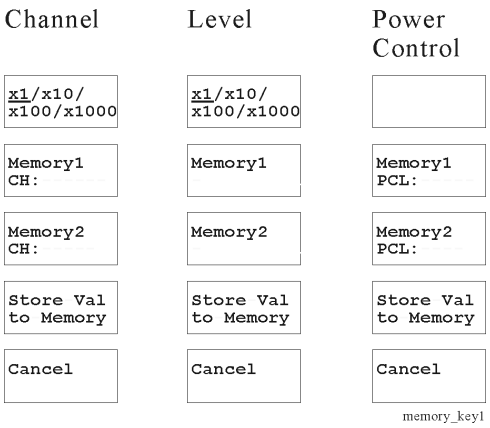


Step 3. Rotate the CURSOR CONTROL knob clockwise or counterclockwise to see the values defined for it.

Step 4. Press the CURSOR CONTROL knob to enter the desired value in the input field. The input field stops blinking and the circular cursor begins blinking again.

Storing Two Numeric Values

For numeric input fields such as channel numbers, input/output levels and power controls, you can store two numeric values using the memory softkey menus with the following procedure:



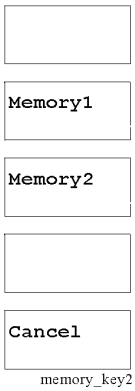
memory_key1

Step 1. Move the cursor to one of the numeric input fields of channels, input/output levels, or power controls.

Step 2. Upon selecting the field by pressing the CURSOR CONTROL knob, the softkey menu shown in the following figure is activated. The two memory softkeys show the values previously stored in the memories if any.

Step 3. Select a numeric value in the input filed with the CURSOR CONTROL knob.

Step 4. Press the Store Val to Memory softkey to reveal another softkey menu for Memory1 and Memory2.



memory_key2

Step 5. Press either of the memory softkeys where you desire to store that value.

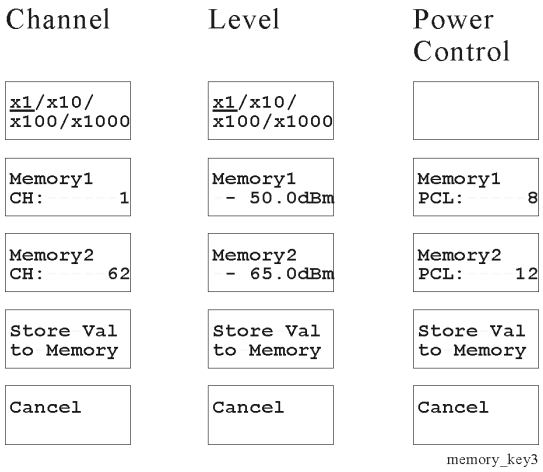
Step 6. The memory softkey menu returns to the state in Step 2 showing the value newly stored.

Step 7. Press the CURSOR CONTROL knob to determine the value into the field and the softkey menu returns to that of Step 1.

Recalling the Numeric Values

Step 1. Move the cursor to one of the numeric input fields of channels, input/output levels, or power controls.

Step 2. Upon selecting the field by pressing the CURSOR CONTROL knob, the softkey menu shown in the following figure is activated. The two memory softkeys show the values previously stored in the memories if any.



Step 3. Press the Memory1 or Memory2 softkey to enter the stored value to the field.

Step 4. The value is entered to the field and the softkey menu returns to that of Step 1.

Variable Increment Softkey

Upon placing the circular cursor at an input field, such as channel number or level, that accepts a numeric value, one softkey with the variable increments is activated as shown in the previous illustration.

Pressing this increment softkey changes the multiplier from 1 to 1000, and each click of the knob varies the value by an increment specified by the increment softkey. The following multipliers are available for selection:

- ×1: Enables an increment of 1.
- ×10: Enables an increment of 10.
- ×100: Enables an increment of 100.
- ×1000: Enables an increment of 1000.

Initial Screen

After power on, the initial screen can be used to select one of the function modes as shown in Figure 3-6. Also, the firmware revision name currently installed and the procedure selection field are shown.

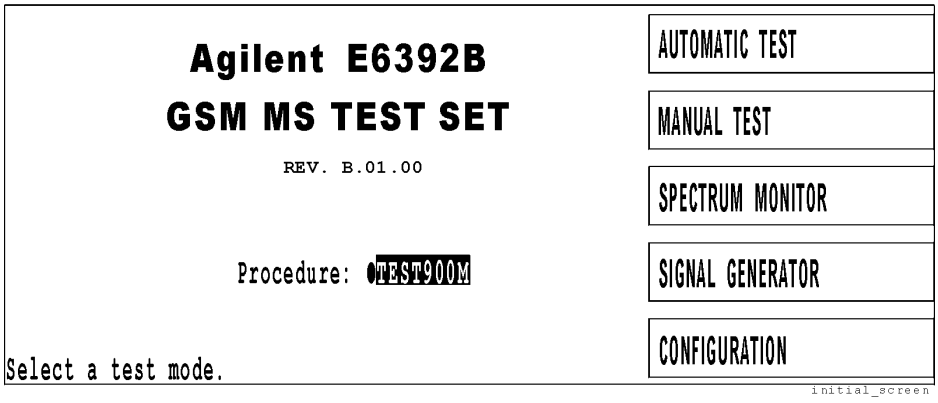
To update the current firmware with the most recent one, refer to "How to Update the Firmware" on page 165.

To recall one of the test procedures from your SRAM memory card, refer to "Recalling a Test Setup File" on page 163.

To return to the initial screen from any function mode, press the Return softkey (multiple times if necessary).

NOTE For Test Sets without Option 002, the SPECTRUM MONITOR and SIGNAL GENERATOR softkeys are not available.

Figure 3-6 Initial Screen



Softkey Menu

- AUTOMATIC TEST: Displays the AUTOMATIC TEST: Stand-by screen and its softkey menu. Refer to "AUTOMATIC TEST" on page 63.
- MANUAL TEST: Displays the MANUAL TEST: Stand-by screen and its softkey menu. Refer to "MANUAL TEST (Synchronous Mode)" on page 80, "MANUAL TEST (Asynchronous Mode)" on page 102 if Option 002 is installed, or "MANUAL TEST (GPRS Mode)" on page 118 if Option 040 is installed.
- SPECTRUM MONITOR: Displays the SPECTRUM MONITOR screen and its softkey menu if Option 002 is installed. Refer to "SPECTRUM MONITOR" on page 136.
- SIGNAL GENERATOR: Displays the SIGNAL GENERATOR screen and its softkey menu if Option 002 is installed. Refer to "SIGNAL GENERATOR" on page 143.

- CONFIGURATION: Displays the CONFIGURATION screen and its softkey menu. Screens for setting up the test sequence, test condition, file management, firmware update are available in this mode. Refer to "CONFIGURATION" on page 145.

AUTOMATIC TEST

In this test mode, Pass/Fail test results on all test items in the table are automatically obtained by configuring the Test Setup: Test Sequence screen and the Test Setup: Test Condition screen in the CONFIGURATION mode. Once a measurement cycle has been completed, detailed test results can be displayed by selecting one of the Pass/Fail cells in the test item table.

NOTE

Insert the test Subscriber Identity Module (SIM) in the mobile phone before performing any test, because the Test Set will attempt to perform measurements which are not generally permitted by usual SIMs.

The default state at power on is the previous setting stored in the internal memory before power off.

When entering numeric values, the variable increment softkey menu is displayed. Refer to “Variable Increment Softkey” and "Storing Two Numeric Values" on page 59.

Stand-by Screen

When the AUTOMATIC TEST softkey is pressed after power on, either of the AUTOMATIC TEST: Stand-by simplified screen (Figure 3-7) or the AUTOMATIC TEST: Stand-by detailed screen (Figure 3-8) is displayed, depending on the previous setting of the Screen Simp/Detai softkey.

Figure 3-7 Stand-by Simplified Screen

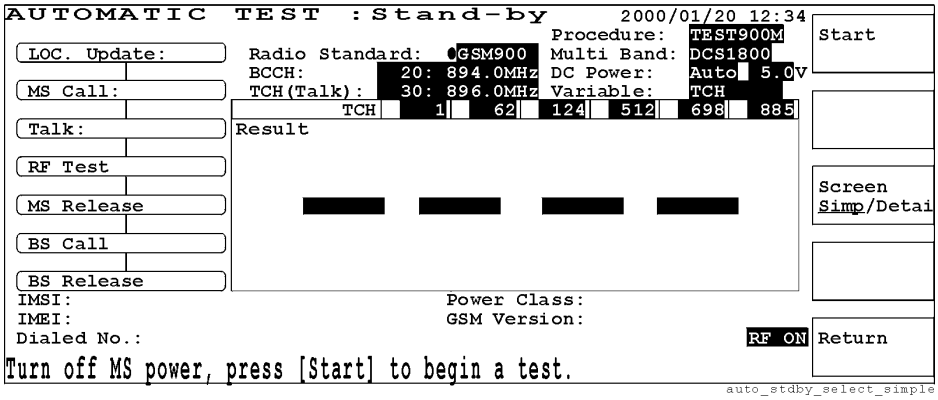
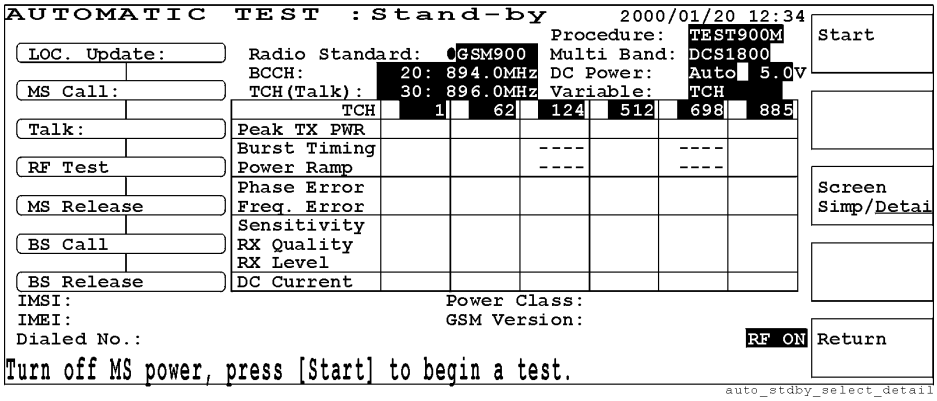


Figure 3-8 Stand-by Detailed Screen



Softkey Menu

- Start: Begins testing the mobile with AUTOMATIC TEST.
- Screen Simp/Detai: Toggles between Simp for simplified and Detai for detailed to select one Stand-by screen.
- Return: Displays the initial screen with function modes.

Screen Fields

The test flow steps from LOC. Update to BS/MS Release are shown to display which steps are included in a test along with the callers and releasers specified to either MS or BS on the Test Setup: Test Sequence screen in the CONFIGURATION mode. The test flow steps with "----" are skipped. Pass/Fail results are also shown for the test flow steps executed.

The input fields of the following parameters need to be set for a new test:

Input Field	Description
Procedure	Displays a list of files that are on an SRAM memory card. If an SRAM memory card containing setup files is used, a list of those file names is shown in this field for selection. If there are no files on the card, this field remains blank.
Radio Standard	Selects either GSM900, E-GSM, DCS1800, or PCS1900.
Multi Band	Selects another band in addition to one in Radio Standard for testing dual band mobile phones. The allowable combinations of radio standards are as follows: Radio Standard: — Multi Band: GSM900 — OFF, DCS1800 E-GSM — OFF, DCS1800 DCS1800 — OFF, GSM900, E-GSM PCS1900 — OFF
BCCH[a]	Specifies the broadcast control channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
DC Power	Selects a supply mode. The choices are Auto, On, and Off as follows: o Auto: Supplies dc voltage to the mobile only during a test cycle. o On: Always supplies dc voltage to the mobile. o Off:[b] Disables to supply dc voltage to the mobile. If this is selected, the Variable field is automatically set to TCH. Accepts a dc voltage value[a] ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.

Input Field	Description
TCH (Talk)[a]	Specifies the traffic channel depending on the parameter selection in the Variable field. The frequency corresponding to the channel accompanies. If TCH is selected in the Variable field, this specifies one traffic channel to make Talk tests in addition to six traffic channels for RF tests. If DC Power is selected in the Variable field, this specifies one traffic channel to make both Talk tests and RF tests.
Variable	Selects either TCH or DC Power as follows: o TCH: Enables to make six measurements on six traffic channels specified in the TCH input fields of the Test Item table, with or without one fixed dc voltage. o DC Power: Enables to make six measurements on one traffic channel with six dc voltages specified in the DCP input fields of the Test Item table.
TCH or DCP[a] (up to 6)	According to the selection of Variable, either of the following parameters need to be specified for a new test: o TCH: Accepts up to six traffic channels with regard to Multi Band. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810 o DCP: Accepts up to six dc voltages ranging from 3.0 to 11.0 V in 0.1 V steps.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.
b. When DC Power is set to Off, DC Current cannot be measured and “----” is shown in the DC Current cells in the table of the AUTOMATIC TEST: Stand-by detailed screen.

If the Screen Simp/Detai softkey is selected, the test items in the table below are shown. Pass/Fail test results against the limits set on the Test Setup: Test Condition screen in the CONFIGURATION mode are also shown.

Test Item	Description
Peak TX Power	Measures and analyzes three peak transmission power levels at High, Mid, and Low.
Burst Timing	Measures and analyzes the power burst timing.
Power Ramp	Measures and analyzes the amplitude envelope in the timeslots of the RF burst signal.
Phase Error	Measures and analyzes the rms and peak phase errors over the active part of the timeslots between 0 to 147 bits.
Frequency Error	Measures and analyzes the frequency error over the active part of the timeslots.
Sensitivity	Measures and analyzes the receiver sensitivity in the BER and FER formats using the loopback function.
RX Quality	Measures and analyzes the received signal quality.
RX Level	Measures and analyzes the received signal level.
DC Current	Measures and analyzes the dc currents consumed at the Camp On and Talk steps of the test flow.

If some items are denoted to be skipped on the Test Setup: Test Sequence screen, or if the DC Power field is set to Off, “----” is shown in those table cells and the corresponding steps in the test flow.

The RF ON annunciator at the lower-right corner of the screen is displayed only when the RF signal from the Test Set is present at the RF IN/OUT connector.

Operation and instruction messages are displayed at the bottom screen. You can create up to 7 instruction messages corresponding to each test flow step using Instruction: # and the Choices: scrolling window on the Test Setup: Test Sequence screen in the CONFIGURATION mode. Refer to "Test Setup: Test Condition Screen" on page 148 and "Test Setup: Test Sequence Screen" on page 153.

The following display fields remain blank on the lower screen at this state:

Display Field	Description
IMSI:	Displays the International Mobile Subscriber Identity from the mobile.
IMEI:	Displays the International Mobile Station Equipment Identity from the mobile.
Dialed No.:	Displays the number dialed from the mobile.
Power Class:	Displays one of the defined factors. See "Power Classes" on page 184.
GSM Version:	Displays either Phase 1 or Phase 2 defined by the mobile.

Talk Measuring Screen

While the measurement is being done after pressing the Start softkey, either the AUTOMATIC TEST: Measuring simple (Figure 3-9) or detailed screen (Figure 3-10) is displayed, depending on the previous setting of the Screen Simp/Detai softkey. The following examples illustrate the screens testing up to the Talk step of the test flow.

Figure 3-9 **Talk Measuring Simplified Screen**

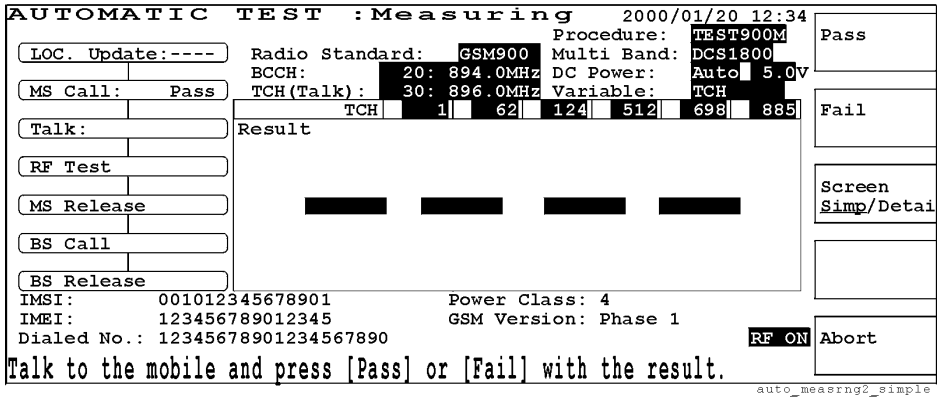
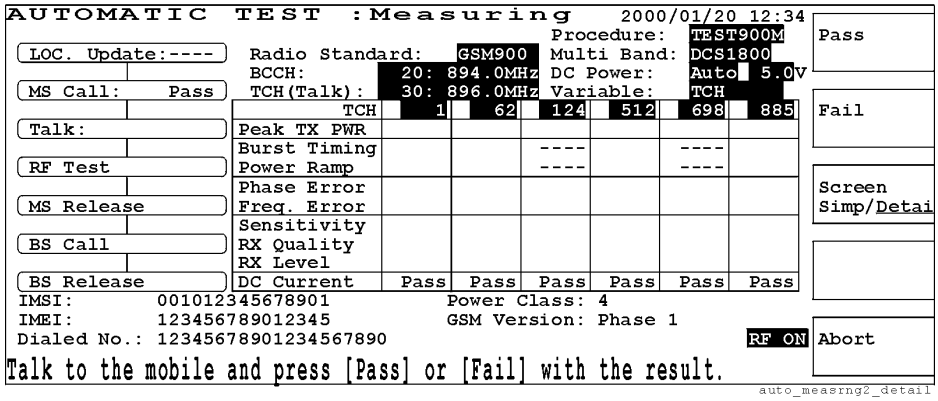


Figure 3-10 **Talk Measuring Detailed Screen**



Softkey Menu

- Pass: Press this softkey if your voice is echoed back from the mobile with good quality. This softkey is activated at the time of the Talk step and erased if pressed.
- Fail: Press this softkey if your voice is echoed back from the mobile with poor quality. This softkey is activated at the time of the Talk step and erased if pressed.
- Screen Simp/Detai: Toggles between Simp for simplified and Detai for detailed to select one of the AUTOMATIC TEST: Measuring screens.
- Abort: Stops the measurement and returns to the Stand-by screen.

Screen Fields

After the Start softkey is pressed in the Stand-by screen, the measurement is initiated and the Measuring screen is displayed.

While making a measurement, the operator must respond to operation or instruction messages by pressing the appropriate softkeys of the Test Set, or by pressing the mobile's keys. Also the circular cursor is not shown because you cannot modify any of the parameter values or test conditions during testing.

One of the test flow steps blinks to show which step is currently being tested. While the RF Test step is blinking, each of the test items blinks sequentially to obtain a test result.

The DC Current consumed at the camp on stage is measured at the LOC. The Update step and its result is displayed in the DC Current cells of the table in the Measuring Detailed screen, when DC Power is set to Auto or On and dc power is supplied from the Test Set to the mobile using the appropriate dc power cable.

The following display fields show the data from the mobile on the lower screen at this state:

Display Field	Description
IMSI:	Displays the International Mobile Subscriber Identity from the mobile.
IMEI:	Displays the International Mobile Station Equipment Identity from the mobile.
Dialed No.:	Displays the number dialed from the mobile.
Power Class:	Displays one of the defined factors. See "Power Classes" on page 184.
GSM Version:	Displays either Phase 1 or Phase 2 defined by the mobile.

Aborted Screen

If the measurement is aborted by pressing the Abort softkey, either the AUTOMATIC TEST: Aborted simplified screen (Figure 3-11) or detailed screen (Figure 3-12) is displayed, depending on the previous setting of the Screen Simp/Detai softkey.

Figure 3-11 **Aborted Simplified Screen**

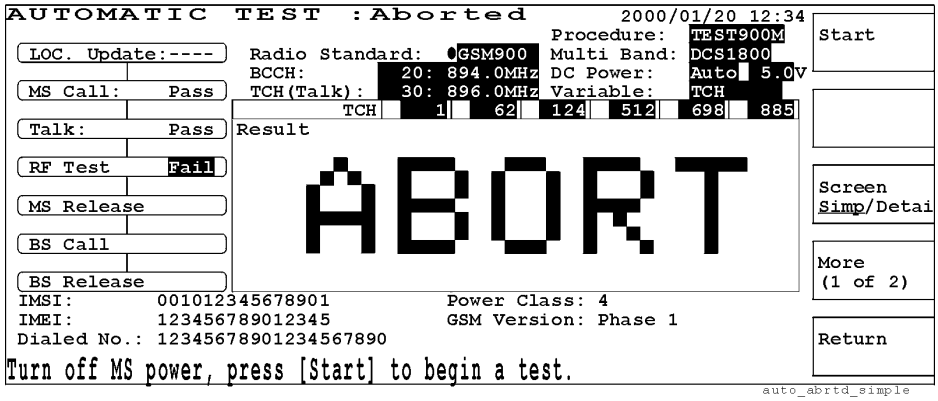
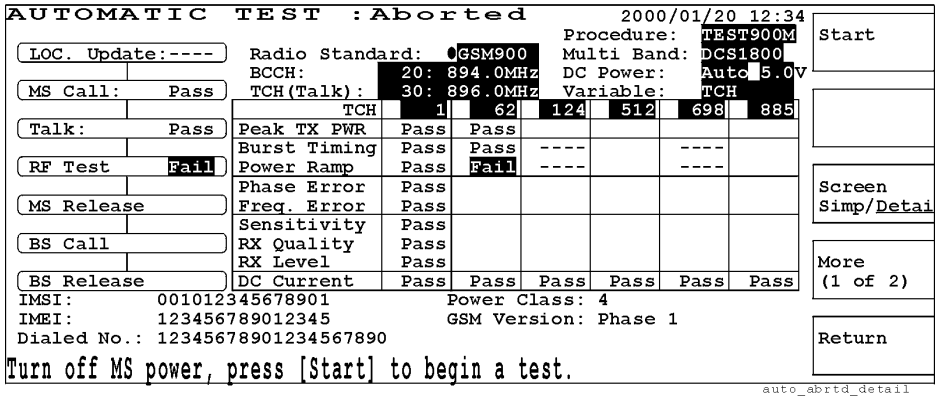


Figure 3-12 **Aborted Detailed Screen**



Softkey Menu 1

- Start: Begins a new test.
- Screen Simp/Detai: Toggles between Simp for simplified and Detai for detailed to select one of the AUTOMATIC TEST: Aborted screens.
- More (1 of 2): Displays softkey menu 2.
- Return: Displays the initial screen with function modes.

Softkey Menu 2

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Print All: Allows you to print a hardcopy set of the whole test parameters and the Pass/Fail test results with measured actual data.
- More (2 of 2): Returns to softkey menu 1.

- Return: Displays the initial screen with function modes.

Explanation

Detailed test results up to the aborted operation can be obtained for further analysis. Place the circular cursor at one of the Pass/Fail cells and press the CURSOR CONTROL knob once to get detailed test results.

The Test Set is reset to the state of the AUTOMATIC TEST: Stand-by screen. The MS Call state is not ensured, therefore the MS power-on process needs to be repeated for a new test.

Other information related to the mobile are also displayed in either simplified or detailed screen. Refer to "Screen Fields" on page 70.

Pass/Fail Screen

When a test is completed, either of the Pass/Fail simplified screen (Figure 3-13) or detailed screen (Figure 3-14) is displayed depending on the previous setting of the Screen Simp/Detai softkey. “Pass” is normally displayed in the table cells, however, any data indicating a failure is highlighted.

Figure 3-13 Pass/Fail Simplified Screen

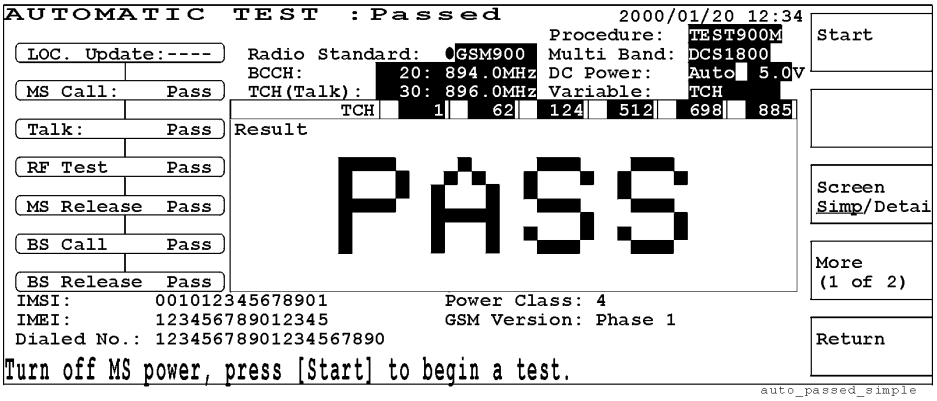
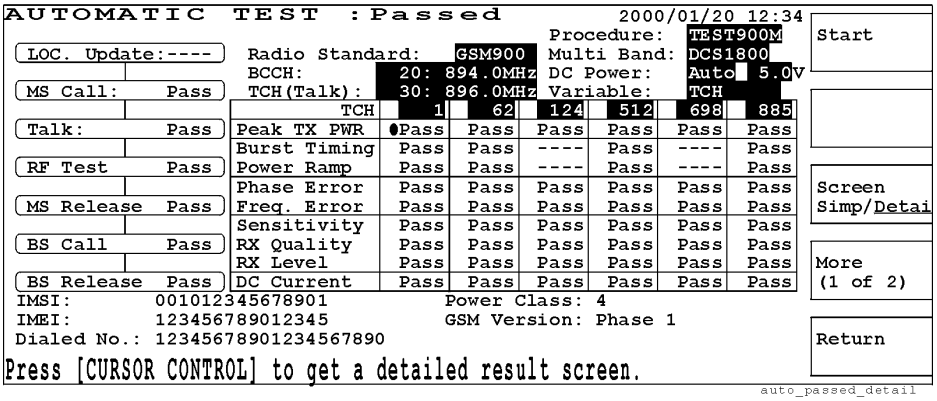


Figure 3-14 Pass/Fail Detailed Screen



Softkey Menu 1

- Start: Begins a new test.
- Screen Simp/Detai: Toggles between Simp for simplified and Detai for detailed to select one of the AUTOMATIC TEST: Pass/Fail screens.
- More (1 of 2): Displays softkey menu 2.
- Return: Displays the initial screen with function modes.

Softkey Menu 2

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Print All: Allows you to print a hardcopy set of the whole test’s parameters and the Pass/Fail test results with measured actual data.
- More (2 of 2): Returns to softkey menu 1.

- Return: Displays the initial screen with function modes.

Explanation

In the Pass/Fail detailed screen, the test item cells are filled with the conclusion of either Pass or Fail. If some items are denoted to be skipped in the Test Sequence screen or the DC Power field is set to Off, “----” is shown in those cells and the corresponding steps in the test flow.

Procedure to Obtain Each Pass/Fail Detailed Screen

Use the following procedure to obtain each Pass/Fail detailed screen:

Step 1. Place the circular cursor at one of the Pass/Fail result cells of the Test Item table by rotating the CURSOR CONTROL knob.

Step 2. Choose that test result cell by pressing the CURSOR CONTROL knob one time.

Step 3. Either a data list or a graph with a data list is displayed according to each test item.

Step 4. Repeat Step 1 to Step 3 to observe other Pass/Fail test results in the Test Item table.

Step 5. Press the Start softkey to execute a new test, or press the Return softkey to go to the initial screen.

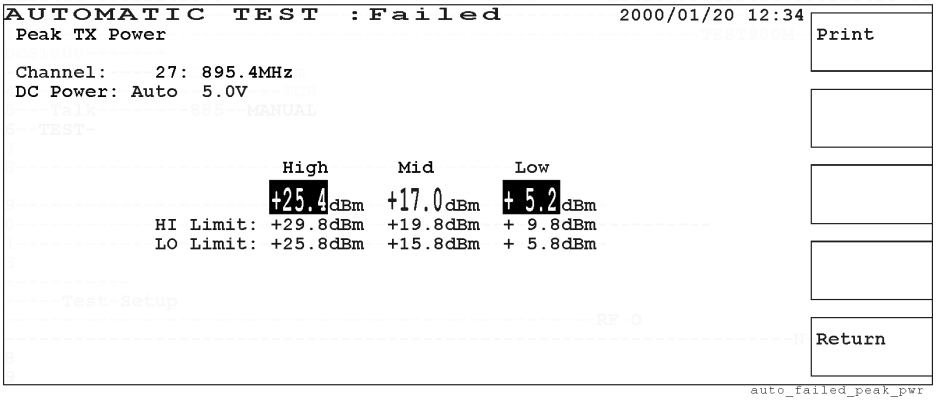
Pass/Fail Screen Examples

The following illustrations show some of the typical detailed screens with Pass/Fail test results.

Pass/Fail: Peak TX Power

This function measures and analyzes three peak transmission power levels against the limits set on the Test Condition screen in the CONFIGURATION mode. The actual measured data are shown with vertically enlarged numerals. Any data indicating a failure is highlighted.

Figure 3-15 Failed: Peak TX Power Screen



Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Return: Displays the Pass/Fail screen.

Pass/Fail: Burst Timing/Power Ramp

This function measures and analyzes the power burst timing and the amplitude envelope in the timeslots of the RF burst signal, however, the Power Ramp result text is shown when the marker is placed at any point of its measured trace. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame. Any data indicating a failure is highlighted.

Figure 3-16 **Passed: Burst Timing/Power Ramp Screen**

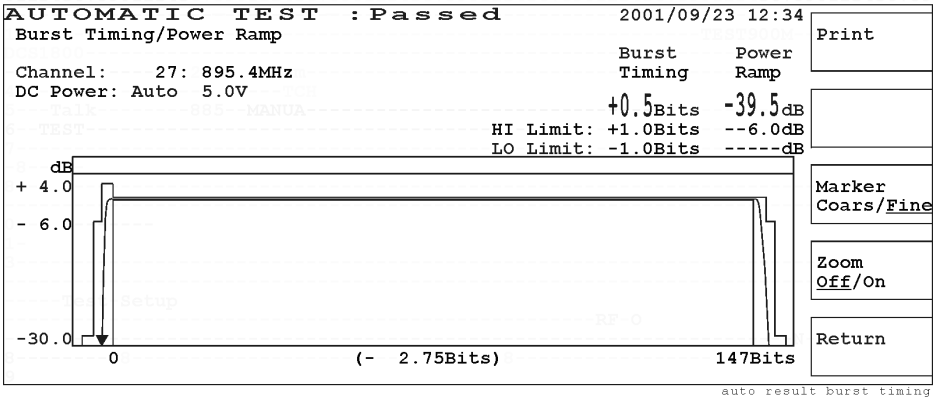
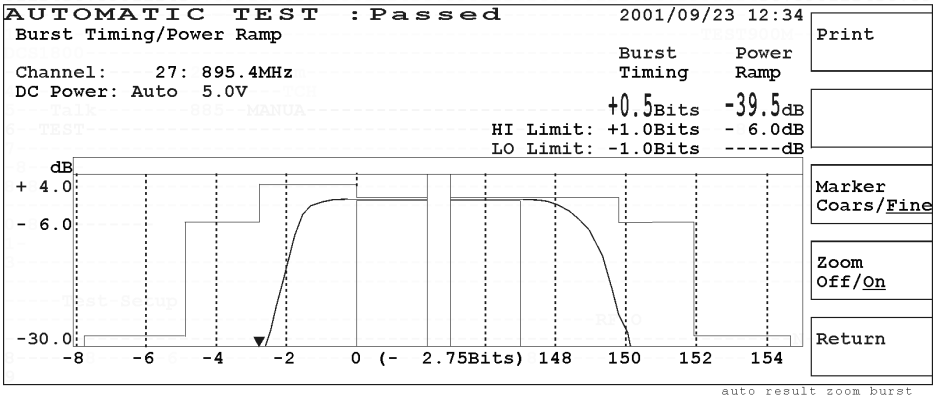


Figure 3-17 **Passed: Burst Timing/Power Ramp Zoomed Screen**



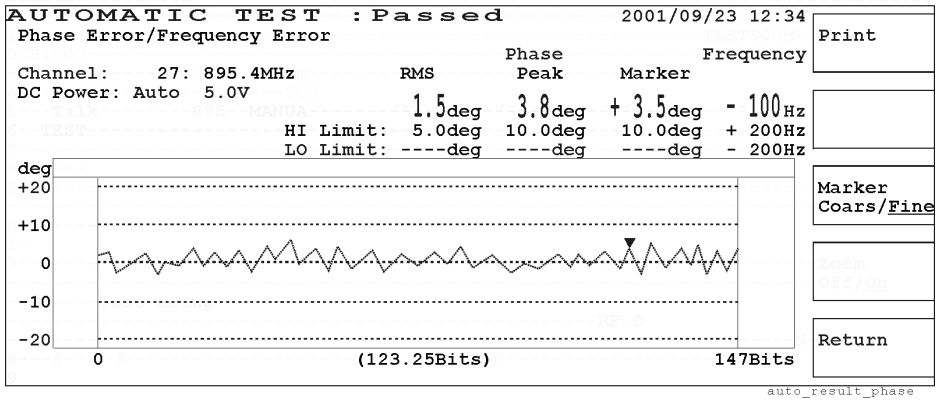
Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the amplitude and timeslot (in bits) are available at any point of the measured trace.
- Zoom Off/On: Toggles the zooming function between Off and On. If On is selected, the rising and trailing edges of Power Ramp are expanded to observe the details as shown in Figure 3-17.
- Return: Displays the Pass/Fail screen.

Pass/Fail: Phase Error/Frequency Error

This function measures and analyzes the rms and peak phase errors and frequency error over the active part of the timeslots between 0 to 147 bits. The test data for RMS, Peak and Marker Phase errors, and Frequency error are displayed, and the graphic display with phase versus timeslots (in bits) is shown. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame. Any data indicating a failure is highlighted.

Figure 3-18 **Passed: Phase Error/Frequency Error Screen**



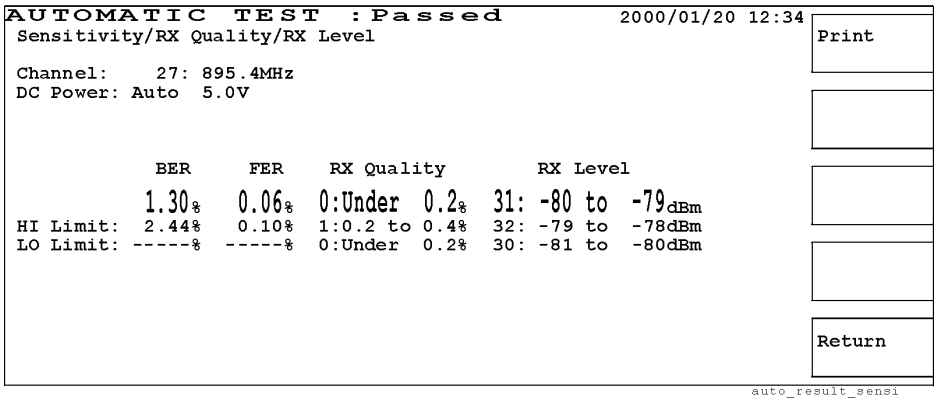
Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the phase error magnitude and timeslot (in bits) are available at any point of the measured trace.
- Return: Displays the Pass/Fail screen.

Pass/Fail: Sensitivity/RX Quality/RX Level

This function measures and analyzes the receiver sensitivity in the BER (bit error rate) and FER (frame erasure rate) formats, and the received signal quality and level using the loopback function. The test data for BER, FER, RX Quality, and RX Level are shown as follows. Any data indicating a failure is highlighted.

Figure 3-19 **Passed: Sensitivity/RX Quality/RX Level Screen**



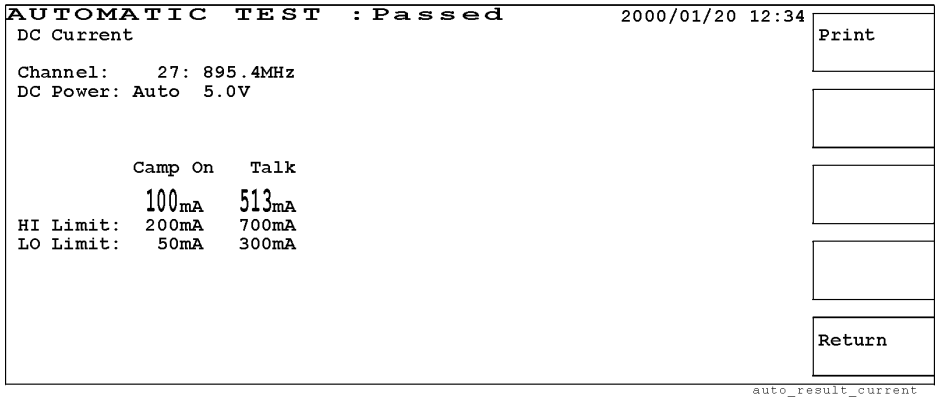
Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Return: Returns to the Pass/Fail screen.

Pass/Fail: DC Current

This function measures and analyzes the dc currents consumed at the Camp On and Talk steps. The test data are shown as follows. Any data indicating a failure is highlighted.

Figure 3-20 **Passed: DC Current Screen**



Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Return: Displays the Pass/Fail screen.

MANUAL TEST (Synchronous Mode)

In the MANUAL TEST mode, each test item or a group of test items can be measured and analyzed with test limits defined in the Test Setup: Test Condition screen of the CONFIGURATION mode.

In the synchronous mode, tests are made while the Test Set and the mobile phone are networked to communicate with each other. This mode is used to test mobile phones during the Talk/RF Test step of a test flow, in a real-time manner.

Measurement Mode Selection

Depending on the installation of the currently available options, the measurement modes in MANUAL TEST are different as shown in the following table:

Option(s)	Selectable Measurement Modes
None (standard)	Not selectable but SYNC (default setting)
002	SYNC/ASYNC
040	SYNC/GPRS
002 and 040	SYNC/ASYNC/GPRS

Test SIM

Insert the test Subscriber Identity Module (SIM) in the mobile phone before performing any test, because the Test Set will attempt to perform measurements which are not generally permitted by normal SIMs.

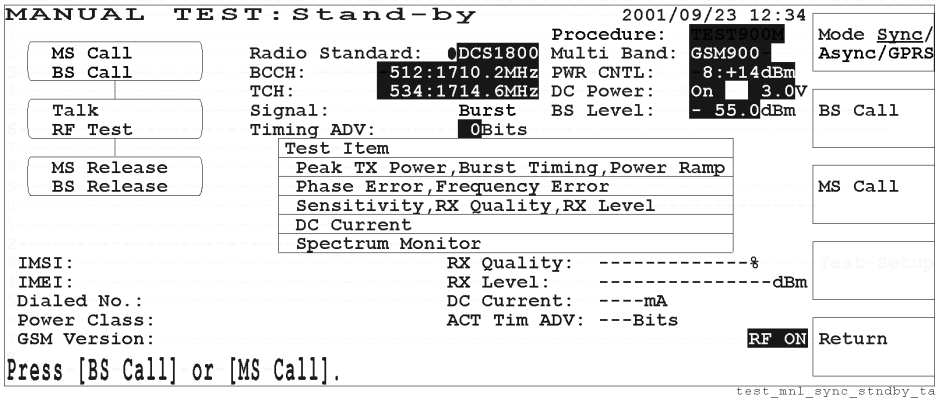
NOTE The default state is the last setting stored in the internal memory before power off.

NOTE When entering numeric values, the variable increment softkey menu is displayed. Refer to “Variable Increment Softkey” and "Storing Two Numeric Values" on page 59.

Stand-by Screen

When the MANUAL TEST mode is selected, the following Stand-by screen is displayed:

Figure 3-21 Synchronous Mode Stand-by Screen



Softkey Menu

- Mode Sync/Async/GPRS: Select either Sync for synchronous, Async for asynchronous, or GPRS for general packet radio service mode. This softkey is available only for Test Sets equipped with Option 002 and Option 040.
- BS Call: Executes the Call Setup process from the Test Set. The operation message, “Processing...”, is shown and the mobile is called.
- MS Call: Shows the operation message, “Executing a call setup from the mobile.”, is shown for a user to take action.
- Return: Displays the initial screen with function modes.

Screen Fields

The input fields of the following parameters need to be set for a new test:

Input Field	Description
Procedure	Displays a list of files that are on an SRAM memory card. If an SRAM memory card containing setup files is used, a list of those file names is shown in this field for selection. If there are no files on the card, this field remains blank.
Radio Standard	Selects either GSM900, E-GSM, DCS1800, or PCS1900.
Multi Band	Selects another band in addition to one in Radio Standard for testing dual band mobile phones. The allowable combinations of radio standards are as follows: Radio Standard: — Multi Band: GSM900 — OFF, DCS1800 E-GSM — OFF, DCS1800 DCS1800 — OFF, GSM900, E-GSM PCS1900 — OFF
BCCH[a]	Specifies the broadcast control channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
PWR CNTL	Specifies one of the factors defined for Power Control Levels according to the Radio Standard. The allowable factor ranges are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 19 (+5 dBm) DCS1800: 29 (+36 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm) PCS1900: 30 (+33 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm)
TCH[a]	Accepts one traffic channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810

Input Field	Description
DC Power	Selects a supply mode. The choices are On and Off as follows: o On: Always supplies dc voltage to the mobile. o Off:[b] Disables to supply dc voltage to the mobile. Accepts a dc voltage value[a] ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.
Signal	For synchronous mode tests, only Burst is valid and cannot be changed.
BS Level	Specifies the RF output level[a] of the Test Set, ranging from –110.0 to –50.0 dBm. The default value is set on the Test Condition screen in the CONFIGURATION mode.
Timing ADV	Accepts a value for the timing advance[a] ranging from 0 to 63 bits.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.
b. When DC Power is set to Off, DC Current cannot be measured.

The following test items are shown in groups in the table. The detailed test screens for the groups are displayed when selected by the CURSOR CONTROL knob.

Test Item	Description
Peak TX Power, Burst Timing, Power Ramp	The Measuring: Peak TX Power/Burst Timing/Power Ramp screen is shown with a result text and graphic display.
Phase Error, Frequency Error	The Measuring: Phase Error/Frequency Error screen is shown with a result text and graphic display.
Sensitivity, RX Quality, RX Level	The Measuring: Sensitivity/RX Quality/RX Level screen is shown with a result text display.
DC Current	The Measuring: DC Current screens for Camp On and Talk are shown with result text displays.
Spectrum Monitor	The Measuring: Spectrum Monitor screen is shown with a result text and graphic display.

The following display fields remain blank on the lower screen at this state:

Display Field	Description
IMSI:	Displays the International Mobile Subscriber Identity from the mobile.
IMEI:	Displays the International Mobile Station Equipment Identity from the mobile.
Dialed No.:	Displays the number dialed from the mobile.
Power Class:	Displays one of the defined factors. See "Power Classes" on page 184.
GSM Version:	Displays either Phase 1 or Phase 2 defined by the mobile.
RX Quality:	Displays the measurement result for the receiver characteristics.
RX Level:	Displays the measurement result for the receiver characteristics.
DC Current:	Displays the dc current consumed by the mobile at the connection state.
ACT Tim ADV:	Displays the number of bits for the actual timing advance data.

The RF ON annunciator at the screen lower right corner is displayed only when the RF signal from the Test Set is present at the RF IN/OUT connector.

The instruction message “Press [BS Call] or [MS Call].” is shown. By pressing the BS Call or MS Call softkey, the first Measuring screen is shown, and you can then execute a test.

MS Call or BS Call Measuring Screen

When the BS Call or MS Call softkey is pressed, the following Measuring screen is displayed before proceeding to the Talk/RF Test step:

Figure 3-22 MS Call Measuring Screen

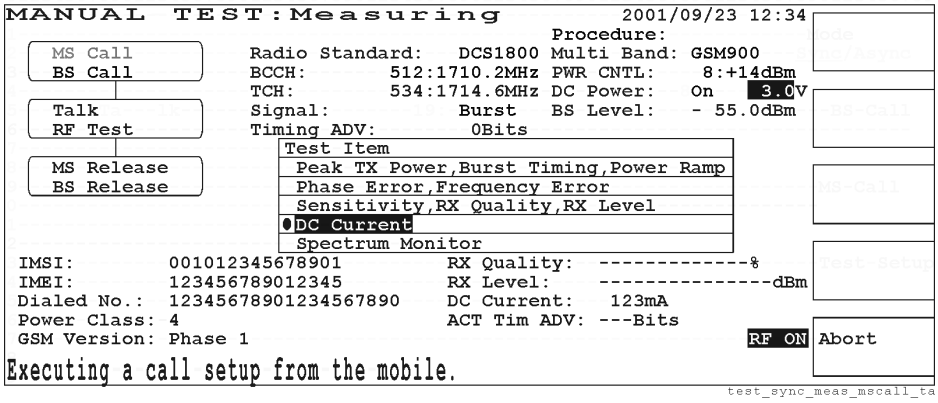
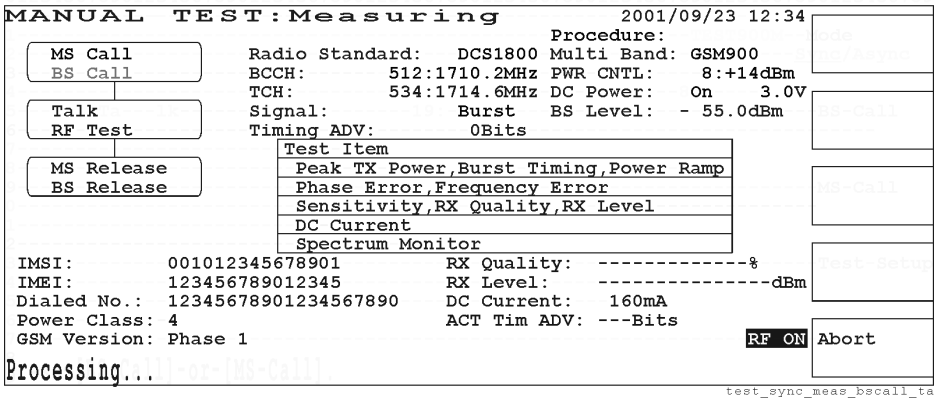


Figure 3-23 BS Call Measuring Screen



Softkey Menu

- Abort: Stops the measurement and returns to the MANUAL TEST: Stand-by screen.

Explanation

If the MS Call softkey is pressed, the MS Call step in the test flow starts blinking and the operation message “Executing a call setup from the mobile.” is shown. When a proper call setup is made, the Talk/RF Test step starts blinking as shown in "Talk/RF Test Measuring Screen" on page 88.

If the BS Call softkey is pressed, the BS Call step starts blinking, and the mobile needs to respond to the Test Set, for example by pressing the **SEND** key. The operation message “Processing....” is shown and then the test sequence goes to the Talk/RF Test step making it start blinking as shown in "Talk/RF Test Measuring

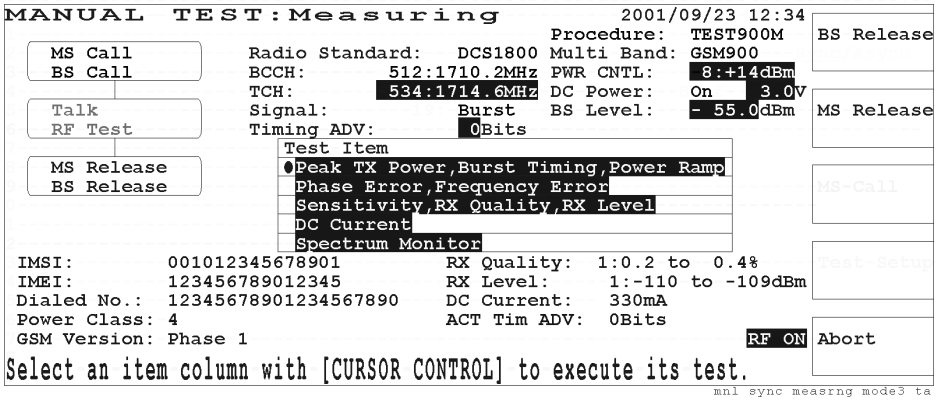
Screen" on page 88. If the response from the mobile takes too much time, the message changes to “Time out error. Press [Abort].” Then, the measurement is cancelled and the screen returns to the Stand-by screen.

In both cases, you cannot change the DC Power supply mode field, however, the DC Power voltage field of the MS Call measuring screen can be changed for making DC Current tests at Camp On. The dc current measurement result for a call setup is shown under the test item table along with other mobile related information but the dialed number is shown only in the case of MS Call.

Talk/RF Test Measuring Screen

While the Talk/RF Test step is blinking as shown in Figure 3-24, you can make measurements on each test item before releasing the mobile. If you select a test item column with the CURSOR CONTROL knob, the corresponding measuring screen is displayed making real-time measurements.

Figure 3-24 Talk/RF Test Measuring Screen



Softkey Menu

- BS Release: Executes Call End from the Test Set showing the operation message “Processing...”.
- MS Release: Shows the operation message “Executing a call end from the mobile.” for a user to take action.

NOTE For Call End from the mobile, both of pressing the MS Release softkey and executing the call end from the mobile are required.

- Abort: Returns to the MANUAL TEST: Stand-by screen, and then to the initial screen with function modes.

NOTE After pressing the Abort softkey, execute call end from the mobile; otherwise the call processing may be failed at the next measurement.

Explanation

While the Talk/RF Test step is blinking, one of the test items can be selected by rotating and pressing the CURSOR CONTROL knob, and its measurements are made in a real-time manner showing the changes in characteristics of the mobile under test.

In this state, DC Current under the test item table shows the dc current consumed at the Talk/RF Test step. RX Quality and RX Level are also shown in this place.

Procedure to obtain the Measuring screens

Step 1. Place the blinking cursor at one of the test items by rotating the CURSOR CONTROL knob.

Step 2. Choose that test item by pressing the CURSOR CONTROL knob.

Step 3. Either result text or text with a graph is shown according to the Test Item chosen.

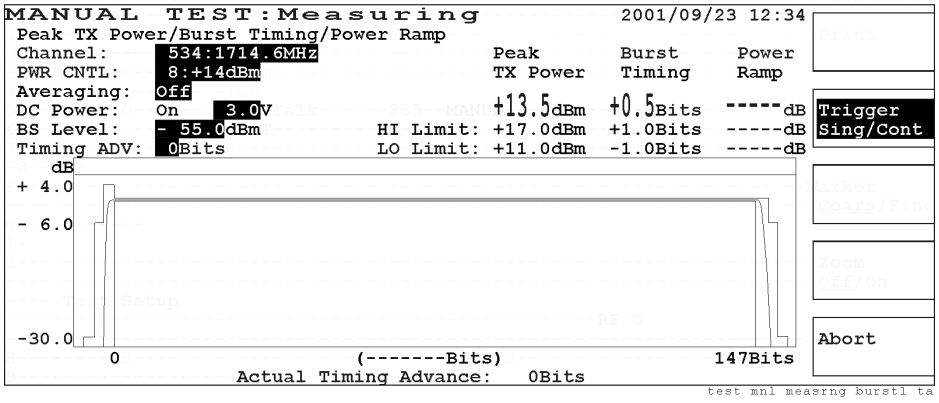
Measuring Screen Examples

Measuring: Peak TX Power/Burst Timing/Power Ramp

The actual measurement data are shown in enlarged numerals but the Power Ramp result text is shown when the marker is placed at any point of its measured trace. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame. Any data indicating a failure is highlighted.

While making continuous measurements, the Trigger Sing/Cont softkey is blinking as shown in Figure 3-25. If Abort softkey is pressed, another softkey menu is shown to activate the trigger mode, zooming and marker functions as shown in Figure 3-26.

Figure 3-25 Measuring: Peak TX Power/Burst Timing/Power Ramp Screen



Softkey Menu

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes if the Abort softkey is pressed. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- Abort: Stops continuous measurements and shows another softkey menu as follows.

Figure 3-26 **Aborted: Peak TX Power/Burst Timing/Power Ramp Screen**

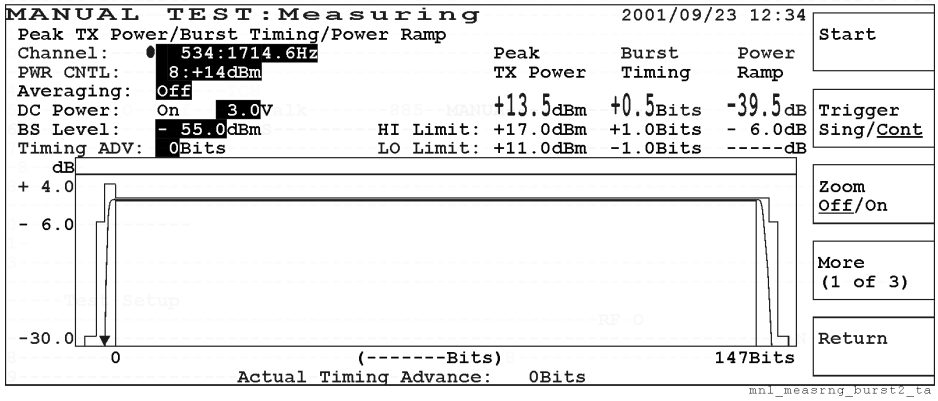
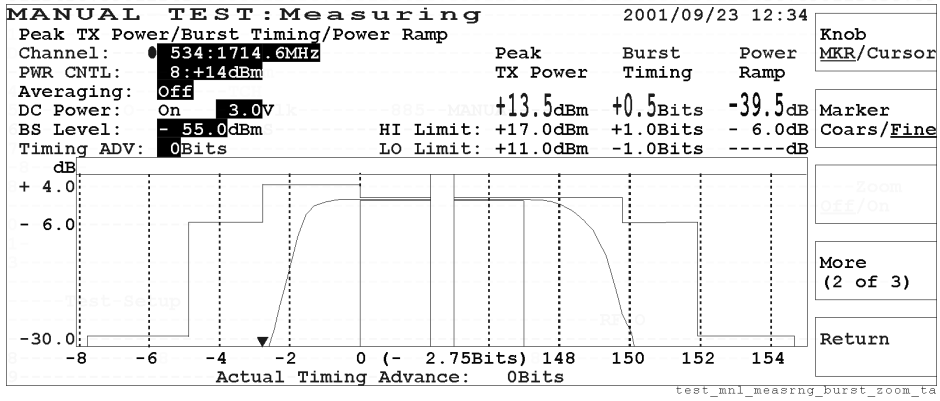


Figure 3-27 **Aborted: Peak TX Power/Burst Timing/Power Ramp Zoomed Screen**



Softkey Menu 1

- Start: Begins a new measurement cycle with either single or continuous trigger mode.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- Zoom Off/On: Toggles the zooming function between Off and On. If On is selected, the rising edge, between –8 bits to 0 bits, and trailing edge, between 147 and 155 bits, of Power Ramp are expanded to observe the detailed test result as shown in Figure 3-27.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the Talk/RF Test Measuring screen.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.

- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the amplitude and timeslot (in bits) are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the Talk/RF Test Measuring screen.

Softkey Menu 3

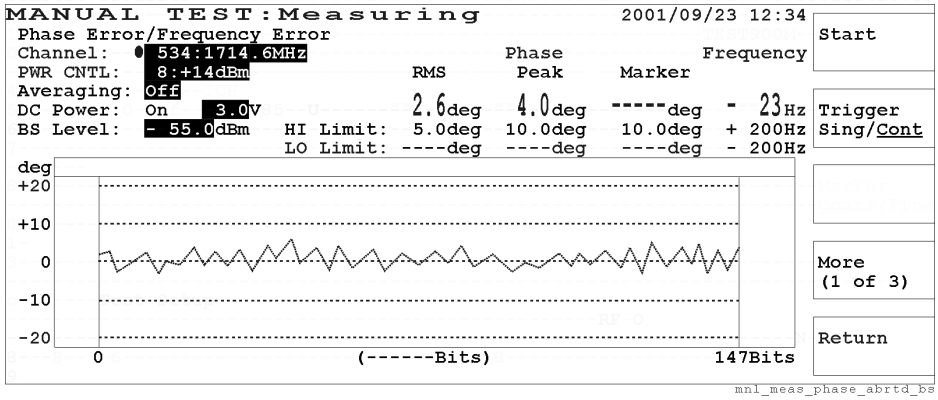
- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the Talk/RF Test Measuring screen.

Measuring: Phase Error/Frequency Error

The RMS and Peak Phase Error and Frequency Error are shown along with the marker readout if the marker is activated. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame.

If there is no limit value set in either HI Limit or LO Limit, "-----" is shown for a value.

Figure 3-28 **Aborted: Phase Error/Frequency Error Screen**



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the Talk/RF Test Measuring screen.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the phase error magnitude and timeslot (in bits) are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the Talk/RF Test Measuring screen.

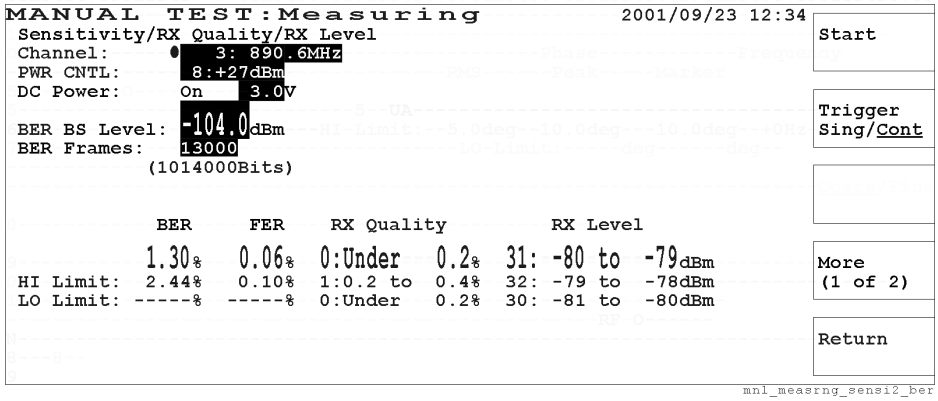
Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the Talk/RF Test Measuring screen.

Measuring: Sensitivity/RX Quality/RX Level

The test data for BER, FER, RX Quality, and RX Level are shown as follows. Any data indicating a failure is highlighted.

Figure 3-29 **Aborted: Sensitivity/RX Quality/RX Level Screen**



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- More (1 of 2): Displays softkey menu 2.
- Return: Returns to the Talk/RF Test Measuring screen.

Softkey Menu 2

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (2 of 2): Returns to softkey menu 1.
- Return: Returns to the Talk/RF Test Measuring screen.

Measuring: DC Current

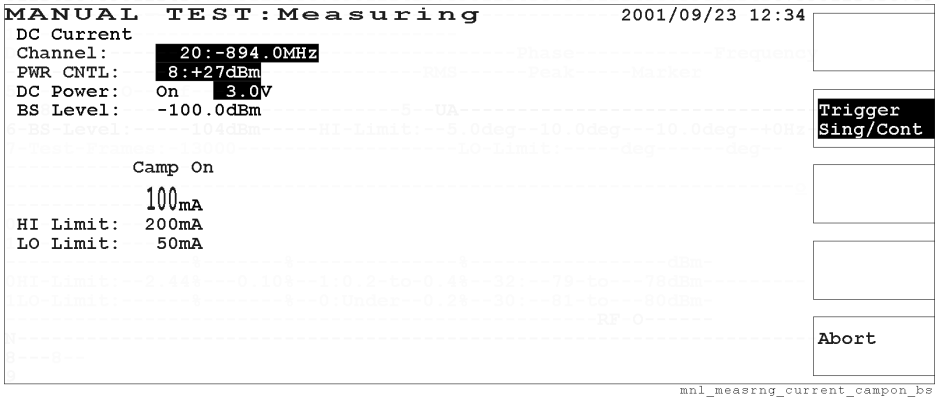
NOTE DC current measurements can be executed only when the DC Power field is set to On and dc power is supplied from the Test Set to the mobile phone.

Camp On DC Current is measured at the Camp On state for MS Call as shown in Figure 3-30.

NOTE Camp On DC Current can be measured when the MS Call softkey is pressed and before executing the call setup from the mobile.

Talk DC Current is measured at the Talk/RF Test state as shown in Figure 3-31. Any data indicating a failure is highlighted.

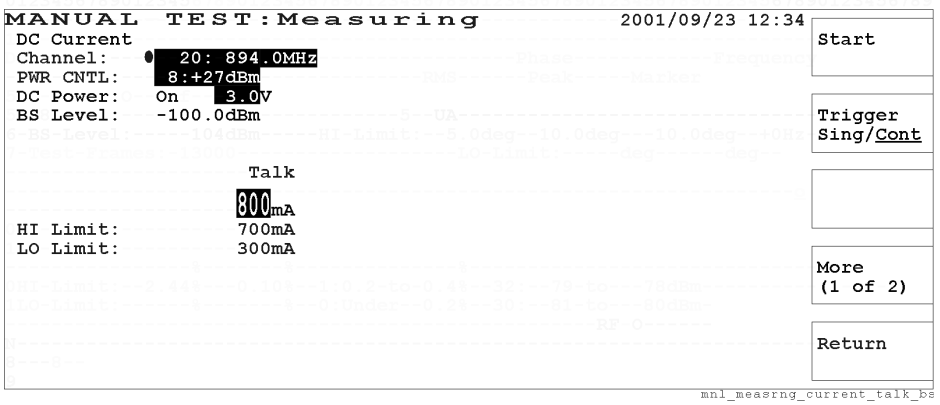
Figure 3-30 Measuring: Camp On DC Current Screen



Softkey Menu

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- Abort: Stops continuous measurements and shows another softkey menu as follows.

Figure 3-31 Aborted: Talk DC Current Screen



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- More (1 of 2): Displays softkey menu 2.
- Return: Returns to the Talk/RF Test Measuring screen.

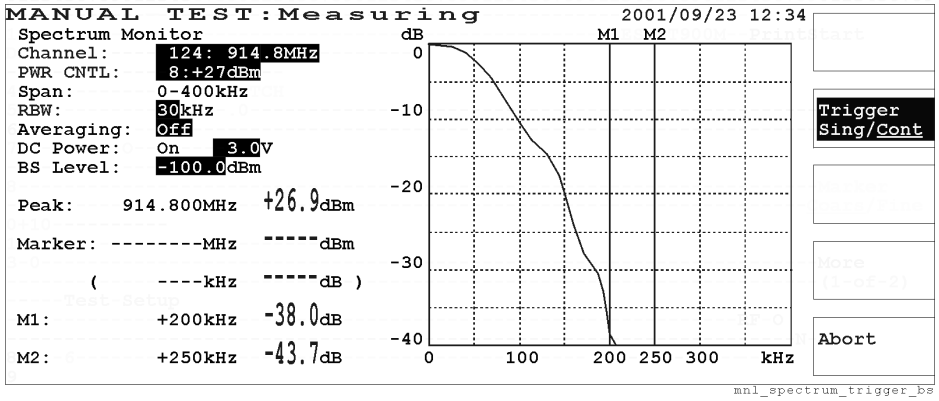
Softkey Menu 2

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (2 of 2): Returns to softkey menu 1.
- Return: Returns to the Talk/RF Test Measuring screen.

Measuring: Spectrum Monitor

The RF spectrum of the traffic channel can be measured with Spectrum Monitor. When aborted, the span from 0 Hz to +400 kHz relative to the traffic channel frequency is shown with the readouts at +200 kHz (M1) and +250 kHz (M2) offsets. The actual measured amplitudes at those frequencies are shown in enlarged numerals.

Figure 3-32 **Measuring: Spectrum Monitor Screen**

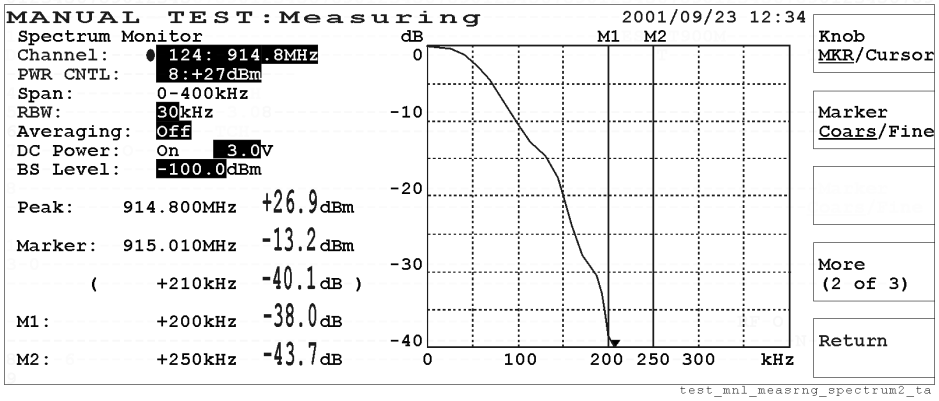


Softkey Menu

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- Abort: Stops continuous measurements and shows another softkey menu.

If the Abort softkey is pressed, another softkey menu is shown to activate the trigger mode and marker functions as shown in Figure 3-33.

Figure 3-33 **Aborted: Spectrum Monitor Screen**



Softkey Menu 1

- Start: Begins a new test.

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the Talk/RF Test Measuring screen.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the frequency and amplitude are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the Talk/RF Test Measuring screen.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the Talk/RF Test Measuring screen.

Screen Fields

The following test parameters need to be specified for a new test:

Input Field	Description
Channel[a]	Specifies one traffic channel to be analyzed. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
PWR CNTL	Specifies one of the factors defined for Power Control Levels according to the Radio Standard. The allowable factor ranges are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 19 (+5 dBm) DCS1800: 29 (+36 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm) PCS1900: 30 (+33 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm)
Span	0 to 400 kHz (fixed)
RBW	Selects either 10 kHz or 30 kHz resolution bandwidth as follows: o 10: Sets the resolution bandwidth to 10 kHz. o 30: Sets the resolution bandwidth to 30 kHz.
Averaging[a]	Specifies the averaging number of measurements from 2 to 99, unless Off is selected.
DC Power:[a]	The supply mode is dependent on the setting in the Stand-by screens. Accepts a dc voltage value ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.
BS Level	Specifies the RF output level[a] of the Test Set, ranging from –110.0 to –50.0 dBm. The default value is set on the Test Condition screen in the CONFIGURATION mode.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.

The following display fields show the measurement results:

Display Field	Description
Peak	The absolute peak power and frequency are shown.
Marker[a]	The frequency and amplitude readouts at the marker point are shown when activated by the Knob MKR/Cursor softkey as follows: o -------- MHz ---- dBm: The absolute frequency and amplitude of the marker readouts are shown. o (---- kHz ---- dB): The relative frequency and amplitude of the marker readouts are shown.
M1: +200 kHz, M2: +250 kHz	The amplitude data at +200 kHz and +250 kHz offsets are also shown.

a. The frequency resolution is 1 kHz or 2 kHz due to the measurement period of 1.59 kHz.

MANUAL TEST (Asynchronous Mode)

NOTE The Asynchronous mode is only available for Test Sets with Option 002 which enables the signal generator and TX analyzer modes too. This option can be installed with Option 040 for GPRS Mode

In the MANUAL TEST mode, each test item or a group of test items can be measured and analyzed with the test limits specified in the Test Set: Test Condition screen of the CONFIGURATION mode.

In the asynchronous mode, tests are made without networking the Test Set and the mobile phone with each other. This mode is used to test the RF transmission characteristics of mobiles in a real-time manner. Therefore, the receiver related characteristics such as sensitivity, RX quality and RX level are not measured. Also, the mobile related information such as IMSI, IMEI and so forth are not available, however, DC Current is displayed under the test item table.

To test mobiles using the asynchronous mode, set the mobile to transmit RF power independently (without sending a special command from the Test Set to the mobile, for instance).

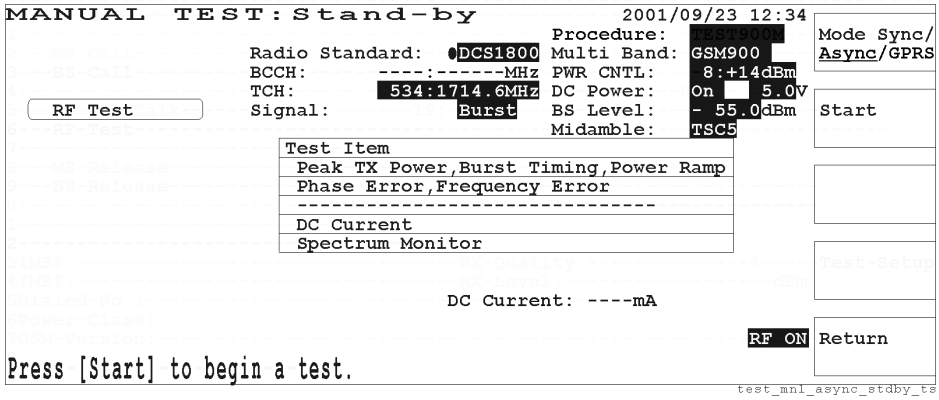
NOTE When entering numeric values, the variable increment softkey menu is displayed. Refer to “Variable Increment Softkey” and "Storing Two Numeric Values" on page 59.

The default state is the last setting stored in the internal memory before power off.

Stand-by Screen

If the Mode Sync/Async/GPRS softkey is selected, the following Stand-by screen is displayed:

Figure 3-34 Asynchronous Mode Stand-by Screen



Softkey Menu

- Mode Sync/Async/GPRS: Select either Sync for synchronous, Async for asynchronous, or GPRS for general packet radio service mode. This softkey is available only for Test Sets equipped with Option 002 and Option 040.
- Start: Begins a new test.
- Return: Displays the initial screen with function modes.

Screen Fields

The following parameters need to be specified for a new test:

Input Field	Description
Procedure	Displays a list of files that are on an SRAM memory card. If a SRAM memory card containing setup files is used, a list of those file names is shown in this field for selection. If there are no files on the card, this field remains blank.
Radio Standard	Selects either GSM900, E-GSM, DCS1800, or PCS1900.
Multi Band	Selects another band in addition to one in Radio Standard for testing dual band mobile phones. The allowable combinations of radio standards are as follows: Radio Standard: — Multi Band: GSM900 — OFF, DCS1800 E-GSM — OFF, DCS1800 DCS1800 — OFF, GSM900, E-GSM PCS1900 — OFF
BCCH	This is invalid showing "----".
PWR CNTL	Specifies one of the factors defined for Power Control Levels according to the Radio Standard. The allowable factor ranges are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 19 (+5 dBm) DCS1800: 29 (+36 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm) PCS1900: 30 (+33 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm)
TCH:[a]	Accepts one traffic channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810

Input Field	Description
DC Power	Selects a supply mode. The choices are On and Off as follows: o On: Always supplies dc voltage to the mobile. o Off:[b] Disables to supply dc voltage to the mobile. Accepts a dc voltage value ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.
Signal	Selects either CW or Burst of a MS transmission signal. o CW: Selects this when a continuous wave is transmitted from the mobile under test. o Burst: Selects this when a bursted signal is transmitted from the mobile.
BS Level	Specifies the RF output level[a] of the Test Set, ranging from −110.0 to −50.0 dBm. The default value is set on the Test Condition screen in the CONFIGURATION mode.
Midamble	Selects the Training Sequence Code (TSC) 0 to 7, or None for the amplitude triggering.[c]

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.
b. When DC Power is set to Off, DC Current cannot be measured.
c. When None is selected, Phase Error/Frequency Error cannot be measured.

The following test items are shown in groups in the table. The detailed test screens for the groups are displayed when selected by the CURSOR CONTROL knob.

Test Item	Description
Peak TX Power, Burst Timing, Power Ramp	The Measuring: Peak TX Power/Burst Timing/Power Ramp screen is shown with a result text and graphic display.
Phase Error, Frequency Error	The Measuring: Phase Error/Frequency Error screen is shown with a result text and graphic display.
DC Current	The Measuring: DC Current screen is shown with a result text display without titling Camp On nor Talk.
Spectrum Monitor	The Measuring: Spectrum Monitor screen is shown with a result text and graphic display.

Explanation

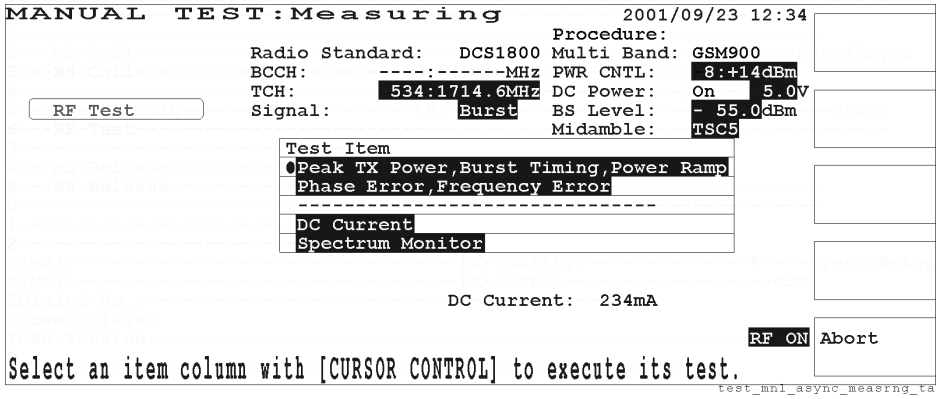
The RF ON annunciator at the screen lower right corner is displayed only when the RF signal from the Test Set is present at the RF IN/OUT connector.

The operation message “Press [Start] to begin a test.” is shown. Refer to "Measuring Screen" on page 107.

Measuring Screen

By pressing the Start softkey, the following measuring screen is shown. Only the RF Test step in the test flow is blinking and the cursor is placed on the first test item column. If you select a test item column with the CURSOR CONTROL knob, one of the measuring screens is displayed.

Figure 3-35 **Measuring Screen**



Softkey Menu

- Abort: Returns to the asynchronous MANUAL TEST: Stand-by screen.

Explanation

In this mode you cannot change the Radio Standard, Procedure, Multi Band, and DC Power supply mode fields. Other highlighted fields can be modified for a new test.

The operation message “Select an item column with [CURSOR CONTROL] to execute its test.” is shown for making an RF test. Refer to "Procedure to obtain the Measuring screens" on page 88.

Only DC Current measurement data at RF Test is displayed under the test item table, but other mobile related information is not shown.

Measuring Screen Examples

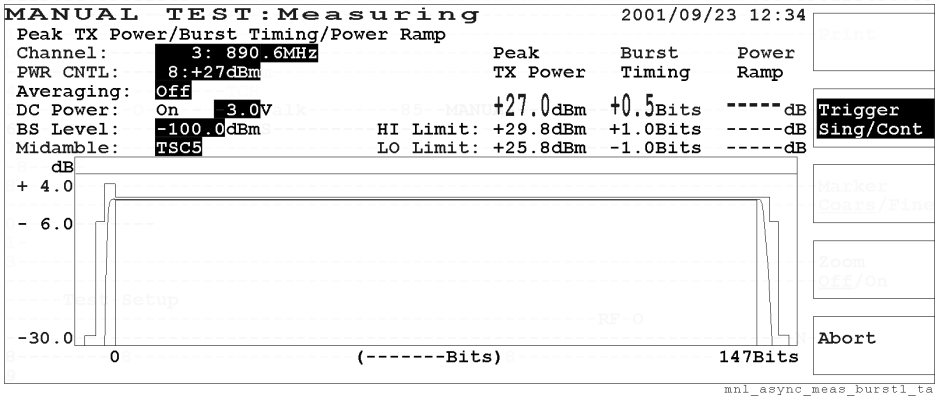
Measuring: Peak TX Power/Burst Timing/Power Ramp

The actual measurement data are shown in enlarged numerals but the Power Ramp result text is shown when the marker is placed at any point of its measured trace. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame. Any data indicating a failure is highlighted.

NOTE The Burst Timing cannot be measured and its value is not displayed with the asynchronous mode.

While making continuous measurements, the Trigger Sing/Cont softkey is blinking as shown in Figure 3-36.

Figure 3-36 Measuring: Peak TX Power/Burst Timing/Power Ramp Screen



Softkey Menu

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- Abort: Stops continuous measurements and shows another softkey menu.

If the Abort softkey is pressed, another softkey menu is shown to activate the trigger mode, zooming and marker functions as shown in Figure 3-37.

Figure 3-37 Aborted: Peak TX Power/Burst Timing/Power Ramp Screen

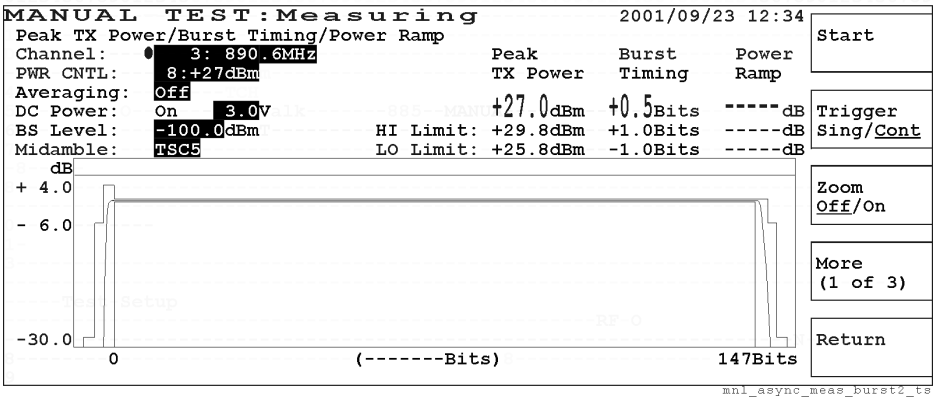
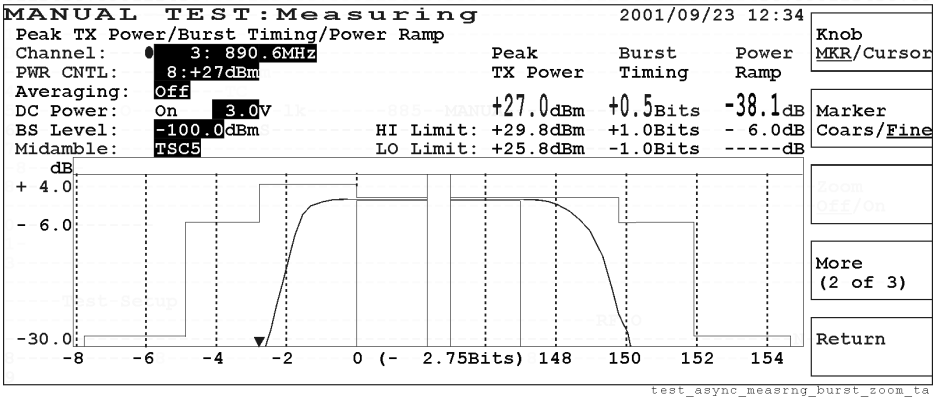


Figure 3-38 Aborted: Peak TX Power/Burst Timing/Power Ramp Zoomed Screen



Softkey Menu 1

- Start: Begins a new measurement cycle with either single or continuous trigger mode.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- Zoom Off/On: Toggles the zooming function between Off and On. If On is selected, the rising edge, from –8 bit to 0 bit, and trailing edge, between bits 147 and 155, of the Power Ramp are expanded to observe the detailed test results as shown in Figure 3-38.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the amplitude and timeslot (in bits) are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the initial Measuring screen.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

NOTE

If the measurement is not triggered, consult the following items:

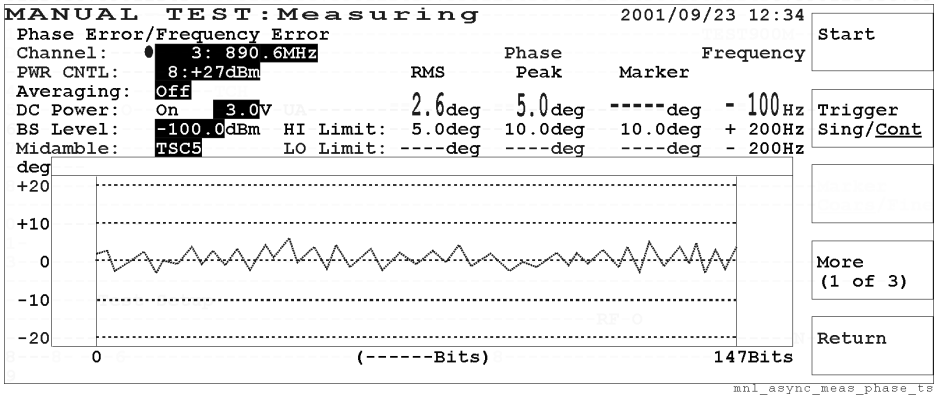
* The Power Control Level (PWR CNTL) is properly set.

* The Midamble is properly set. If you don’t know which Training Sequence Code (TSC) is used, set Midamble to None to use the amplitude trigger mode.

Measuring: Phase Error/Frequency Error

The RMS and Peak Phase Errors and Frequency Error are shown, along with the marker readouts if the marker is activated. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame. Any data indicating a failure is highlighted.

Figure 3-39 **Aborted: Phase Error/Frequency Error Screen**



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the phase error magnitude and timeslot (in bits) are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

NOTE

If the measurement is not triggered, consult the following items.

* The Power Control Level (PWR CNTL) is properly set.

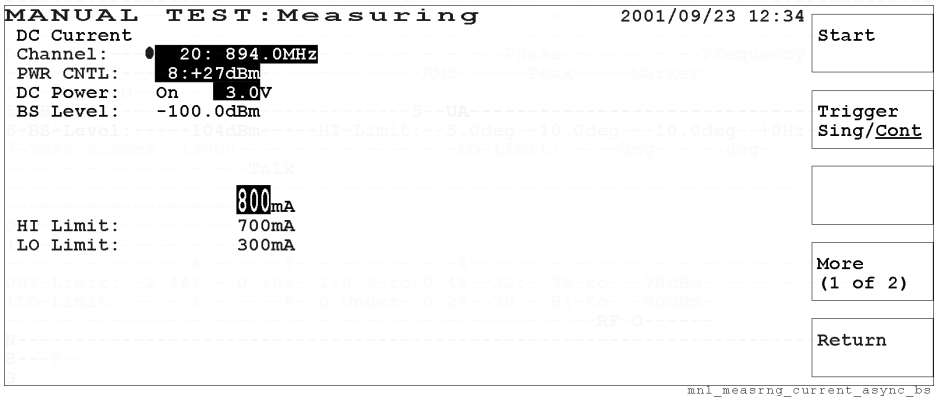
* The Midamble is properly set. If None is selected, the Phase Error/Frequency Error measurement cannot be performed.

Measuring: DC Current

The test data for the DC Current is displayed as shown in Figure 3-40. As this measurement is asynchronously made, the test result does not show Camp On nor Talk.

NOTE DC current can be measured only when the DC Power field is set to On and power is supplied from the Test Set to the mobile under test.

Figure 3-40 Measuring: DC Current with Asynchronous Mode



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- More (1 of 2): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Softkey Menu 2

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (2 of 2): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

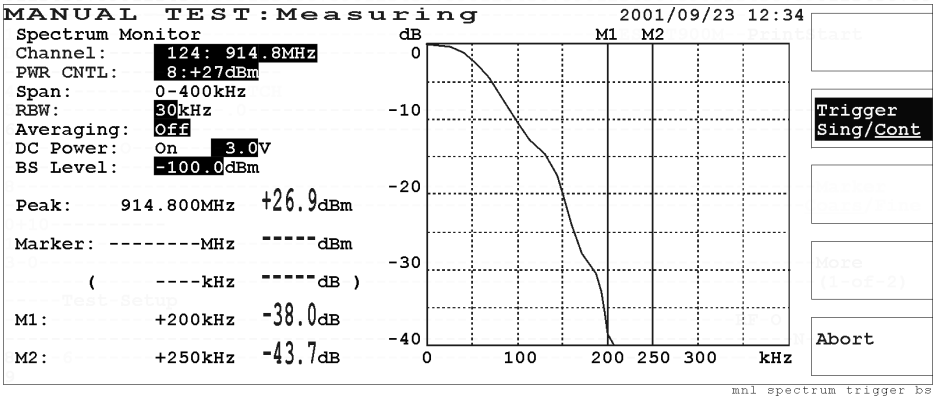
Measuring: Spectrum Monitor

The RF spectrum from 0 Hz to +400 kHz relative to the traffic channel frequency is shown with the readouts of the frequencies and amplitudes at +200 kHz (M1) and +250 kHz (M2) offsets. The actual measured data at those frequencies are shown in enlarged numerals.

The trigger conditions depend on the Signal field setting in the Stand-by Screen as follows:

- Burst: Amplitude triggering which uses the low-to-high amplitude transitions in pulsed carriers as the trigger source
- CW: Immediate triggering

Figure 3-41 **Measuring: Spectrum Monitor Screen**



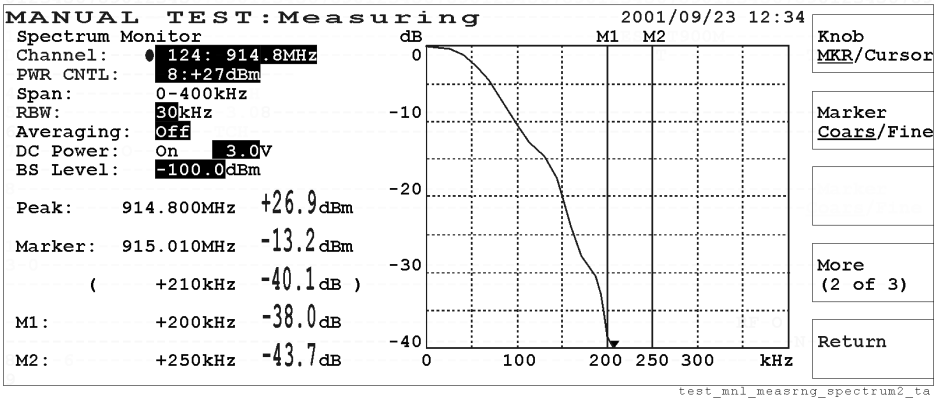
Softkey Menu

o Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.

o Abort: Stops continuous measurements and shows another softkey menu.

If the Abort softkey is pressed, another softkey menu is shown to activate the trigger mode and marker functions as shown in Figure 3-42.

Figure 3-42 Aborted: Spectrum Monitor Screen



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the frequency and amplitude are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Screen Fields

The following test parameters need to be specified for a new test:

Input Field	Description
Channel[a]	Specifies one traffic channel to be analyzed. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
PWR CNTL	Specifies one of the factors defined for Power Control Levels according to the Radio Standard. The allowable factor ranges are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 19 (+5 dBm) DCS1800: 29 (+36 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm) PCS1900: 30 (+33 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm)
Span	0 to 400 kHz (fixed)
RBW	Selects either 10 kHz or 30 kHz resolution bandwidth as follows: o 10: Sets the resolution bandwidth to 10 kHz. o 30: Sets the resolution bandwidth to 30 kHz.
Averaging[a]	Specifies the averaging number of measurements from 2 to 99, unless Off is selected.
DC Power[a]	The supply mode is dependent on the setting in the Stand-by screens. Accepts a dc voltage value ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.
BS Level	Specifies the RF output level[a] of the Test Set, ranging from –110.0 to –50.0 dBm. The default value is set on the Test Condition screen in the CONFIGURATION mode.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.

The following display fields show the measurement results:

Display Field	Description
Peak	The absolute peak power and frequency are shown.
Marker[a]	The frequency and amplitude readouts at the marker point are shown when activated by the Knob MKR/Cursor softkey as follows: o -------- MHz ---- dBm: The absolute frequency and amplitude of the marker readouts are shown. o (---- kHz ---- dB): The relative frequency and amplitude of the marker readouts are shown.
M1: +200 kHz, M2: +250 kHz	The amplitude data at +200 kHz and +250 kHz offsets are also shown.

a. The frequency resolution is 1 kHz or 2 kHz due to the measurement period of 1.59 kHz.

MANUAL TEST (GPRS Mode)

NOTE The GPRS mode is only available for Test Sets with Option 040 .

The general packet radio service (GPRS) is a GSM data service which is capable to provide mobile users with higher data transfer rates over the public switched telephone network (PSTN). The system can transfer data in packet over the air interface, and uses existing TCP/IP protocols to mate with the Internet and other data networks. With the GPRS mode in MANUAL TEST, each test item or a group of test items can be measured and analyzed with the test limits specified in the Test Set: Test Condition screen of the CONFIGURATION mode.

In the GPRS mode, like the synchronous mode, tests are made while the Test Set and the mobile phone are networked to communicate with each other. The required connection process is done by pressing the Start softkey.

The combinations of the slot configuration and the order of measurement slot are as follows :

Option	Slot Configuration	Slot Order Measured
040	Downlink 1 × Uplink 1	4 (fourth)
040	Downlink 2 × Uplink 1	4 (fourth)

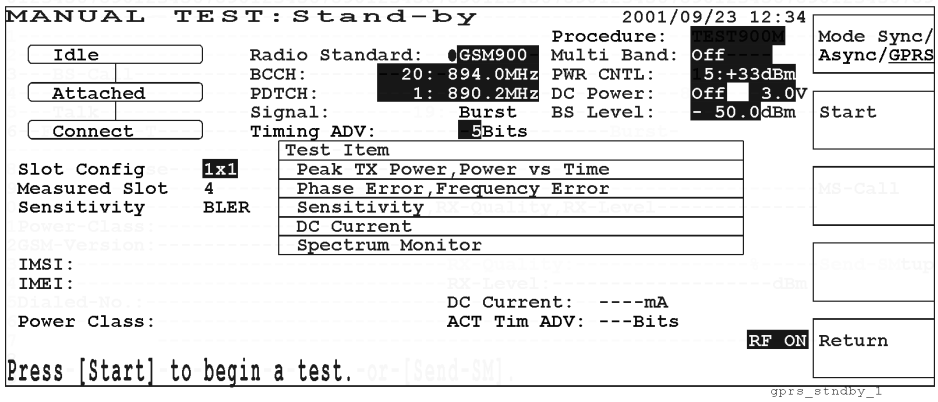
NOTE When entering numeric values, the variable increment softkey menu is displayed. Refer to “Variable Increment Softkey” and "Storing Two Numeric Values" on page 59.

The default state is the last setting stored in the internal memory before power off.

Stand-by Screen

If GPRS is selected in the Mode Sync/Async/GPRS softkey, the following Stand-by screen is displayed. The input fields for Slot Config, Measured Slot, and Sensitivity are additionally available for GPRS measurements. Pressing the Start softkey activates the attaching process to the mobile under test.

Figure 3-43 **Stand-by Screen**



Softkey Menu

- Mode Sync/Async/GPRS: Select either Sync for synchronous, Async for asynchronous, or GPRS for general packet radio service mode. This softkey is available only for Test Sets equipped with Option 002 and Option 040.
- Start: Begins an attaching process through the idle state.
- Return: Displays the initial screen with function modes.

Screen Fields

The following input fields of test parameters need to be set for a new test:

Input Field	Description
Procedure	Displays a list of files that are on an SRAM memory card. If an SRAM memory card containing setup files is used, a list of those file names is shown in this field for selection. If there are no files on the card, this field remains blank.
Radio Standard	Selects either GSM900, E-GSM, DCS1800, or PCS1900.
Multi Band	Selects another band in addition to one in Radio Standard for testing dual band mobile phones. The allowable combinations of radio standards are as follows: Radio Standard: — Multi Band: GSM900 — OFF, DCS1800 E-GSM — OFF, DCS1800 DCS1800 — OFF, GSM900, E-GSM PCS1900 — OFF
BCCH[a]	Specifies the broadcast control channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
PWR CNTL	Specifies one of the factors defined for Power Control Levels according to the Radio Standard. The allowable factor ranges are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 19 (+5 dBm) DCS1800: 29 (+36 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm) PCS1900: 30 (+33 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm)
PDTCH[a]	Accepts a value for packet data traffic channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810

Input Field	Description
DC Power	Selects a supply mode. The choices are On and Off as follows: o On: Always supplies dc voltage to the mobile. o Off:[b] Disables to supply dc voltage to the mobile. Accepts a dc voltage value[a] ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.
Signal	For synchronous mode tests, only Burst is valid and cannot be changed.
BS Level	Specifies the RF output level[a] of the Test Set, ranging from –110.0 to –50.0 dBm. The default value is set on the Test Condition screen in the CONFIGURATION mode.
Timing ADV	Accepts a value for the timing advance[a] ranging from 0 to 63 bits.
Slot Config	Selects either 1 (downlink) × 1 (uplink) or 2 × 1 if Option 040 is installed.
Measured Slot	The order of measured slot is defaulted to 4 (fourth) if Option 040 is installed.
Sensitivity	Displays BLER (block error rate) to make a sensitivity measurement.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.
b. When DC Power is set to Off, DC Current cannot be measured.

The following test items are shown in groups in the table. The detailed test screens for the groups are displayed at the measuring state when selected by the CURSOR CONTROL knob.

Test Item	Description
Peak TX Power, Power vs Time	The Measuring: Peak TX Power/Power vs Time screen is shown with a result text and graphic display. If the marker function is active, the Power Ramp value is displayed according to the marker position.
Phase Error, Frequency Error	The Measuring: Phase Error/Frequency Error screen is shown with a result text and graphic display.
Sensitivity	The Measuring: Sensitivity screen is shown with a result text display for BLER which is fixed in the Sensitivity field.
DC Current	The Measuring: DC Current screen is shown with a result text display without titling Camp On nor Talk, if DC Power is set to On and the dc power is supplied to the mobile under test.
Spectrum Monitor	The Measuring: Spectrum Monitor screen is shown with a result text and graphic display.

The following display fields remain blank at this state on the lower screen:

Item	Description
IMSI:	In the GPRS mode, the International Mobile Subscriber Identity will not be displayed.
IMEI:	In the GPRS mode, the International Mobile Station Equipment Identity will not be displayed.
Power Class:	Displays one of the defined factors. See "Power Classes" on page 184.
DC Current:	Displays the dc current consumed by the mobile at the connection state, if DC Power is set to On and the dc power is supplied to the mobile under test.
ACT Tim ADV:	Displays the number of bits for the actual timing advance data.

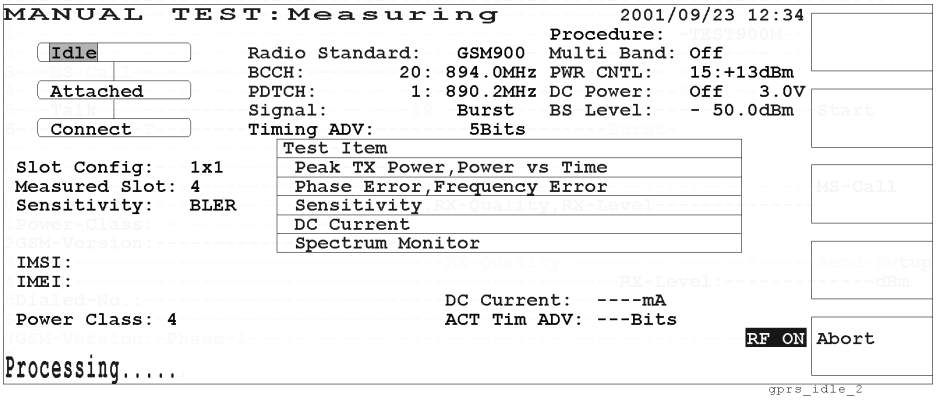
The RF ON annunciator at the screen lower right corner is displayed only when the RF signal from the Test Set is present at the RF IN/OUT connector.

The instruction message “Press [Start] to begin a test.” is shown. By pressing the Start softkey, the following idle screen is shown automatically changing from the standby screen.

Idle Screen

In the attaching process after pressing the Start softkey, the following idle screen is displayed for a while prior to changing to the attached screen. The PWR CNTL field is changed from the standby screen for the appropriate measurement.

Figure 3-44 **Measuring: Idle Screen**



Softkey Menu

- Abort: Returns to the initial state and displays the idle screen.

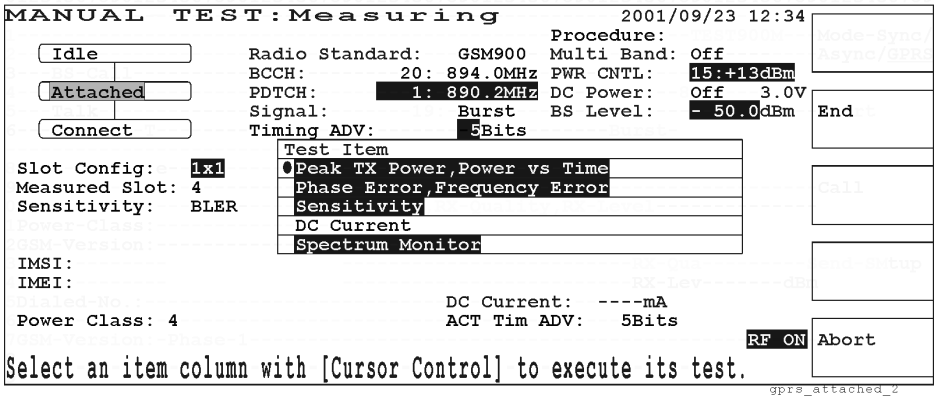
The following display fields show the data from the mobile under test:

Item	Description
IMSI:	In the GPRS mode, the International Mobile Subscriber Identity will not be displayed.
IMEI:	In the GPRS mode, the International Mobile Station Equipment Identity will not be displayed.
Power Class:	Displays one of the defined factors. See "Power Classes" on page 184.

Attached Screen

Upon completion of the attaching process, the following measuring screen is shown. The Attached step in the test flow is blinking and the cursor is placed on the first test item column.

Figure 3-45 **Measuring: Attached Screen**



Softkey Menu

- End: Returns to the MANUAL TEST: Stand-by screen.
- Abort: Returns to the MANUAL TEST: Stand-by screen.

NOTE As the connection state becomes on to begin measurements for a short period immediately when one of the test items is selected, the Connect step stays unchanged but the Attached step is blinking.

Explanation

In this mode, you cannot change the input fields of the Radio Standard, Procedure, Multi Band, and DC Power supply mode. If the DC Power mode is set to On in the Stand-by screen, the dc voltage field can be modified and DC Current in the test item table is also highlighted to make measurements. Other highlighted fields can be modified for a new test.

The operation message “Select an item column with [CURSOR CONTROL] to execute its test.” is shown for making an RF test. Refer to "Procedure to obtain the Measuring screens" on page 125.

The following display fields show the measurement data at this state on the lower screen:

Display Field	Description
DC Current:	Displays the dc current consumed by the mobile at the attachment state when the dc voltage is supplied to the mobile using Universal DC Power Adapter.
ACT Tim ADV:	Displays the number of bits for the actual timing advance data.

Procedure to obtain the Measuring screens

Step 1. Place the blinking cursor at one of the test items by rotating the CURSOR CONTROL knob.

Step 2. Choose that test item by pressing the CURSOR CONTROL knob.

Step 3. Either the result text or the text with a graph is shown depending on the Test Item chosen.

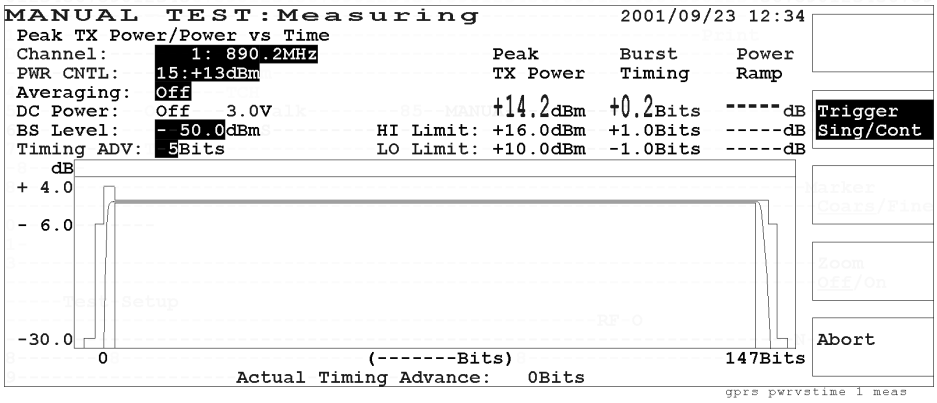
Measuring Screen Examples

Measuring: Peak TX Power/Power vs Time

The actual measurement data are shown in enlarged numerals but the Power Ramp result text is shown when the marker is placed at any point of its measured trace. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame. Any data indicating a failure is highlighted.

While making continuous measurements, the Trigger Sing/Cont softkey is blinking as shown in Figure 3-46.

Figure 3-46 **Measuring: Peak TX Power/Power vs Time**



Softkey Menu

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- Abort: Stops continuous measurements and shows another softkey menu.

If the Abort softkey is pressed, another softkey menu is shown to activate the trigger mode, zooming and marker functions as shown in Figure 3-47 and Figure 3-48.

Figure 3-47 **Aborted: Peak TX Power/Power vs Time Screen**

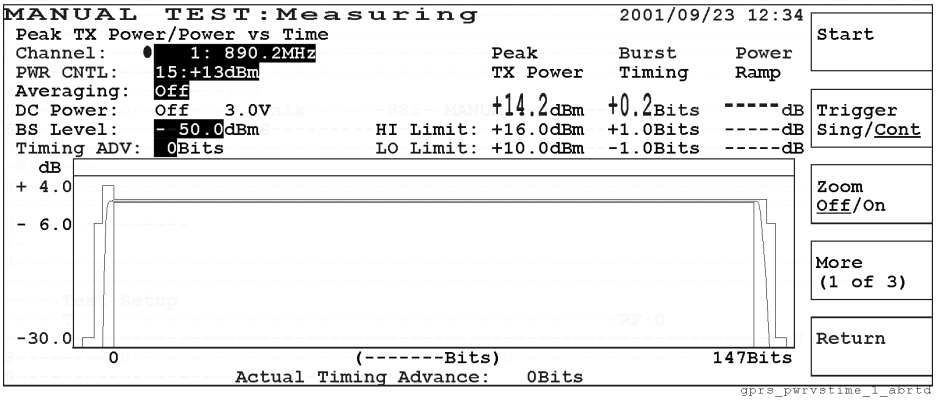
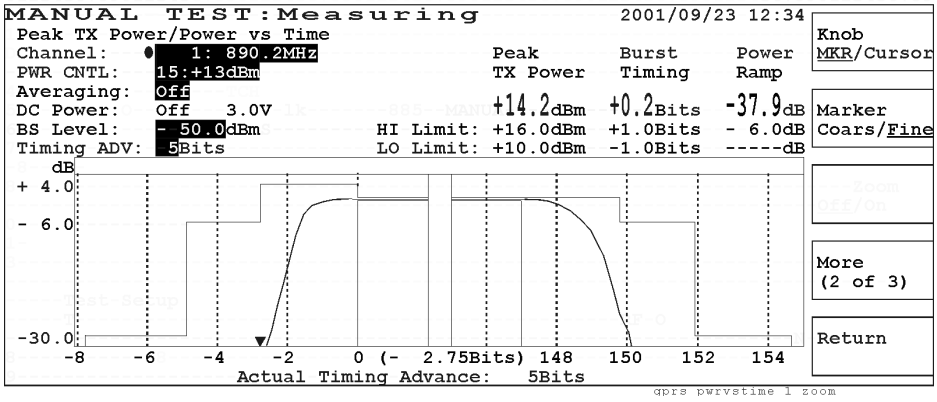


Figure 3-48 **Aborted: Peak TX Power/Power vs Time Zoomed Screen**



Softkey Menu 1

- Start: Begins a new measurement cycle with either single or continuous trigger mode.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- Zoom Off/On: Toggles the zooming function between Off and On. If On is selected, the rising edge, from –8 bit to 0 bit, and trailing edge, between bits 147 and 155, of the Power Ramp waveforms are expanded to observe the detailed results as shown in Figure 3-48.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the knob function of CURSOR CONTROL between Cursor and MKR for marker control.

- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the amplitude and timeslot (in bits) are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the initial Measuring screen.

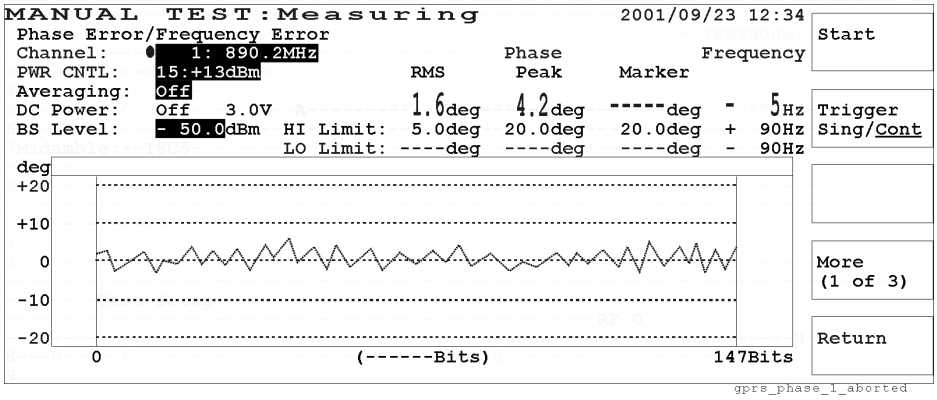
Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Measuring: Phase Error/Frequency Error

The RMS and Peak Phase Errors and Frequency Error are shown, along with the marker readouts if the marker is activated. If the actual data exceeds the limits in the graph, one (or two for two fails) white triangle marker indicates the failed position at the top of the graph frame. Any data indicating a failure is highlighted.

Figure 3-49 **Aborted: Phase Error/Frequency Error Screen**



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the phase error magnitude and timeslot (in bits) are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the initial Measuring screen as shown in Figure 3-35.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Measuring: Sensitivity in BLER

The test data for BLER (block error rate) is displayed as shown in Figure 3-50 or Figure 3-51.

Figure 3-50 **Measuring: Sensitivity in BLER Screen**

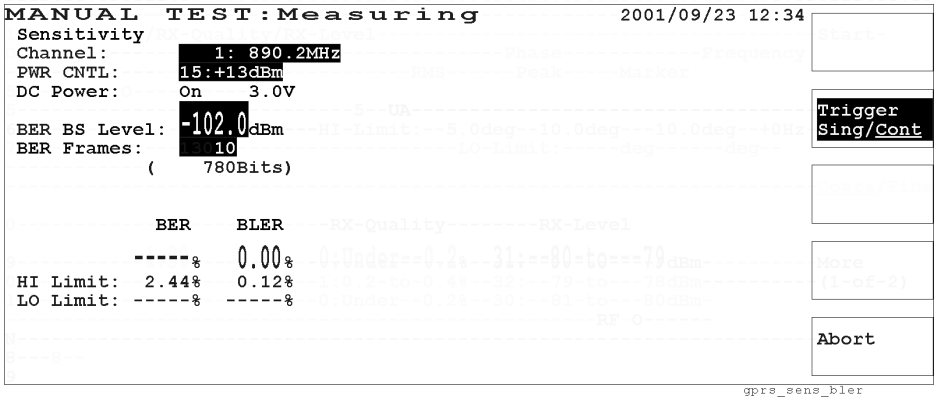
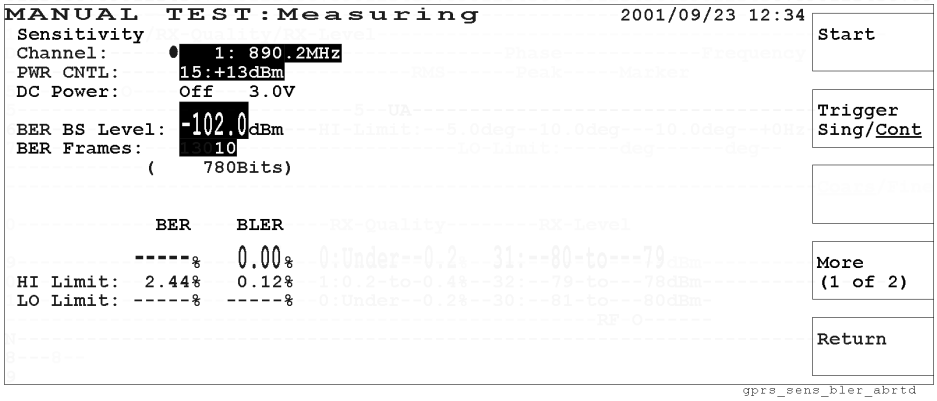


Figure 3-51 **Aborted: Sensitivity in BLER Screen**



Softkey Menu

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- Abort: Returns to the initial Measuring screen as shown in Figure 3-51.

Softkey Menu 2

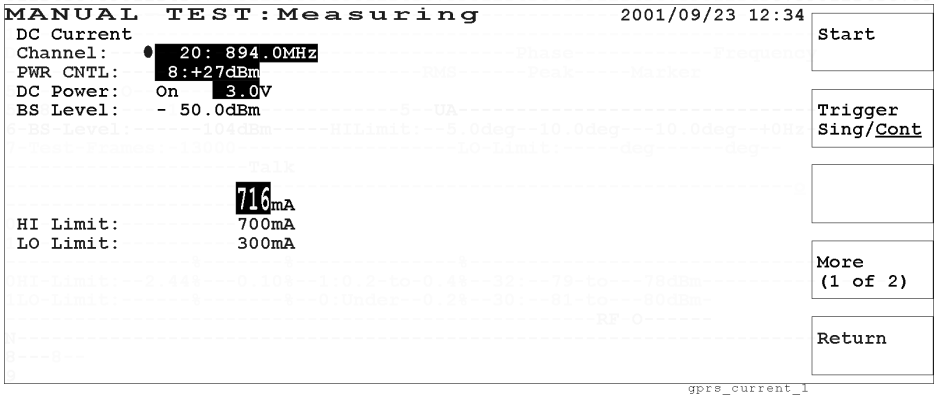
- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (2 of 2): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Measuring: DC Current

The test data for the DC Current is displayed as shown in Figure 3-52. As this measurement is made at the attached state, the test result does not show any title but it is equivalent for the connect state.

NOTE DC current can be measured only when the DC Power field is set to On and power is supplied from the Test Set to the mobile under test.

Figure 3-52 Measuring: DC Current



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- More (1 of 2): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Softkey Menu 2

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (2 of 2): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

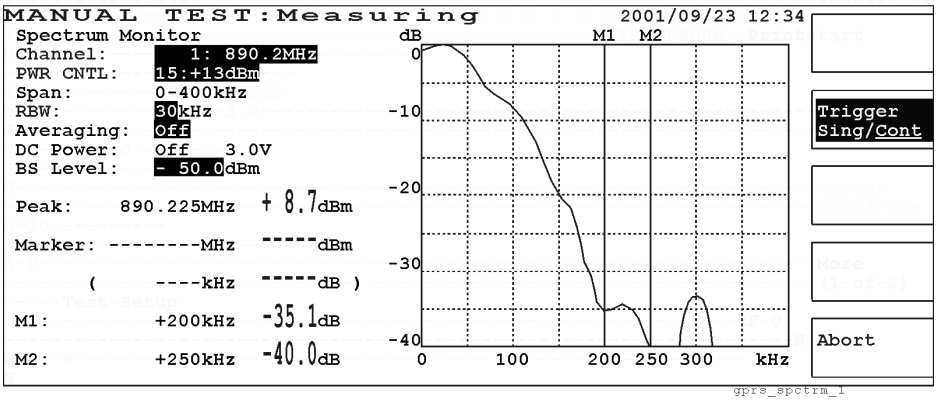
Measuring: Spectrum Monitor

The RF spectrum from 0 Hz to +400 kHz relative to the traffic channel frequency is shown with the readouts of the frequencies and amplitudes at +200 kHz (M1) and +250 kHz (M2) offsets. The actual measured data at those frequencies are shown in enlarged numerals.

The trigger conditions depend on the Signal field setting in the Stand-by Screen as follows:

- Burst: Amplitude triggering which uses the low-to-high amplitude transitions in pulsed carriers as the trigger source
- CW: Immediate triggering

Figure 3-53 **Measuring: Spectrum Monitor Screen**



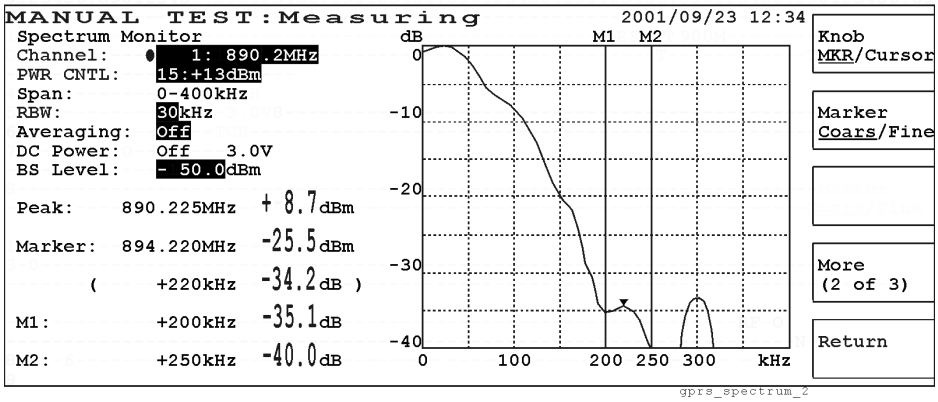
Softkey Menu

o Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.

o Abort: Stops continuous measurements and shows another softkey menu.

If the Abort softkey is pressed, another softkey menu is shown to activate the trigger mode and marker functions as shown in Figure 3-54.

Figure 3-54 Aborted: Spectrum Monitor Screen



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the frequency and amplitude are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Returns to the initial Measuring screen as shown in Figure 3-45.

Screen Fields

The following input fields of the parameters need to be specified for a new spectrum test:

Input Field	Description
Channel[a]	Specifies one traffic channel to be analyzed. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
PWR CNTL	Specifies one of the factors defined for Power Control Levels according to the Radio Standard. The allowable factor ranges are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 19 (+5 dBm) DCS1800: 29 (+36 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm) PCS1900: 30 (+33 dBm) to 31 (+32 dBm), and 0 (+30 dBm) to 15 (+0 dBm)
Span	0 to 400 kHz (fixed)
RBW	Selects either 10 kHz or 30 kHz resolution bandwidth as follows: o 10: Sets the resolution bandwidth to 10 kHz. o 30: Sets the resolution bandwidth to 30 kHz.
Averaging[a]	Specifies the averaging number of measurements from 2 to 99, unless Off is selected.
DC Power[a]	The supply mode is dependent on the setting in the Stand-by screens. Accepts a dc voltage value ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.
BS Level[a]	Specifies the RF output level of the Test Set, ranging from –110.0 to –50.0 dBm. The default value is set on the Test Condition screen in the CONFIGURATION mode.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.

The following display fields show the measurement results:

Display Field	Description
Peak	The absolute peak power and frequency are shown.
Marker[a]	The frequency and amplitude readouts at the marker point are shown when activated by the Knob MKR/Cursor softkey as follows: o -------- MHz ---- dBm: The absolute frequency and amplitude of the marker readouts are shown. o (---- kHz ---- dB): The relative frequency and amplitude of the marker readouts are shown.
M1: +200 kHz, M2: +250 kHz	The amplitude data at +200 kHz and +250 kHz offsets are also shown.

a. The frequency resolution is 1 kHz or 2 kHz due to the measurement period of 1.59 kHz.

SPECTRUM MONITOR

This function mode is specialized for testing mobile phones, therefore the settings for spectrum analysis are very much dedicated to make quick measurements.

To test mobile phones using the Spectrum Monitor, set the mobile phone to transmit RF power independently (without sending a special command from the Test Set to the mobile phone, for instance).

NOTE

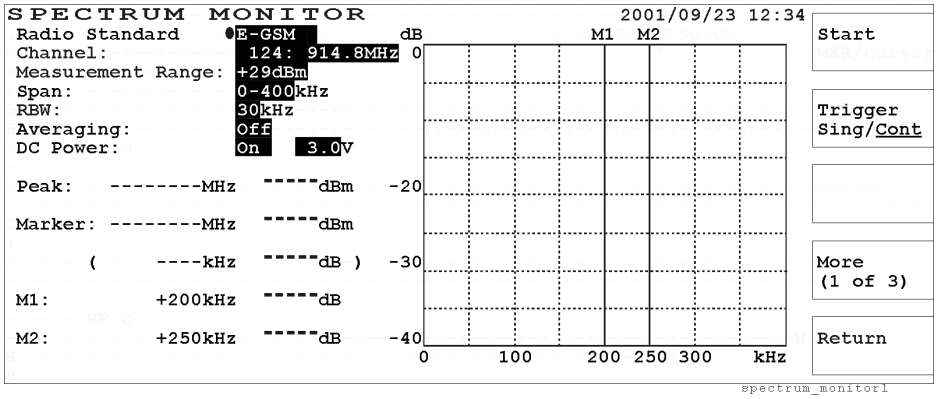
This section is applicable only for Test Sets with Option 002.

When entering numeric values, the variable increment softkey menu is displayed. Refer to “Variable Increment Softkey” and "Storing Two Numeric Values" on page 59.

Initial Screen

If the SPECTRUM MONITOR softkey is pressed, the spectrum screen is shown with the frequency span in either 0 to 400 kHz or ±100 kHz, along with the test conditions and result text.

Figure 3-55 Initial Screen of Spectrum Monitor



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Displays the initial screen with function modes.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.
- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the frequency and amplitude are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Displays the initial screen with function modes.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Displays the initial screen with function modes.

Explanation

When the Start softkey is pressed, the Test Set tries to synchronize with the bursted signal by amplitude triggering which uses the rising (low-to-high) amplitude transition in pulsed carriers as the trigger source. If this synchronization fails, for example when the signal is a continuous wave, the Test Set is triggered immediately.

NOTE When you are measuring a bursted signal with the continuous trigger mode and the waveform disappears suddenly, the Test Set may lose synchronization with the burst signal. If this happens, press the Abort softkey, and then the Start softkey to restart the measurement. This resynchronizes the measurement because the Test Set determines the measurement timing for the burst signal when the Start softkey is pressed and repeats the measurements with every 8-slot timing.

Screen Fields

The following input fields of the test parameters need to be specified for a new test:

Input Field	Description
Radio Standard	Select either GSM900, E-GSM, DCS1800, or PCS1900. If Radio Standard is changed, Channel is also automatically changed accordingly.
Channel[a]	Specifies one traffic channel to be analyzed. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
Measurement Range	Specifies one measurement range as follows. +39dBm: The maximum input level is +39 dBm. +29dBm: The maximum input level is +29 dBm. +19dBm: The maximum input level is +19 dBm. +9dBm: The maximum input level is +9 dBm. –3dBm: The maximum input level is –3 dBm.
Span	Selects either 0 to 400 kHz or ±100 kHz as follows: o 0-400: Sets the span to 0 to 400 kHz relative to the channel frequency. o ±100: Sets the span to ±100 kHz centered at the channel frequency.
RBW	Selects either 10 kHz or 30 kHz resolution bandwidth as follows: o 10: Sets the resolution bandwidth to 10 kHz. o 30: Sets the resolution bandwidth to 30 kHz.
Averaging[a]	Specifies the averaging number of measurements from 2 to 99, unless Off is selected.
DC Power[a]	Selects a supply mode. The choices are On and Off as follows: o On: Always supplies dc voltage to the mobile. o Off: Disables to supply dc voltage to the mobile. Accepts a dc voltage value ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.

The following display fields show the measurement results:

Display Field	Description
Peak	The absolute peak power and frequency are shown.
Marker[a]	The frequency and amplitude readouts at the marker position are shown when activated by the Knob MKR/Cursor softkey as follows: o -------- MHz ---- dBm: The absolute frequency and amplitude of the marker readouts are shown. o (---- kHz ---- dB): The relative frequency and amplitude of the marker readouts are shown.
0-400 kHz span: M1: +200 kHz, M2: +250 kHz	The amplitude data at +200 kHz and +250 kHz offsets are also shown in the left lower screen corner.
±100 kHz span: M1: –67.7 kHz, M2: ±0 kHz, M3: +67.7 kHz	Three peak amplitudes at around the offsets M1, M2, and M3 from the center frequency are measured and shown with those corresponding frequencies[b] in the left lower screen corner.

a. The frequency resolution is 1 kHz or 2 kHz due to the measurement resolution of 1.59 kHz.
b. The frequency resolution is 1 kHz due to the measurement resolution of 0.79 kHz. This will cause to have two amplitude readouts at the same frequency.

Measuring Screens

If the Start softkey is pressed in the initial screen, the following Measuring screen with either 0 to 400 kHz or ±100 kHz span is displayed with the continuous trigger mode.

Figure 3-56 **Measuring: Span 0 to 400 kHz Screen**

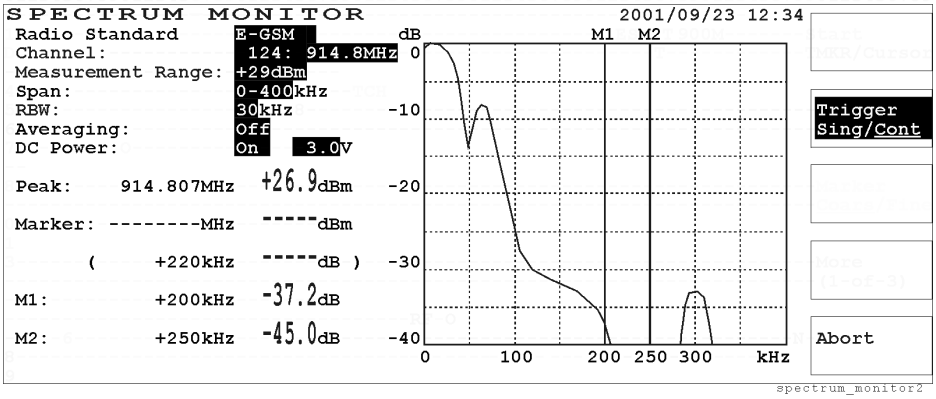
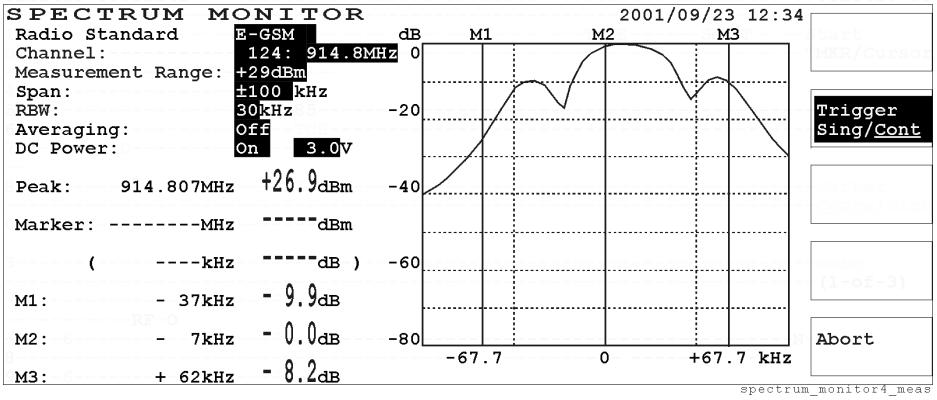


Figure 3-57 **Measuring: Span ±100 kHz Screen**



Softkey Menu

- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle.
- Abort: Stops continuous measurements and shows another softkey menu.

If the Abort softkey is pressed in the measuring screen, the following aborted screen is displayed with either 0 to 400 kHz (Figure 3-56) or ±100 kHz (Figure 3-57) span.

Figure 3-58 Aborted: Span 0 to 400 kHz Spectrum Screen

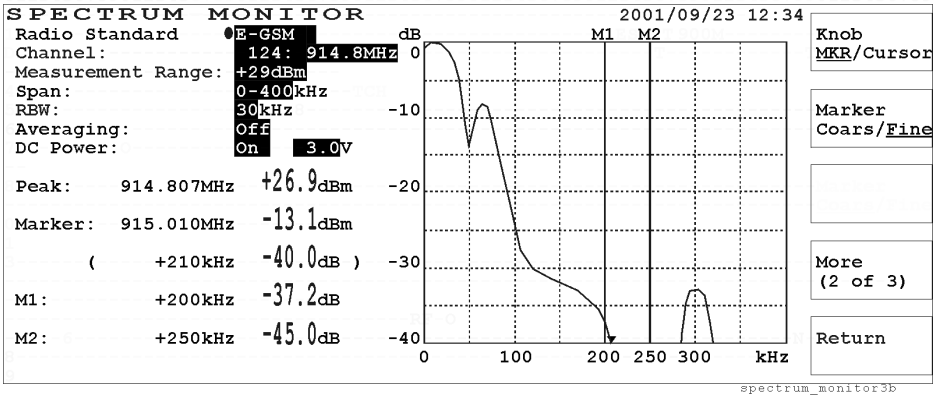
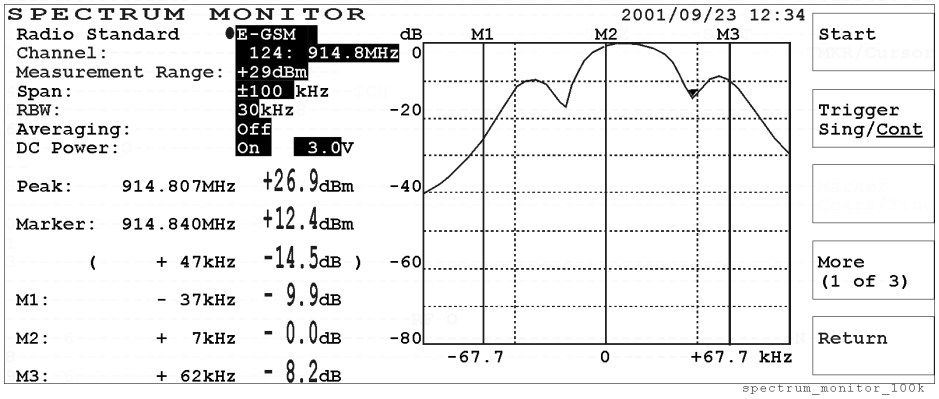


Figure 3-59 Aborted: Span ±100 kHz Spectrum Screen



Softkey Menu 1

- Start: Begins a new test.
- Trigger Sing/Cont: Toggles the trigger mode between Sing for single and Cont for continuous modes. In the continuous mode, this softkey is highlighted blinking until the Abort softkey is pressed. In the single mode, this softkey is highlighted for one measurement cycle and the marker function is available with the Knob MKR/Cursor softkey.
- More (1 of 3): Displays softkey menu 2.
- Return: Displays the initial screen with function modes.

Softkey Menu 2

- Knob MKR/Cursor: Toggles the function of the CURSOR CONTROL knob between Cursor and MKR for marker control.

- Marker Coars/Fine: Toggles the marker control between Coars for coarse and Fine to move the marker with 10 dots (coarse) or 1 dot (fine) resolution. The marker readouts for the frequency and amplitude are available at any point of the measured trace.
- More (2 of 3): Displays softkey menu 3.
- Return: Displays the initial screen with function modes.

Softkey Menu 3

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- More (3 of 3): Returns to softkey menu 1.
- Return: Displays the initial screen with function modes.

SIGNAL GENERATOR

The Test Set is capable to generate RF signal dedicated to the radio standards GSM900, E-GSM, DCS1800, and PCS1900.

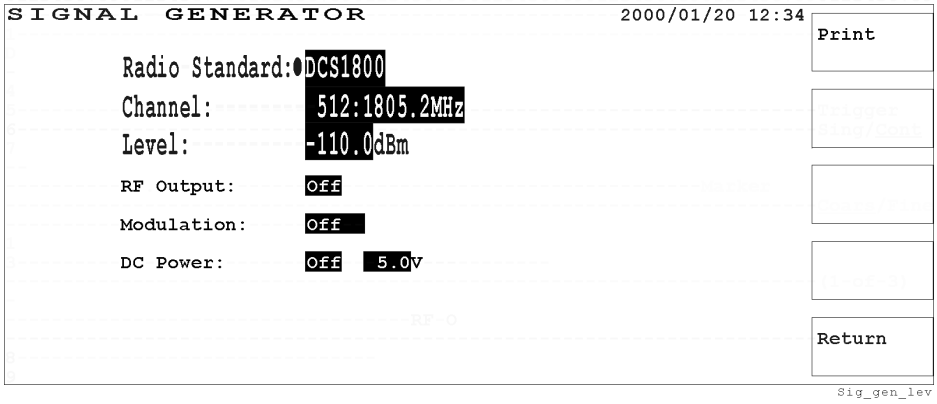
NOTE This section is applicable only for Test Sets with Option 002.

NOTE When entering numeric values, the variable increment softkey menu is displayed. Refer to “Variable Increment Softkey” and "Storing Two Numeric Values" on page 59.

SIGNAL GENERATOR Screen

When the SIGNAL GENERATOR softkey is pressed, the following screen is displayed to set the parameters required to generate a type of signal:

Figure 3-60 SIGNAL GENERATOR Screen



Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Return: Displays the initial screen with function modes.

Screen Fields

The following input fields of the test parameters need to be set to generate RF signal from the Test Set. The parameters can be set using the CURSOR CONTROL knob as explained in "Front Panel Overview" on page 52.

Input Field	Description
Radio Standard	Selects either GSM900, E-GSM, DCS1800, or PCS1900. If Radio Standard is changed, Channel is also automatically changed accordingly.
Channel[a]	Specifies the transmitting traffic channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
Level[a]	Sets the RF output level. The allowable range is from –110.0 to –50.0 dBm in 0.5 dB steps.
RF Output	Toggles the RF power output between On and Off. When Off is selected, the RF output level from the RF IN/OUT connector is below –110 dBm.
Modulation	Selects one of the following modulation modes: o Off: Outputs carrier wave without modulation. o PN9: Outputs RF signal modulated with a 9-step Pseudo-random binary sequence noise. o All 0: Outputs RF signal modulated with all-zero data.
DC Power[a]	Selects a supply mode. The choices are On and Off as follows: o On: Always supplies dc voltage to the mobile. o Off: Disables the dc voltage supply to the mobile. Accepts a dc voltage value ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.

CONFIGURATION

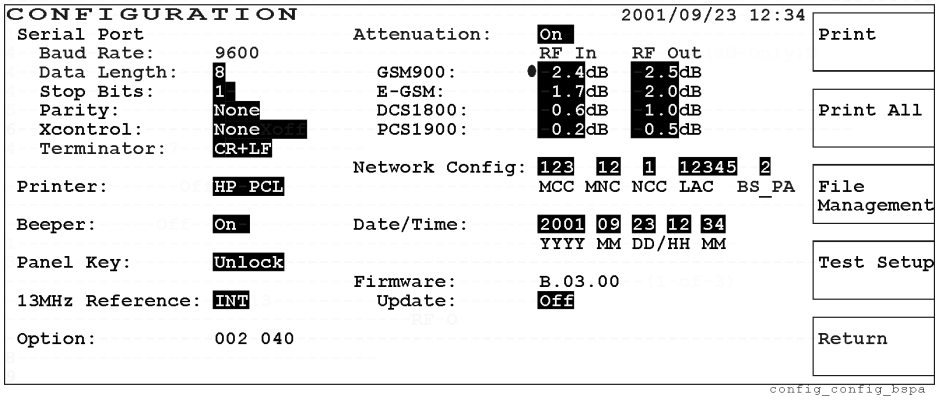
In this mode there are three major functions of CONFIGURATION, File Management, and Test Setup: Test Sequence/Test Condition.

NOTE When entering numeric values, the variable increment softkey menu is displayed. Refer to “Variable Increment Softkey” and "Storing Two Numeric Values" on page 59.

CONFIGURATION Screen

When the CONFIGURATION softkey is pressed, the following screen is displayed:

Figure 3-61 CONFIGURATION Screen



Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Print All: Allows you to print a hardcopy set of the whole contents for the CONFIGURATION, Test Sequence, and Test Condition screens for all radio standards.
- File Management: Goes to the File Management screen. Refer to "File Management" on page 160.
- Test Setup: Reveals the Test Setup: Test Condition or Test Sequence screen. Refer to "Test Setup: Test Condition Screen" on page 148 and "Test Setup: Test Sequence Screen" on page 153.
- Return: Displays the initial screen with function modes.

Screen Fields

The following input fields of the parameters need to be configured. The parameters are set using the CURSOR CONTROL knob as explained in "Front Panel Overview" on page 52.

Input Field	Description
Serial Port	o Baud Rate: Fixed to 9600 bit per second. o Data Length: Selects either 7 or 8 bits. o Stop Bits: Specifies to either 1, 1.5, or 2 bits. o Parity: Selects either None, Odd, or Even. o Xcontrol: Selects either None or Xon/Xoff. o Terminator: Selects either CR, LF, or CR+LF.
Printer	Toggles between HP PCL and ESC/P.
Beeper	Toggles between On and OFF. If On is selected, there is a beep for each step of operation. If Off is selected, beeps are suppressed except for noticing some errors and warnings.
Panel Key	Toggles between Lock and Unlock. If Lock is selected, the system settings are protected from any attempt to use the front-panel settings. The initial screen softkey menu includes only AUTOMATIC TEST and CONFIGURATION. The test parameters excluding Procedure are not allowed to change.
13 MHz Reference	Selects either INT (internal) or EXT (external). If EXT is selected, the 13 MHz reference signal must be supplied to the 13 MHz Reference connector on the rear panel.
Option	Displays the options installed.
Attenuation[a]	Toggles the attenuation function between On and Off. Specifies the insertion losses caused by the coupler or cable you are using to connect the RF signals from/to the mobile with individual radio standards, respectively. Depending on transmitter testing and receiver testing it is required to set loss values in the RF In and RF Out fields as follows: o RF In: Accepts the attenuations for transmitter testing. The allowable range is from 0.0 to 99.9 dB in 0.1 dB steps. o RF Out: Accepts the attenuations for receiver testing. The allowable range is from 0.0 to 99.5 dB in 0.5 dB steps.

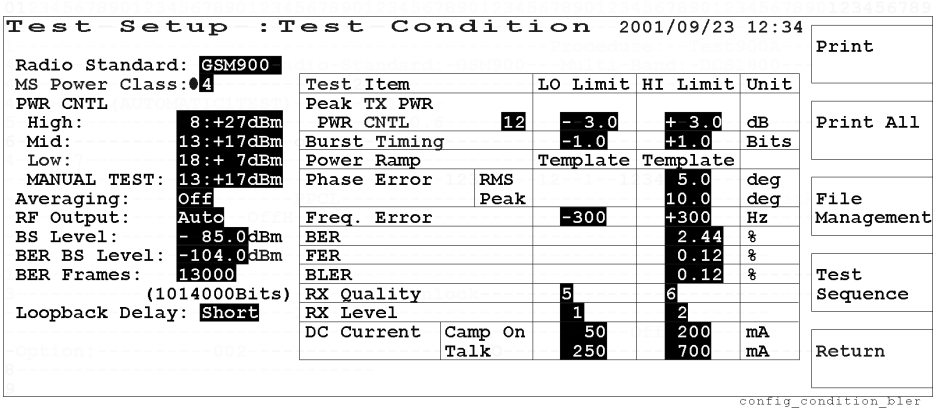
Input Field	Description
Network Config	Specifies the network parameters. Setting these parameter is required when you test a phone using a user SIM instead of a test SIM or when you want to test network capabilities. o MCC: Accepts an entry for Mobile Country Code. The allowable range is from 0 to 999. o MNC: Accepts an entry for Mobile Network Code. The allowable range is from 0 to 99. o NCC: Accepts an entry for Network Color Code. The allowable range is from 0 to 7. o LAC: Accepts an entry for Location Area Code. The allowable range is from 0 to 65535. o BS_PA: Accepts an entry for the number of multiframes between two transmissions of the same paging message (BS_PA_MFRMS). The allowable range is from 2 to 9.
Date/Time[a]	Specifies the current date and time with the following formats: o YYYY: Accepts an entry for the year. The allowable range is from 1990 to 2089. o MM: Accepts an entry for the month. The allowable range is from 01 to 12. o DD: Accepts an entry for the date. The allowable range is from 01 to 31. o HH: Accepts an entry for the hour. The allowable range is from 00 to 23. o MM: Accepts an entry for the minute. The allowable range is from 00 to 59.
Firmware	Shows the current firmware revision name stored in the Test Set.
Update	Toggles between On (enable to update) and Off (disable to update). If On is selected, refer to "How to Update the Firmware" on page 165.
New Firmware	When the Update: field is set to On, shows the new firmware revision name stored in the firmware update card.

a. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.

Test Setup: Test Condition Screen

If the Test Setup softkey in the CONFIGURATION screen is pressed, the Test Setup: Test Condition screen is displayed as follows:

Figure 3-62 Test Setup: Test Condition Screen



Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Print All: Allows you to print a hardcopy set of the whole contents for the CONFIGURATION, Test Sequence, and Test Condition screens for all radio standards.
- File Management: Allows you to go to the File Management screen to store a new test setup file into an SRAM memory card, or to load a test setup file from an SRAM memory card. Refer to "File Management" on page 160.
- Test Sequence: This softkey toggles the screens between Test Sequence and Test Condition.
- Return: Displays the CONFIGURATION screen and then the initial screen with function modes.

NOTE For the GPRS mode with MANUAL TEST, the test limits for BER, FER, RX Quality, and RX Level will not be effective.

Screen Fields

The following input fields of the parameters need to be defined with the proper values for testing the mobile with AUTOMATIC TEST and MANUAL TEST. The parameters are set using the CURSOR CONTROL knob as explained in "Front Panel Overview" on page 52.

Input Field	Description
Radio Standard	Selects either GSM900, E-GSM, DCS1800, or PCS1900.
MS Power Class	Specifies one of the defined factors. The allowable factor ranges are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 5 (+29 dBm) DCS1800: 1 (+30 dBm), 2 (+24 dBm), 3 (+36 dBm) PCS1900: 1 (+30 dBm), 2 (+24 dBm), 3 (+33 dBm)
PWR CNTL (High[a], Mid, Low, MANUAL TEST)	For the AUTOMATIC TEST mode, specifies three defined factors for the High, Mid and Low levels according to the radio standard. For the MANUAL TEST mode, specifies one defined factor. The allowable factor ranges accompanied by the absolute power levels are as follows: GSM900 and E-GSM: 2 (+39 dBm) to 19 (+5 dBm) DCS1800: 0 (+30 dBm) to 15 (+0 dBm), or 29 (+36 dBm) to 31 (+32 dBm) PCS1900: 0 (+30 dBm) to 15 (+0 dBm), or 29 (+36 dBm) to 31 (+32 dBm) The maximum value is limited by the MS Power Class setting.
Averaging[b]	Specifies the averaging number of measurements from 2 to 99 for measuring Peak TX Power, Phase Error and Frequency Error, unless Off is selected.
RF Output	Selects a signal supply mode as follows: o Auto: Supplies the RF signal to the mobile only during a test cycle. o On: Always supplies the RF signal to the mobile.
BS Level[b]	Specifies the RF output level of the Test Set *except for* the Sensitivity test of which level is defined in the BER BS Level field. The allowable range is from –110.0 to –50.0 dBm in 0.5 dB steps.

Input Field	Description
BER BS Level[b]	Specifies the RF output level of the Test Set for the Sensitivity test. The allowable range is from −110.0 to −50.0 dBm in 0.5 dB steps.
BER Frames[b]	Specifies the number of test frames. The allowable range is from 1 to 13000. The number of test bits, derived from the equation “Test Frames multiplied by 78 bits”, is shown in the parentheses.
Loopback Delay	Selects a delay time from Short, Mid, or Long.

a. In the AUTOMATIC TEST mode, the High value is used for the Burst Timing, Power Ramp, Phase Error, and Frequency Error tests.
b. The variable increment softkey is activated. Refer to "Variable Increment Softkey" on page 60.

Setting Test Limits on Test Items

The LO Limit and HI Limit values for the test items in the table need to be set to execute Pass/Fail tests with AUTOMATIC TEST and MANUAL TEST. All test items can be specified with limits to make tests in the Test Setup: Test Sequence screen (even if some test items are skipped).

The variable increment softkey is activated to enter each limit. Refer to "Variable Increment Softkey" on page 60.

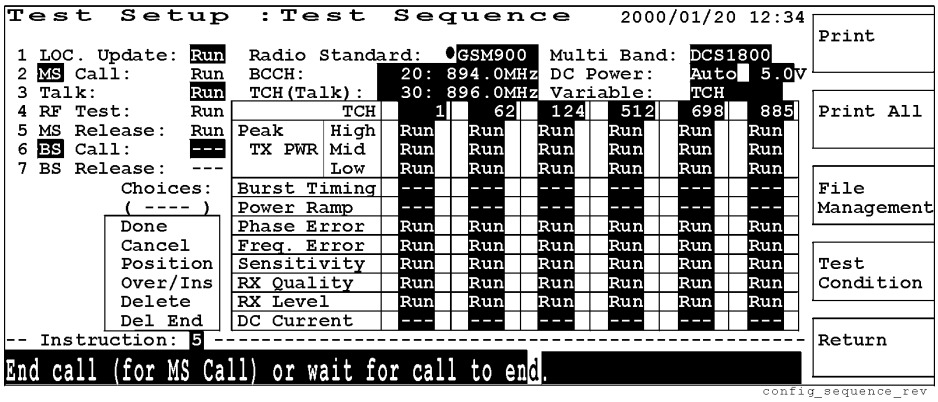
Test Item	Description
Peak TX Power	Accepts a set of high and low test limits. The nominal limits are specified in the radio standard in conjunction with the power control level (PWR CNTL). You are allowed to modify the nominal limits by entering temporary limits ranging from –99.9 to +99.9 dB in 0.1 dB steps. However, once power control level is changed after this modification, the nominal limits are automatically applied also.
Burst Timing	Accepts a set of high and low test limits. The allowable range is from –9.9 to +9.9 bits in 0.1 bit steps.
Power Ramp	The test limits are specified by the radio standard selected.
Phase Error	Accepts a set of high test limits for the rms and peak errors over the active part of the timeslots between 0 and 147 bits. The allowable range is from 0.0 to 99.9° in 0.1° steps.
Frequency Error	Accepts a set of high and low limits over the active part of the timeslots. The allowable range is from –999 to +999 Hz in 1 Hz steps.
BER	Accepts a high limit for the bit error rate. The allowable range is from 0.00 to 99.99% in 0.01% steps.
FER	Accepts a high limit for the frame erasure rate. The allowable range is from 0.00 to 99.99% in 0.01% steps. This is not effective for the Test Set installed with Option 040.
BLER	Accepts a high limit for the block error rate. The allowable range is from 0.00 to 99.99% in 0.01% steps. This is effective for the Test Set installed with Option 040.

Test Item	Description
RX Quality	Accepts a set of high and low limits. The allowable choices are 0 (<0.2%), 1 (0.2 to 0.4%), 2 (0.4 to 0.8%), ..., 6 (6.4 to 12.8%), and 7 (>12.8%). This is not effective for the Test Set installed with Option 040.
RX Level	Accepts a set of high and low limits. The allowable choices are 0 (<–110 dBm), 1 (–110 to –109 dBm), 2 (–109 to –108 dBm), ..., 62 (–49 to –48 dBm) and 63 (>–48 dBm). This is not effective for the Test Set installed with Option 040.
DC Current	Accepts a set of high and low limits at Camp On and Talk. The allowable range is from 3 to 1000 mA in 1 mA steps.

Test Setup: Test Sequence Screen

If the Test Sequence softkey in the Test Setup: Test Condition screen is pressed, the Test Setup: Test Sequence screen is displayed as follows. This screen allows you to make a test sequence for executing AUTOMATIC TEST.

Figure 3-63 **Test Setup: Test Sequence Screen**



Softkey Menu

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Print All: Allows you to print a hardcopy set of the whole contents for the CONFIGURATION, Test Sequence, and Test Condition screens for all radio standards.
- File Management: Allows you to go to the File Management screen to store a new test setup file into an SRAM memory card, or to load a test setup file from an SRAM memory card. Refer to "File Management" on page 160.
- Test Condition: This softkey toggles the screens between Test Condition and Test Sequence.
- Return: Displays the CONFIGURATION screen and then the initial screen with function modes.

Automatic Test Flow

For creating a test flow to execute AUTOMATIC TEST, refer to Table 3-1.

Select either MS or BS in the second step of the sequence, then the fifth, sixth and seventh steps are automatically set accordingly.

Select Run to include a sequence in a test flow, or select --- (skip) to exclude that sequence from a test flow.

Table 3-1 Setting an Automatic Test Flow

Step	Sequence	Action	Test	Action
1	LOC. Update:		Run|---	<Select either Run or --->
2	MS|BS Call:	<Select either MS or BS>	Run	
3	Talk:		Run|---	<Select either Run or --->
4	RF Test:		Run	
5	MS|BS Release:	<Determined by Step 2>	Run	
6	BS|MS Call:	<Determined by Step 2>	Run|---	<Select either Run or --->
7	BS|MS Release:	<Determined by Step 2>	Run|---	<Determined by Step 6>

Place the cursor in front of the input field of a sequence and press the CURSOR CONTROL knob one time to activate this input field. Select either MS or BS, for example, by rotating the CURSOR CONTROL knob, and set it by pressing the knob.

Screen Fields

The following input fields of the parameters need to be set for a new test sequence for executing AUTOMATIC TEST.

Input Field	Description
Radio Standard	Selects either GSM900, E-GSM, DCS1800, or PCS1900.
Multi Band	Selects another band in addition to one in Radio Standard for testing dual band mobile phones. The allowable combinations of radio standards are as follows: Radio Standard: Multi Band: GSM900 OFF, DCS1800 E-GSM OFF, DCS1800 DCS1800 OFF, GSM900, E-GSM PCS1900 OFF
BCCH[a]	Specifies the broadcast control channel. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
DC Power	Selects a supply mode. The choices are Auto, On, and Off as follows: o Auto: Supplies dc voltage to the mobile only during a test cycle. o On: Always supplies dc voltage to the mobile. o Off[b]: Disables to supply dc voltage to the mobile. If Off is selected, the Variable field is automatically set to TCH. Accepts a dc voltage value ranging from 3.0 to 11.0 V in 0.1 V steps. This value is used among the AUTOMATIC TEST, MANUAL TEST, SPECTRUM MONITOR, and SIGNAL GENERATOR modes in common.

Input Field	Description
TCH (Talk)[a]	Specifies one traffic channel depending on the parameter selection in the Variable field. If TCH is selected in the Variable field, this specifies one traffic channel to make Talk tests in addition to six traffic channels for RF tests. If DC Power is selected in the Variable field, this specifies one traffic channel to make both Talk tests and RF tests. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810
Variable	Specifies to either TCH or DC Power as follows to make up to six measurements: o TCH: Enables to make six measurements on six traffic channels specified in the TCH input fields of the Test Item table, with or without one fixed dc voltage. o DC Power: Enables to make six measurements on one traffic channel with six dc voltages specified in the DCP input fields of the Test Item table.
TCH or DCP	According to the selection of Variable field, either of the following parameters need to be specified for a new test: o TCH: Accepts up to six traffic channels. The frequency corresponding to the channel accompanies. The allowable range is as follows: GSM900: 1 to 124 E-GSM: 0 to 124, and 975 to 1023 DCS1800: 512 to 885 PCS1900: 512 to 810 o DCP: Accepts up to six dc voltages ranging from 3.0 to 11.0 V in 0.1 V steps.

a. The variable increment softkeys are activated. Refer to "Variable Increment Softkey" on page 60.
b. When DC Power is set to Off, the DC Current cannot be measured and “----” is shown in the DC Current cells in the table of the AUTOMATIC TEST: Stand-by detailed screen.

The following test items need to be set to either “Run” to execute a Pass/Fail test or to “---” (skip) not to execute a Pass/Fail test, for each channel or dc power, respectively:

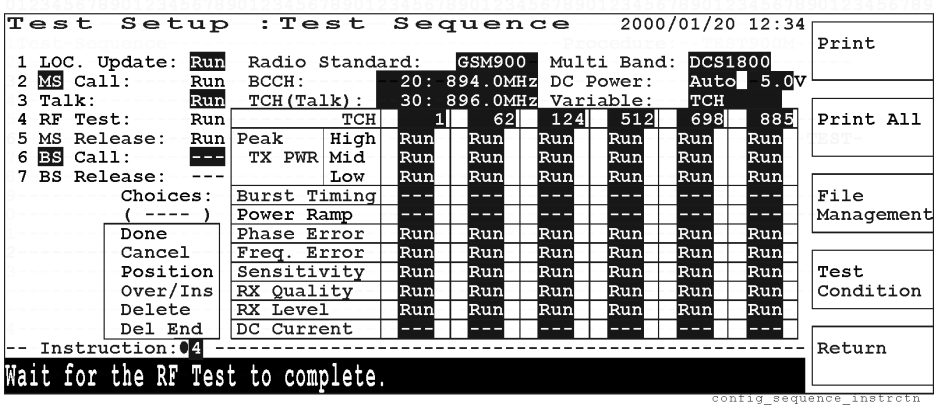
Test Item	Description
Peak TX Power	Defines whether to run or skip the Peak TX Power test for the High, Mid, and Low levels. The MS power class and the power control levels for the High, Mid, and Low levels are defined in the Test Setup: Test Condition screen.
Burst Timing	Defines whether to run or skip the Burst Timing test. In the GPRS mode, this will be substituted by Power vs Time.
Power Ramp	Defines whether to run or skip the Power Ramp test. In the GPRS mode, this will be substituted by Power vs Time.
Phase Error	Defines whether to run or skip the Phase Error test.
Frequency Error	Defines whether to run or skip the Frequency Error test.
Sensitivity	Defines whether to run or skip the Sensitivity test in BER and FER. In the GPRS mode, BLER will substitute BER and FER. The BS level and the number of test frames are defined in the Test Setup: Test Condition screen.
RX Quality	Defines whether to run or skip the RX Quality test. In the GPRS mode, this can not be measured.
RX Level	Defines whether to run or skip the RX Level test. In the GPRS mode, this can not be measured.
DC Current	Defines whether to run or skip the DC Current test at Camp On and Talk steps.

When TCH is set in the Variable field and the all of test items are set to skip for one TCH, only the handover capability can be tested for that TCH.

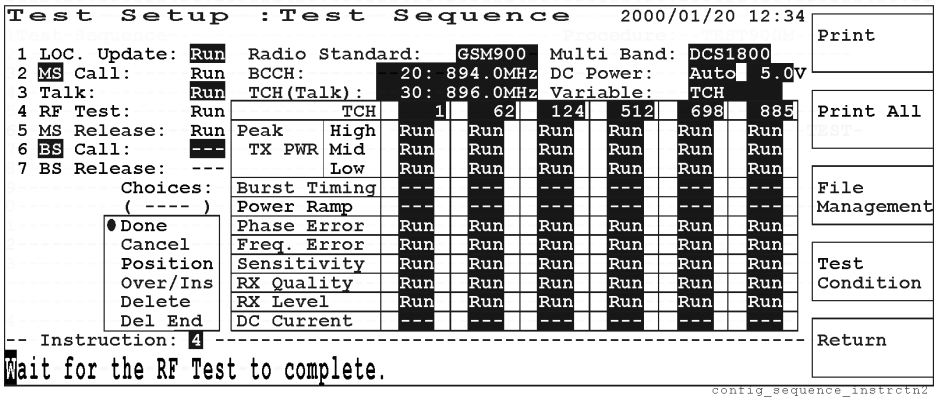
Creating Instruction Messages

An instruction message with up to 69 characters including spaces and symbols can be created for each step of a test flow to execute AUTOMATIC TEST. The range of the step numbers is from 1 to 7 corresponding to each step of a test flow. Use the following procedure to create an instruction message:

Step 1. Place the circular cursor in front of the input field of Instruction.



Step 2. Press and rotate the CURSOR CONTROL knob until the desired step number is shown and press the CURSOR CONTROL knob to select it. Then, the whole message line is displayed with the rectangular cursor on the first position, showing a message if it is already stored. Check that the circular cursor is set to Done in the Choices scrolling window.



Step 3. Create a message by rotating and pressing the CURSOR CONTROL knob to select commands, alphanumeric characters, and some kinds of symbols from the scrolling window.

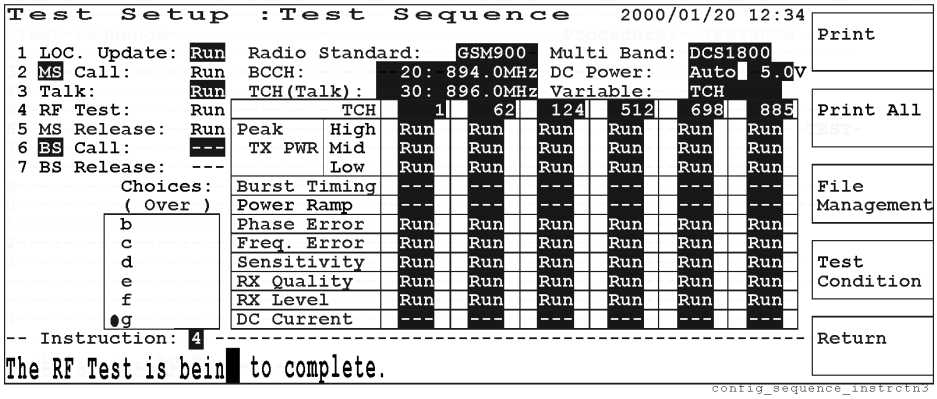
The available commands and characters are as follows:

- Done: Enters the newly created instruction message in the instruction message field.
- Cancel: Exits the editing function without any change of the message.
- Position: Allows you to move the rectangular cursor to any position of the message for editing.

- Over/Ins: Selects either Over (overwrite) or Ins (insert). Over enables you to overwrite (erase and replace) the selected alphanumeric character. Ins enables you to insert characters at the position of the rectangular cursor without erasing the existing characters.
- Delete: Deletes the alphanumeric character selected by the rectangular cursor.
- Del End: (Delete to the End) Deletes all alphanumeric characters from the rectangular cursor to the end of a message line.
- Bk Space: (Backspace) Erases one alphanumeric character behind the rectangular cursor.
- Available alphanumeric characters and symbols are as follows:

  A B C D E F G H I J K L M N O P Q R S T U V W X Y Z _ 0 1 2 3 4 5 6 7 8 9 (space) a b c d e f g h i j k l m n o p q r s t u v w x y z ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ { | } ~

The following illustration shows the editing screen about to enter "g" to spell out "being" overwriting the default message.



Step 4. If the created message is right, move the circular cursor back to Done and press the CURSOR CONTROL knob once more to enter that message. The circular cursor returns in front of the step number. Then, the message line is highlighted.

The default instruction messages at factory shipment are as follows:

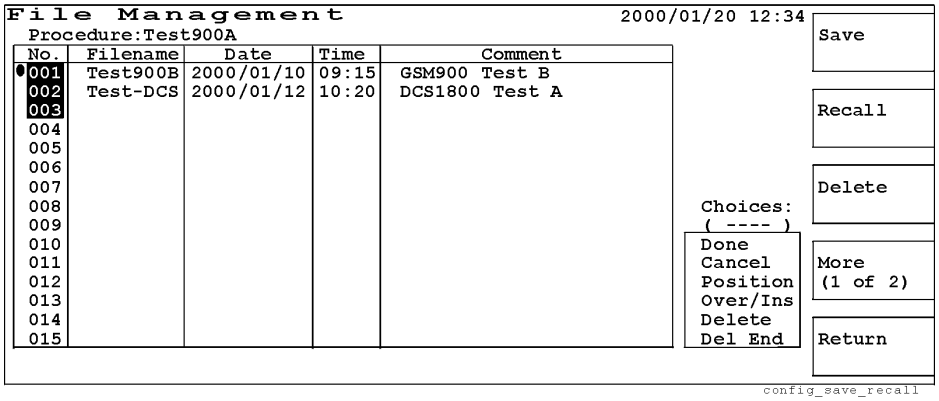
1. Turn on MS power, wait for Location Update.
2. Make MS Call or respond to BS Call.
3. Talk to the mobile and press [Pass] or [Fail] with the result.
4. Wait for the RF Test to complete.
5. End call (for MS Call) or wait for call to end.
6. Respond to BS Call or make MS Call.
7. Wait for call to end (for BS Release) or end (for MS Release).

File Management

When the File Management softkey is pressed with a proper SRAM memory card inserted in the MEMORY CARD slot, the following screen is displayed. All setup file names in the card are listed in the table.

You can save all of the test setup information into an SRAM memory card. Data and time are automatically added from the Test Set. Refer to "Saving a Test Setup File" on page 161.

Figure 3-64 File Management Screen



Softkey Menu 1

- Save: Stores a new test setup file into a SRAM memory card. Refer to "Saving a Test Setup File" on page 161.
- Recall: Loads one of the test setup files from a SRAM memory card into the Test Set. If a proper SRAM memory card is not inserted, this softkey is not activated. Refer to "Recalling a Test Setup File" on page 163
- Delete: Deletes the file selected by the cursor. If a proper SRAM memory card is not inserted, this softkey is not activated.
- More (1 of 2): Displays softkey menu 2.
- Return: Displays the previous screen and then the initial screen with function modes.

Softkey Menu 2

- Print: Allows you to print a hardcopy of a graphic image from the screen.
- Print All: Prints all of the file list on the SRAM memory card.
- Format: Initializes a new SRAM memory card or a used card erasing all information in it.

NOTE The memory cards which contain the firmware update revisions for the Test Set can not be initialized using this Format softkey. A PC may be used to initialize such SRAM cards.

- More (2 of 2): Returns to softkey menu 1.
- Return: Displays the previous screen and then the initial screen with function modes.

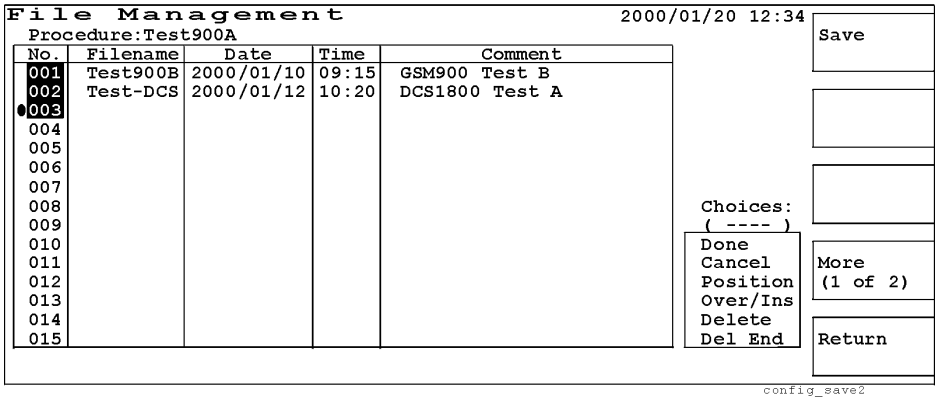
Saving a Test Setup File

For saving a new test setup file, use the following procedure:

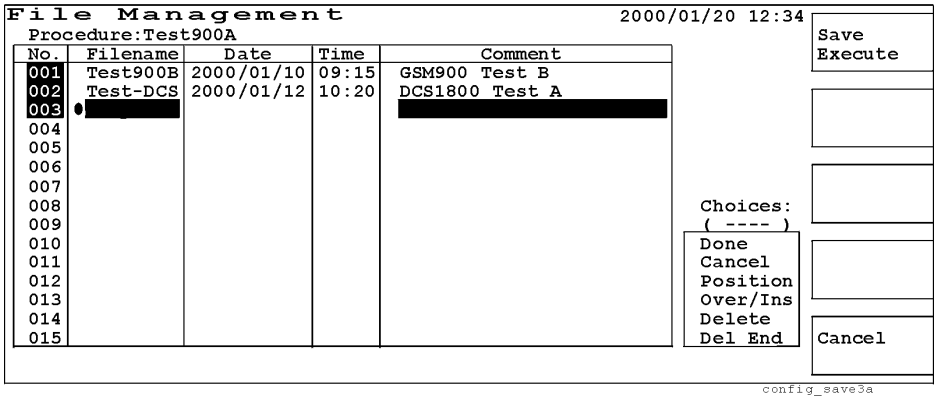
Step 1. If a new SRAM memory card is going to be used, initialize it by pressing the Format softkey.

Step 2. Insert your SRAM memory card into the MEMORY CARD slot.

Step 3. Move the cursor to the number next to the last filename. The Recall and Delete softkeys will be erased from the menu.



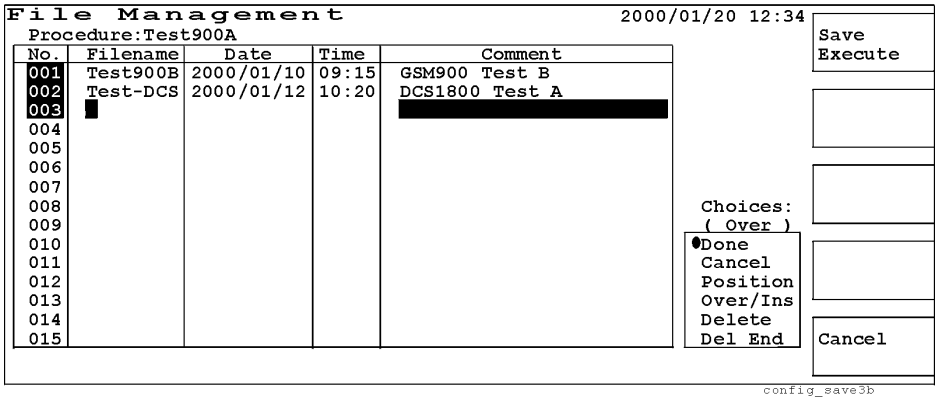
Step 4. Press the Save softkey, then the Filename and Comment fields are highlighted with the circular cursor in front of the Filename field.



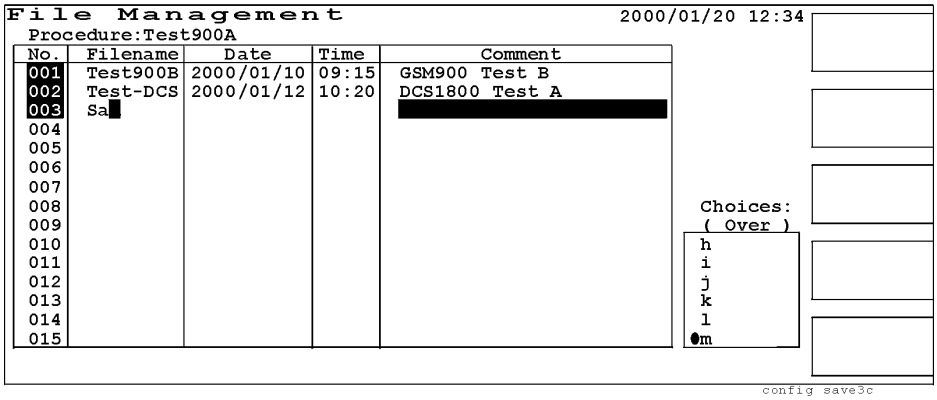
Softkey Menu

- Save Execute: Press this softkey after entering your filename and comment to store your file into a SRAM card.
- Cancel: Cancels the save execute screen and return to the save screen in Step 3.

Step 5. Press the CURSOR CONTROL knob once to activate the Choices scrolling window with the blinking circular cursor at Done. The entry mode is automatically set to overwrite showing Over in the parentheses under Choices. The rectangular cursor is placed at the first position of the Filename field enabling to enter the first character of your filename.

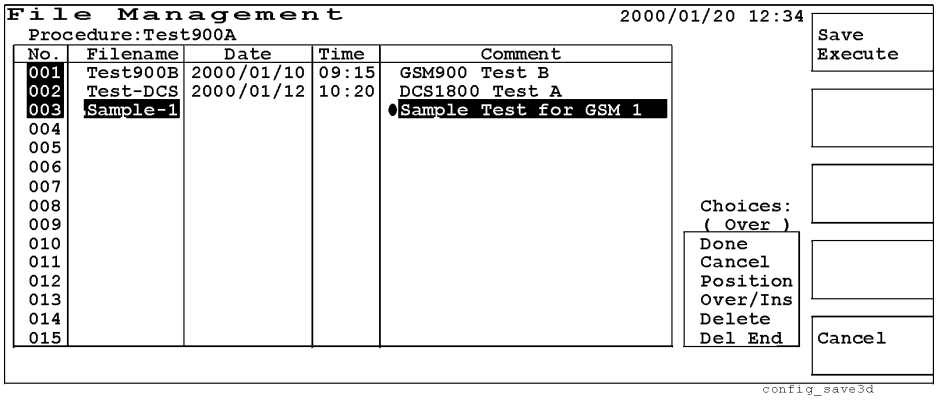


Step 6. Select alphanumeric characters and other symbols by rotating and pressing the CURSOR CONTROL knob and create a filename.



Step 7. Rotate the CURSOR CONTROL knob counterclockwise to find Done and press the knob to enter the filename created.

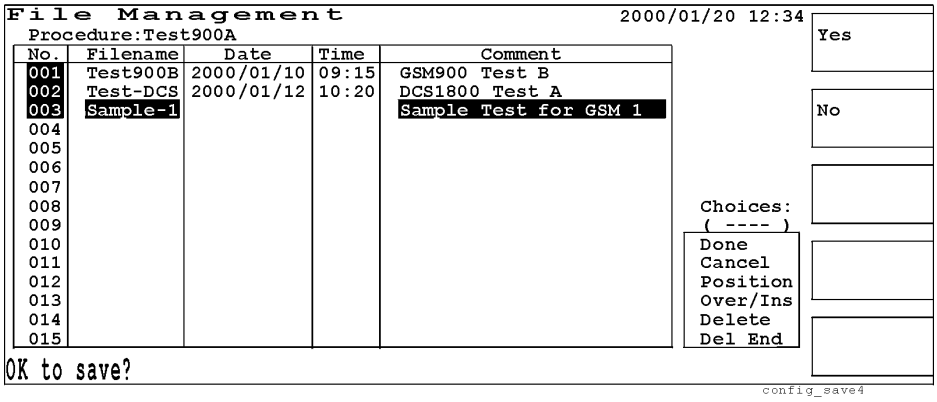
Step 8. Rotate the CURSOR CONTROL knob one click clockwise and the Comment field should be highlighted with the circular cursor in front of it. Repeat Step 5 to Step 7 to complete entering your comment.



Softkey Menu

- Save Execute: The operation message “OK to save?” is shown when this softkey is pressed, and the Yes and No response softkeys are displayed. Refer to Step 9.
- Cancel: Exits the save execute screen, and returns to the save/recall screen.

Step 9. Press the Save Execute softkey and respond to the operation message “OK to save?” by pressing the Yes softkey. If there is something to revise, press the No softkey to go back to Step 4.



Softkey Menu

- Yes: Stores a new setup file into an SRAM memory card. The operation message “Saving...” is shown while saving. After saving, the save/recall screen is displayed.
- No: Returns to Step 4 to restart editing File name and Comment.

Step 10. If the new filename and comment have been correctly created, the operation message “Saving....” is shown for a while, and then returns to the File Management screen.

Step 11. If saving is properly done, the new filename should be shown in the filename table with the Date and Time data that are automatically taken from the internal clock of the Test Set.

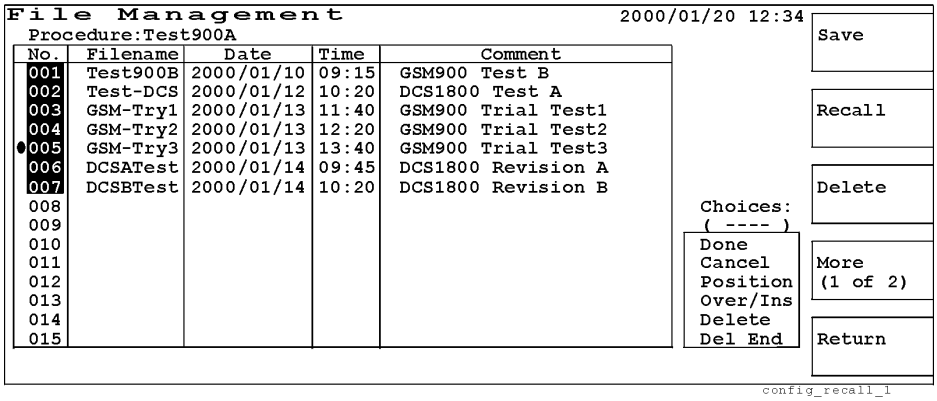
Step 12. If the Save Execute softkey and the Yes softkey are pressed when the filename has been left blank, the operation message “The filename is improper. Press [Cancel].” is shown and the Test Set beeps. Press the OK softkey to stop the beeps and go back to Step 4.

Recalling a Test Setup File

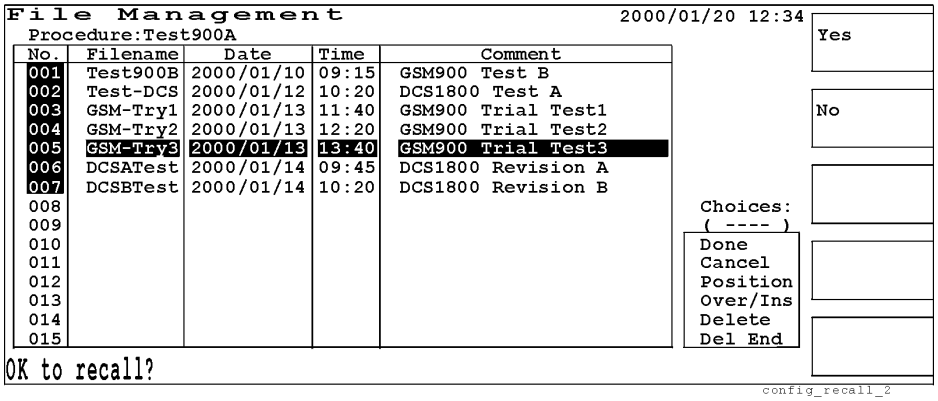
For recalling one of the test setup files from an SRAM memory card, use the following procedure:

Step 1. Insert your SRAM memory card into the MEMORY CARD slot to obtain the setup file list.

Step 2. Move the cursor to the file number which you want to recall.

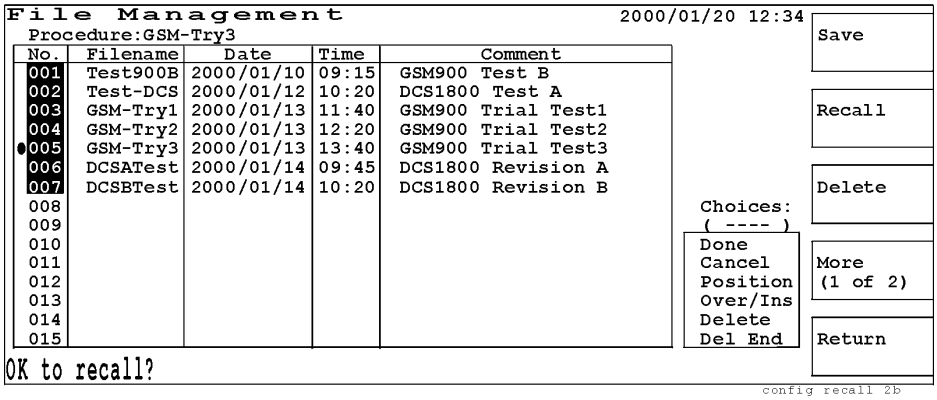


Step 3. Press the Recall softkey, then the Filename and Comment fields are highlighted.



Step 4. Respond to the operation message “OK to recall?” by pressing the Yes softkey. If there is something to revise, press the No softkey to go back to Step 2.

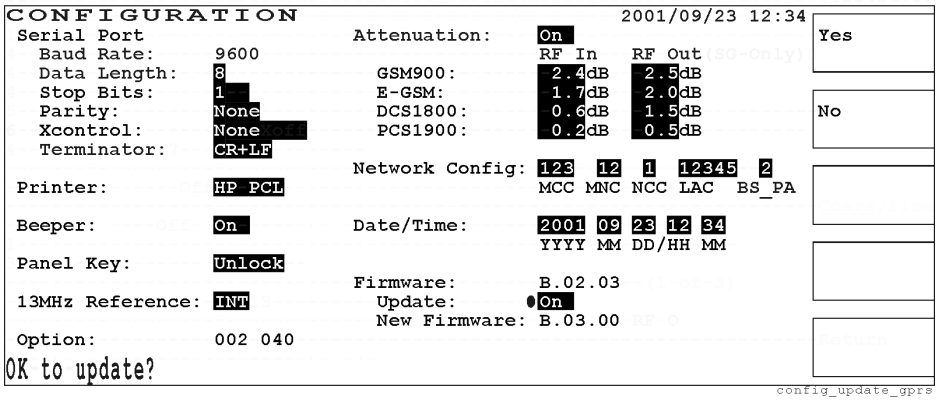
Step 5. If the new filename has been correctly recalled to the Test Set, the Procedure: field above the table shows that filename. The blinking cursor is placed in front of the file number. The softkey menu returns to the initial menu.



How to Update the Firmware

If Update is set to On and a firmware update card is inserted in the MEMORY CARD slot, the version number of the firmware on the card is displayed in the New Firmware field. If a firmware update card is not inserted or an improper card is inserted, “?.??.??” is shown in this field.

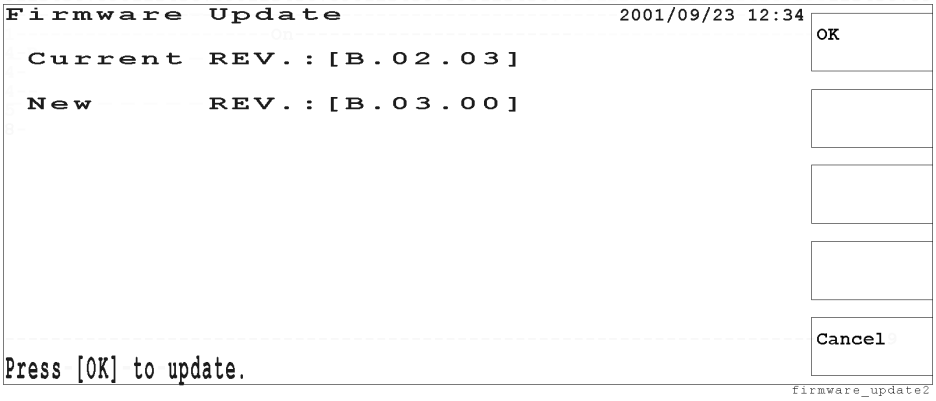
Figure 3-65 **Firmware Update Screen (1/2)**



Softkey Menu

- Yes: Initiates the updating process. When this softkey is pressed with the proper update card inserted, the screen shown in Figure 3-66 is displayed.
- No: Changes from Update: On to Update: Off without updating the current firmware.

Figure 3-66 **Firmware Update Screen (2/2)**



Softkey Menu

- OK: Begins updating the firmware to the new revision. Following the update card #1, it is required to insert the update card #2 according to the operation message.

  After completing the update process, the Test Set reboot to display the initial screen.

If a proper update card is not inserted when the OK softkey is pressed, the operation message “Insert the proper update card. Press [Abort].” is shown with warning beeps.

- Cancel: Returns to AUTOMATIC TEST: Stand-by screen with the initial screen with function modes.

NOTE Before pressing the OK softkey, carefully check if the proper update card is inserted in the card slot.

4 Functionality/Operation

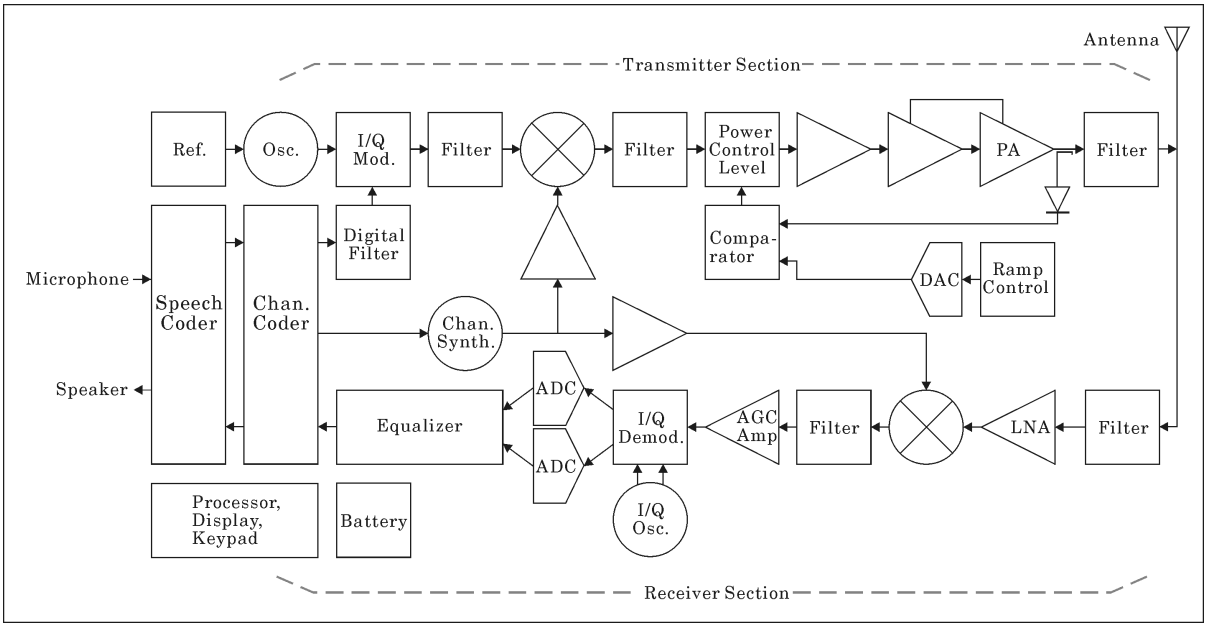
This chapter introduces the typical block diagram of a GSM mobile phone to relate some blocks with each test item done by the Test Set, especially from the perspective of incoming inspection and repair for GSM mobile phones.

Also, there is a technical information summary that may help you utilize the Test Set.

GSM Mobile Block Diagram

Figure 4-1 shows the typical block diagram of a GSM mobile phone. The upper part of this diagram represents the mobile's transmitter blocks and the lower part is the receiver blocks. For simplicity, the digital circuitry is eliminated even though there are important parts such as EEPROM's at I/Q Modulator and Ramp Control for compensating with correction coefficients.

Figure 4-1 Typical GSM Mobile Block Diagram



GSM Measurements Selection

It is worthwhile to consider which parts of the block diagram are being tested by each measurement with the Test Set. The following table lists the relationships between each test item, test step, or parameter of the Test Set and those related parts expected, or likely, to be functioning. Depending on the tests, however, some parts may be involved multiple times with more or less information. Pitfalls are descriptive examples suggesting where further investigation may be helpful.

Table 4-1 GSM Tests vs. Related Parts

	Test Item/Step/Parameter	Functioning Parts	Pitfalls
TX	Camp On & Call Setup	Micro-Processor	Low TX power?
		Battery connection	Poor modulation?
		Keyboard & Display	Channel Synth. not on all channels?
		Channel Coder	Poor receiver gain or sensitivity?
		SIM inserted	
		TX & RX	
	Specifying TCH & BCCH	Channel Synthesizer	Same ARFCN for BCCH & TCH?
	Audio Echo	Speaker & Microphone	Channel Synth. not on all channels?
		Audio Circuits	
		Speech Coder	
	Power Control Level	RF Detector	Unstable loop at some amplitudes?
		Power Calibration	Incorrect power vs. time burst shape?
		Power Level Loop	Power amplifier compensated?
	Power Ramp	Ramp Control	Incorrect power vs. time burst shape?
		PA Switch Timing	Power amplifier compensated?
		Power Level Loop	
	Phase & Frequency Errors	I/Q Modulator	Slight I/Q modulator imbalance?
		Pre-mod Gaussian Filter	Channel synthesizer spurious?
		PA Distortion	
		Channel Synthesizer	
	Spectrum Monitor	Channel Synthesizer	Channel synthesizer spurious?
		Pre-mod Gaussian Filter	Slight I/Q modulator imbalance?
		I/Q Mod. Adjustment	

	Test Item/Step/Parameter	Functioning Parts	Pitfalls
RX	BER Sensitivity (BER 0% at −50 to −90 dBm)	Channel Synthesizer	
		I/Q Demodulation	
		Equalizer	
		AGC Amplifier/Control	
	RX Quality/Level (BER <2% at −102 dBm)	LNA Gain & Noise	
		AGC Amplifier Gain	
		IF & Filter Insertion Loss	
	Timebase Tuning	Reference Oscillator	
		Channel Synthesizer	

GPRS Overview

This section summarizes the functional features of the General Packet Radio Service, or GPRS, for the Test Set installed with Option 040.

Difference from HSCSD

A single user can establish a call on more than one timeslot for the data transfer using a GSM data service called HSCSD, or High Speed Circuit Switched Data. GPRS is an overlay for the current GSM system that requires only software and a couple of new network components to work, and it allows users to transmit and receive over more than one channel. Both schemes can achieve similar data transfer rates, but the fundamental differences to move data are as follows:

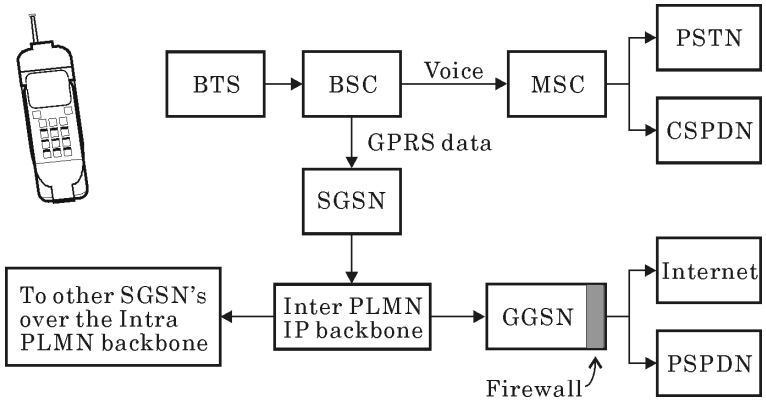
GPRS: Uses packet switching that transfers data in little chunks over several virtual connections.

Applies only a loose relationship between the same number uplink and downlink timeslot, and allows multiple users to share a single timeslot.

HSCSD: Uses circuit switching that transfers data in a single big block over a dedicated point-to-point connection.

GPRS Network Topology

Focusing on one of the base transmission stations among other GPRS network the typical functional structure is illustrated as follows:



Abbreviations in the illustration:

BSC: Base Station Controller

CSPDN: Circuit Switched Public Data Network

GGSN: Gateway GPRS Support Node

MSC: Mobile-services Switching Center

PLMN: Public Land Mobile Network

PSPDN: Packet Switched Public Data Network

PSTN: Public Switched Telephone Network

SGSN: Serving GPRS Support Node

The BSC has a second path to choose from when sending and receiving user data.

Voice: Sent to the MSC

GPRS data: Sent to the Serving GPRS Support Node (SGSN)

5 Specifications

This chapter provides the specifications of the Agilent E6392B GSM MS Test Set. These specifications are the standard performance limits with which the Test Set is thoroughly verified at factory.

General Information

Specifications describe the test set's warranted performance and are valid over the entire operation and environmental ranges unless otherwise noted. All specifications are valid after a 30-minute warm up period of continuous operation, and within the frequency ranges defined below.

Supplemental characteristics are intended to provide additional information useful in applying the instrument by giving typical, but non-warranted performance parameters. These characteristics are shown in Italics and labeled as "nominal", "typical", or "supplemental."

RF Input/Output

Maximum Safe Reverse Power (peak):	*+41 dBm (12.6 W; CW; supplemental characteristic)*
Impedance:	*50 Ω nominal*
Input SWR:	≤1.5:1
Connector:	N-type, female

RF Signal Generator

Frequency Range:	935 MHz to 960 MHz (GSM downlink)
	925 MHz to 960 MHz (E-GSM downlink)
	1805 MHz to 1880 MHz (DCS1800 downlink)
	1930 MHz to 1990 MHz (PCS1900 downlink)
Frequency Resolution:	200 kHz at channel frequency
Frequency Accuracy:	Same as frequency reference
Output Level Range:	–110.0 dBm to –50.0 dBm in 0.5 dB steps
Output Level Accuracy:	±1.0 dB for GSM/E-GSM *(±0.6 dB typical at 25 °C)*
	±1.3 dB for DCS1800 *(±0.6 dB typical at 25 °C)*
	±1.5 dB for PCS1900 *(±0.8 dB typical at 25 °C)*
0.3 GMSK Modulation:	PN9 (with training sequence), all 0, Off (CW sinewave)
Phase Error	*<3° rms supplemental characteristics*
Peak Phase Error:	*<6 ° peak supplemental characteristics*

RF Analyzer

Frequency Range:	890 MHz to 915 MHz (GSM uplink)
	880 MHz to 915 MHz (E-GSM uplink)
	1710 MHz to 1785 MHz (DCS1800 uplink)
	1850 MHz to 1910 MHz (PCS1900 uplink)

Transmitter Carrier Peak Power Measurement

Range:	–20 dBm to +39 dBm (0.3 GMSK at burst/continuous or CW)
Accuracy:	For GSM900/E-GSM/DCS1800: ±1.0 dB at ≥0 dBm ±2.0 dB at <0 dBm *(±0.5 dB typical at all power ranges at 25 °C)*
	For PCS1900: ±1.3 dB at ≥0 dBm ±2.0 dB at <0 dBm *(±0.6 dB typical at all power ranges at 25 °C)*
Resolution:	0.2 dB

Power Ramp Measurement

Range:	0 dBm to +39 dBm of peak power input (0.3 GMSK at burst)
Accuracy:	*±0.6 dB supplemental characteristics at 25 ± 5 °C* at ≥0 dBm
	±1.6 dB supplemental characteristics at 25 ± 5 °C at <0 dBm
Resolution:	0.2 dB
Dynamic Range:	*≥40dB supplemental characteristics*

Phase and Frequency Error Measurement

Input Level Range:	−11 dBm to +39 dBm
Input Phase Error Range:	0 to 20° (0.3 GMSK at burst)
Phase Error Measurement Accuracy:	≤1.5 ° rms at phase error ≥2.5 ° ≤6.0 ° peak at phase error ≥2.5 °
Frequency Error Measurement Range:	±9 kHz (0.3 GMSK at burst/continuous or CW)
Frequency Error Measurement Accuracy: (average of 10 measurements)	For GSM900/E-GSM: ±(12 Hz + frequency reference accuracy) *[±(8 Hz + frequency reference accuracy) typical]* For DCS1800/PCS1900: ±(25 Hz + frequency reference accuracy) *[±(15 Hz + frequency reference accuracy) typical]*

Spectrum Monitor

Input Level Range:	−11 dBm to +39 dBm
Frequency Span: (from channel frequency)	0 Hz to +400 kHz
Resolution Bandwidth:	10 kHz or 30 kHz
Amplitude Accuracy:	*±2.0 dB supplemental characteristics*
Amplitude Resolution:	*0.4 dB supplemental characteristics*
Dynamic Range:	*≥40 dB supplemental characteristics at input ≥0 dBm*

DC Power Supply

Range:	3.0 Vdc to 11.0 Vdc
Resolution:	0.1 V
Accuracy:	±0.1 V at 100 mA load
Maximum Current:	1 A, peak 2 A at 3.0 to 9.0 V, peak 1.5 A at 9.1 to 11.0 V
Ripple Noise:	*60 mV p-p supplemental characteristics*

DC Current Measurement

Range:	3 mA to 1000 mA
Accuracy:	±(3 mA + 2%)

Memory Card

Type:	PCMCIA (U.S.)
Memory Size:	SRAM 512 KB

Asynchronous Test (Option 002)

Spectrum Monitor

Frequency Range:	890 MHz to 915 MHz (GSM uplink)
	880 MHz to 915 MHz (E-GSM uplink)
	1710 MHz to 1785 MHz (DCS1800 uplink)
	1850 MHz to 1910 MHz (PCS1900 uplink)
Input Level Range:	–11 dBm to +39 dBm
Frequency Span (from channel frequency):	0 Hz to +400 kHz or ±100 kHz
Resolution Bandwidth:	10 kHz or 30 kHz
Amplitude Accuracy:	*±2.0 dB supplemental characteristics*
Amplitude Resolution:	*0.4 dB supplemental characteristics*
Dynamic Range:	*≥40 dB supplemental characteristics at input ≥0 dBm*

RF Signal Generator

Frequency Range:	935 MHz to 960 MHz (GSM downlink)
	925 MHz to 960 MHz (E-GSM downlink)
	1805 MHz to 1880 MHz (DCS1800 downlink)
	1930 MHz to 1990 MHz (PCS1900 downlink)
Frequency Resolution:	200 kHz at channel frequency
Frequency Accuracy:	Same as frequency reference
Output Level Range:	–110.0 dBm to –50.0 dBm in 0.5 dB steps
Output Level Accuracy:	±1.0 dB for GSM/E-GSM *(±0.6 dB typical at 25 °C)*
	±1.3 dB for DCS1800 *(±0.6 dB typical at 25 °C)*
	±1.5 dB for PCS1900 *(±0.8 dB typical at 25 °C)*
0.3 GMSK Modulation:	PN9 (with training sequence), all 0, Off (CW sinewave)
Phase Error:	*<3° rms supplemental characteristics*
Peak Phase Error:	*<6° peak supplemental characteristics*

GPRS Test (Option 040)

Specifications Unique for GPRS Measurement

Slot Configuration:	Downlink 1 × Uplink 1
	Downlink 2 × Uplink 1
Slot Order Measured:	4 (fourth)
Sensitivity Measurement:	BLER (block error rate)
Changes in Test Item Table:	Peak TX Power, Power vs Time (Burst Timing and Power Ramp can be also displayed.)
	Sensitivity: Only BLER is displayed. (BER, FER, RX Quality, and RX Level can not be displayed.)

Rear Panel

Frequency Reference

Frequency:	13 MHz
Frequency Accuracy:	±[(Time since calibration × Aging) + Temperature effects + Accuracy of calibration]
Aging:	±0.1 ppm/year
Temperature Stability:	±0.1 ppm (20 °C to 30 °C)
Reference Input:	*13 MHz, 0 to +10 dBm supplemental characteristics, 50 Ω nominal*
Reference Output:	*13 MHz, >+3 dBm supplemental characteristics, 50 Ω nominal*

Serial Interface

Interface:	EIA RS-232C
Baud Rate:	9600
Connector:	D-Sub 9-pin male

Printer Interface

Interface:	Centronics
Connector:	D-Sub 25-pin female

General Specifications

Size:	350 mm (W) × 150 mm (H) × 350 mm (D)
Weight:	10 kg ± 10%
Power Voltage:	90 V to 264 V
Power Frequency:	47 Hz to 63 Hz
Power Consumption:	≤135 VA at 100 Vac
Operating Temperature:	+15 °C to +35 °C
Storage Temperature:	–20 °C to +60°C

A General Information on the GSM System

For your reference, some major information on the GSM system is described in this appendix.

The GSM System

A GSM mobile phone transmits speech as bursts of encoded data. An RF carrier is modulated by the special form of frequency modulation known as the Gaussian Minimum Shift keying (GMSK). Signals are transmitted in short bursts (577 µs each) using the method called Time Division Multiple Access (TDMA) on Absolute RF Channels (ARFCNs) spaced 200 kHz apart.

RF Channels

The next table shows the RF channel frequencies and channel numbers for each radio standard.

	GSM900	E-GSM	DCS1800	PCS1900
Uplink	890.2 to 914.8 MHz	880.2 to 914.8 MHz	1710.2 to 1784.8 MHz	1850.2 to 1909.8 MHz
Downlink	935.2 to 959.8 MHz	925.2 to 959.8 MHz	1805.2 to 1879.8 MHz	1930.2 to 1989.8 MHz
ARFCN Range	1 to 124	0 to 124, 975 to 1023	512 to 885	512 to 810

Power Classes

The power classes are defined as follows:

	1	2	3	4	5
GSM900, E-GSM		+39 dBm	+37 dBm	+33 dBm	+29 dBm
DCS1800	+30 dBm	+24 dBm	+36 dBm		
PCS1800	+30 dBm	+24 dBm	+33 dBm		

Power Control Levels

The power control levels, RF power levels and permissible tolerances are shown below:

#	GSM900,E-GSM		DCS1800		PCS1900	
29			+36 dBm	±2 dB		
30			+34 dBm	±3 dB	+33 dBm	±2 dB
31			+32 dBm	±3 dB[a]	+32 dBm	±2 dB[a]
0	+43 dBm	±2 dB	+30 dBm	±3 dB	+30 dBm	±3 dB
1	+41 dBm	±3 dB	+28 dBm	±3 dB	+28 dBm	±3 dB
2	+39 dBm	±3 dB[a]	+26 dBm	±3 dB	+26 dBm	±3 dB
3	+37 dBm	±3 dB[a]	+24 dBm	±3 dB[a]	+24 dBm	±3 dB[a]
4	+35 dBm	±3 dB	+22 dBm	±3 dB	+22 dBm	±3 dB
5	+33 dBm	±3 dB[a]	+20 dBm	±3 dB	+20 dBm	±3 dB
6	+31 dBm	±3 dB	+18 dBm	±3 dB	+18 dBm	±3 dB
7	+29 dBm	±3 dB[a]	+16 dBm	±3 dB	+16 dBm	±3 dB
8	+27 dBm	±3 dB	+14 dBm	±3 dB	+14 dBm	±3 dB
9	+25 dBm	±3 dB	+12 dBm	±4 dB	+12 dBm	±4 dB
10	+23 dBm	±3 dB	+10 dBm	±4 dB	+10 dBm	±4 dB
11	+21 dBm	±3 dB	+8 dBm	±4 dB	+8 dBm	±4 dB
12	+19 dBm	±3 dB	+6 dBm	±4 dB	+6 dBm	±4 dB
13	+17 dBm	±3 dB	+4 dBm	±4 dB	+4 dBm	±4 dB
14	+15 dBm	±3 dB	+2 dBm	±5 dB	+2 dBm	±5 dB
15	+13 dBm	±3 dB	+0 dBm	±5 dB	+0 dBm	±5 dB
16	+11 dBm	±5 dB				
17	+9 dBm	±5 dB				
18	+7 dBm	±5 dB				
19	+5 dBm	±5 dB				

a. This shall be ±2 dB when the power level corresponds to the power class of the mobile.

RX Level

The RX levels are defined as follows:

#	RX Level	#	RX Level	#	RX Level
0	≤110 dBm	22	–89 to –88 dBm	44	–67 to –66 dBm
1	–110 to –109 dBm	23	–88 to –87 dBm	45	–66 to –65 dBm
2	–109 to –108 dBm	24	–87 to –86 dBm	46	–65 to –64 dBm
3	–108 to –107 dBm	25	–86 to –85 dBm	47	–64 to –63 dBm
4	–107 to –106 dBm	26	–85 to –84 dBm	48	–63 to –62 dBm
5	–106 to –105 dBm	27	–84 to –83 dBm	49	–62 to –61 dBm
6	–105 to –104 dBm	28	–83 to –82 dBm	50	–61 to –60 dBm
7	–104 to –103 dBm	29	–82 to –81 dBm	51	–60 to –59 dBm
8	–103 to –102 dBm	30	–81 to –80 dBm	52	–59 to –58 dBm
9	–102 to –101 dBm	31	–80 to –79 dBm	53	–58 to –57 dBm
10	–101 to –100 dBm	32	–79 to –78 dBm	54	–57 to –56 dBm
11	–100 to –99 dBm	33	–78 to –77 dBm	55	–56 to –55 dBm
12	–99 to –98 dBm	34	–77 to –76 dBm	56	–55 to –54 dBm
13	–98 to –97 dBm	35	–76 to –75 dBm	57	–54 to –53 dBm
14	–97 to –96 dBm	36	–75 to –74 dBm	58	–53 to –52 dBm
15	–96 to –95 dBm	37	–74 to –73 dBm	59	–52 to –51 dBm
16	–95 to –94 dBm	38	–73 to –72 dBm	60	–51 to –50 dBm
17	–94 to –93 dBm	39	–72 to –71 dBm	61	–50 to –49 dBm
18	–93 to –92 dBm	40	–71 to –70 dBm	62	–49 to –48 dBm
19	–92 to –91 dBm	41	–70 to –69 dBm	63	≥48 dBm
20	–91 to –90 dBm	42	–69 to –68 dBm		
21	–90 to –89 dBm	43	–68 to –67 dBm		

RX Quality

The RX quality is defined as follows:

#	RX Quality	#	RX Quality
0	<0.2%	4	1.6 to 3.2%
1	0.2 to 0.4%	5	3.2 to 6.4%
2	0.4 to 0.8%	6	6.4 to 12.8%
3	0.8 to 1.6%	7	>12.8%

Limits for BER and FER

The permissible limits for BER and FER are defines as follows:

RF Level	Mobile	BER	FER
–100 dBm	all	0.00%	
–102 dBm	P>2 W	<2.44%	
–104 dBm	P≤2W	<2.44%	<0.10%

Limits for Frequency Error

The permissible limits for the Frequency Error are defined as follows:

≤±0.1ppm

B Input Fields and Allowable Ranges

Here is a table of the input fields and allowable ranges of values for test parameters and test items. This table is also useful for configuring the Test Setup: Test Sequence and Test Setup: Test Condition screens.

Table 0-1 Input Fields and Allowable Choices or Ranges

		Radio Standard		
Test Mode	**Test Item, Parameter**	**GSM900/E-GSM**	**DCS1800**	**PCS1900**
Automatic Test, Manual Test, Spectrum Monitor, Signal Generator	BCCH (Frequency):	GSM: 1 to 124 (890.2 to 914.8 MHz), E-GSM: 0 to 124 (890.0 to 914.8 MHz), 975 to 1023 (880.2 to 889.8 MHz)	512 to 885 (1710.2 to 1784.8 MHz)	512 to 810 (1850.2 to 1909.8 MHz)
	TCH (Talk) (Frequency):	GSM: 1 to 124 (890.2 to 914.8 MHz), E-GSM: 0 to 124 (890.0 to 914.8 MHz), 975 to 1023 (880.2 to 889.8 MHz)	512 to 885 (1710.2 to 1784.8 MHz)	512 to 810 (1850.2 to 1909.8 MHz)
	Procedure:	Default [previous setting], User		
	Multi Band:	OFF, DCS1800	OFF, GSM900, E-GSM	OFF
	DC Power:	Off, On, Auto [only for Automatic Test]; 3.0 to 11.0 V in 0.1 V steps		
	Variable:[a]	TCH, DC Power		
	TCH 1 to 6 or DCP 1 to 6	GSM: 1 to 124, E-GSM: 0 to 124, 975 to 1023	512 to 885	512 to 810
		3.0 to 11.0 V in 0.1 V steps		
Manual Test	PDTCH (Frequency): [GPRS mode]	GSM: 1 to 124 (890.2 to 914.8 MHz) E-GSM: 0 to 124 (890.0 to 914.8 MHz), 975 to 1023 (880.2 to 889.8 MHz)	512 to 885 (1710.2 to 1784.8 MHz)	512 to 810 (1850.2 to 1909.8 MHz)
	Signal: SYNC mode ASYNC mode GPRS mode	Burst [fixed] Burst, CW Burst [fixed]		
	Timing ADV: [SYNC and GPRS modes]	0 to 63 bits		
	PWR CNTL:	2: +39 dBm to 19: +5 dBm	29: +36 dBm to 15: 0 dBm	30: +33 dBm to 15: 0 dBm
	BS Level:	–110.0 to –50.0 dBm		
	Slot Config: [GPRS mode]	Downlink 1 × Uplink 1, or Downlink 2 × Uplink 1		
	Measured Slot: [GPRS mode]	4 (fourth)		

	Sensitivity: [GPRS mode]	BLER (FER, BER, RX Quality, and RX Level can not be displayed.)		
	Midamble: [ASYNC mode]	TSC0 to TSC7, or None (amplitude triggering)		
	Averaging:	Off, 2 to 99		
	Span:	0-400 kHz (fixed)		
	RBW:	10, 30 (kHz)		
Spectrum Monitor	Channel (Frequency):	GSM: 1 to 124 (890.2 to 914.8 MHz) E-GSM: 0 to 124 (890.0 to 914.8 MHz), 975 to 1023 (880.2 to 889.8 MHz)	512 to 885 (1710.2 to 1784.8 MHz)	512 to 810 (1850.2 to 1909.8 MHz)
	Measurement Range:	–3, +9, +19, +29, +39 dBm		
	Span:	0–400, ±100 (kHz)		
	RBW:	10, 30 (kHz)		
	Averaging:	Off, 2 to 99		
	DC Power:	Off, On; 3.0 to 11.0 V in 0.1 V steps		
Signal Generator	Channel (Frequency):	GSM: 1 to 124 (935.2 to 959.8 MHz), E-GSM: 0 to 124 (935.0 to 959.8 MHz), 975 to 1023 (925.2 to 934.8MHz)	512 to 885 (1805.2 to 1879.8 MHz)	512 to 810 (1930.2 to 1989.8 MHz)
	Level:	–110.0 to –50.0 dBm in 0.5 dB steps		
	RF Output:	Off, On		
	Modulation:	Off, PN9, All_0		
	DC Power:	Off, On; 3.0 to 11.0 V in 0.1 V steps		
Configuration	Baud Rate:	9600 (fixed)		
	Data Length:	7, 8		
	Stop Bits:	1, 1.5, 2		
	Parity:	None, Odd, Even		
	Xcontrol:	None, Xon/Xoff		
	Terminator:	CR, LF, CR+LF		
	Printer:	HP PCL, ESC/P		
	Beeper:	Off, On		
	Panel Key:	Lock, Unlock		
	13 MHz Reference:	INT, EXT		
	Option:	002, 040 [for example]		

	Attenuation: RF In: RF Out:	Off, On 0.0 to 99.9 dB in 0.1 dB steps 0.0 to 99.5 dB in 0.5 dB steps		
	Network Config:	0 to 999 (MCC), 0 to 99 (MNC), 0 to 7 (NCC), 0 to 65535 (NCC), 2 to 9 (BS_PA)		
	Date/Time:	1990 to 2089 (YYYY), 01 to 12 (MM), 01 to 31 (DD) 00 to 23 (HH), 00 to 59 (MM)		
	Firmware: Update: New Firmware:	X.XX.XX Off, On Y.YY.YY [when Update is On]		
Configuration: Condition	MS Power Class:	2 to 5	1 to 3	1 to 3
	PWR CNTL High: Mid: Low: Manual Test:	2: +39 dBm to 19: +5 dBm	29: +36 dBm to 31: +32 dBm, 0: +30 dBm to 15: 0 dBm	30 +33 dBm to 31: +32 dBm, 0: +30 dBm to 15: 0 dBm
	Averaging:	Off, 2 to 99		
	RF Output:	Auto, On		
	BS Level:	–110.0 to –50.0 dBm in 0.5 dB steps		
	BER BS Level:	–110.0 to –50.0 dBm in 0.5 dB steps		
	BER Frames:	1 to 13000 frames in 1 frame steps [# of bits shown]		
	Loopback Delay:	Short, Mid, Long		
	Limit Setting:			
	Peak TX Power:	Template, or –99.9 to +99.9 dB in 0.1 dB steps		
	PWR CNTL[a]	2: +39 dBm to 19: +5 dBm	29: +36 dBm to 31: +32 dBm, 0: +30 dBm to 15: 0 dBm	30 +33 dBm to 31: +32 dBm, 0: +30 dBm to 15: 0 dBm
	Burst Timing:	–9.9 to +9.9 bits in 0.1 bit steps		
	Power Ramp:	Template		
	Phase Error RMS/Peak:	0.0 to 99.9 ° in 0.1 ° steps		
	Frequency Error:	–999 to + 999 Hz in 1 Hz steps		
	BER:	0.00 to 99.99% in 0.01% steps		
	FER:	0.00 to 99.99% in 0.01% steps		
	BLER:	0.00 to 99.99% in 0.01% steps		
	RX Quality:	0: < 0.2%, 1: 0.2 to 0.4%, ..., 6: 6.4 to 12.8%, 7: > 12.8%		
	RX Level:	0: < –110 dBm, 1: –110 to –109 dBm, ..., 62: –49 to –48 dBm, 63: > –48		
	DC Current Camp On: Talk:	3 to 1000 mA in 1 mA steps 3 to 1000 mA in 1 mA steps		

Configuration: Sequence	Test Steps: 1. LOC. Update: 2. 1st Call: 3. Talk: 4. RF Test: 5. 1st Release: 6. 2nd Call: 7. 2nd Release:	Run, --- MS, BS Run, --- (no entry required) MS, BS (determined by step 2) BS, MS (determined by step 2); Run, --- BS, MS (determined by step 2); Run, --- (determined by step 6)		
	BCCH (Frequency):	GSM: 1 to 124 (890.2 to 914.8 MHz), E-GSM: 0 to 124 (890.0 to 914.8 MHz), 975 to 1023 (880.2 to 889.8 MHz)	512 to 885 (1710.2 to 1784.8 MHz)	512 to 810 (1850.2 to 1909.8 MHz)
	TCH (Talk) (Frequency):	GSM: 1 to 124 (890.2 to 914.8 MHz), E-GSM: 0 to 124 (890.0 to 914.8 MHz), 975 to 1023 (880.2 to 889.8 MHz)	512 to 885 (1710.2 to 1784.8 MHz)	512 to 810 (1850.2 to 1909.8 MHz)
	Multi Band:	OFF, DCS1800	OFF, GSM900, E-GSM	OFF
	DC Power:	Off, On, Auto (only for Automatic Test); 3.0 to 11.0 V in 0.1 V steps		
	Variable:	TCH, DC Power		
	TCH 1 to 6 or DCP 1 to 6	GSM: 1 to 124, E-GSM: 0 to 124, 975 to 1023	512 to 885	512 to 810
		3.0 to 11.0 V in 0.1 V steps		

a. Valid only for AUTOMATIC TEST

C Manual Changes

Introduction

This appendix contains revision notes for adapting the information in this guide to correspond to the Test Set units that were manufactured before this guide was printed.

Serial Numbers

The serial number of your Test Set is marked on the serial number plate attached to the rear panel.

Manual Changes

After reviewing Table C-1, write in this user's guide the necessary changes from the revision notes that correspond to the serial number of your Test Set.

Table C-1 Serial Number and Changes

Serial Prefix or Number	Changes
JP3MG	1
JP5MG	1 and 2

Change 1

"Phase and Frequency Error Measurement" on page 177

Change the "Frequency Error Measurement Accuracy" as follows:

Frequency Error Measurement Accuracy:	For GSM900/E-GSM at <33 dBm input at 25 ± 5 °C: ±(12 Hz + frequency reference accuracy) *[±(8 Hz + frequency reference accuracy) typical]*
(average of 10 measurements)	For DCS1800/PCS1900 at <30 dBm input at 25 ± 5 °C: ±(25 Hz + frequency reference accuracy) *[±(15 Hz + frequency reference accuracy) typical]*

Change 2

"MANUAL TEST (GPRS Mode)" on page 118

This section is added to make manual tests on the general packet radio service (GPRS) if the Test Set is installed with Option 040.

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