Hughes Cell Site Test Software
HP 11807B Option 045
Software User's Guide
for the HP 8921A

HP Part No. 11807-90142
Printed in U. S. A.
March 1996

Rev A

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1

Product Description

HP 11807B Software

The HP 11807B Option 045 Software performs accurate, repeatable, automated tests that determine the RF performance for the commissioning of Hughes GMH 2000 AMPS Base Transceiver Stations.

Test Set or Test System is Defined As (One of the Following):

- HP 8921A Cell Site Test Set (firmware revision above A.14.00 is highly recommended)
- HP 8921D Cell Site Test System
- HP 8921A, Option 500, Dual-Mode Cellular Test System

Items Supplied in the Software Package

The HP 11807B Option 045 Software Package contains the following items:

- HP 11807B Option 045 Software card part number HP 11807-10039
- HP 11807B Option 045 Software User's Guide part number HP 11807-90142
- A cable used to connect a serial printer to the serial port part number HP 08921-61038
- 128 Kbyte SRAM memory card for storing customized test programs and results. This card must be initialized, see**"Memory Cards" in chapter 6** for the initialization procedure, part number HP 85702A

Equipment Needed

- You will need one of the following:
  - HP 8921A Cell Site Test Set (firmware revision above A.14.00 is highly recommended)
  - HP 8921D Cell Site Test System
  - HP 8921A, Option 500, Dual-Mode Cellular Test System
- T1 Tester
- Hughes LMT software revision 1.6.
- *Optional:*
  - Printer and printer connection cable for documenting test results.
  - PC, disk drive, or HP Palmtop and appropriate connection cable for storing test results.

Software Functions:

Using the HP 11807B Option 045 Software you can test:

- Cable Loss
- Swept Return Loss
- Discrete Channel Return Loss
- Cable Fault vs Distance
- TX MIN/MAX Output Power
- TX Output Power
- TX Frequency
- TX Frequency Deviation/Audio Level
- TX SAT Frequency and Deviation
- TX Maximum Voice Deviation
- TX Path Insertion Loss (for NGA)
- SCA Frequency Response & MIN/MAX
- RX Sensitivity/SINAD
- RX Deviation/Audio Level
- RX RSSI
- RX Path Gain
- RX Path Insertion Loss

For a full list of Tests and descriptions, see **chapter 5, "Test, Procedure, Parameter, and Pass/Fail Limit Descriptions"**.

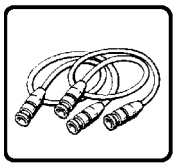
Software Features

The following features simplify testing:

- System interconnects are graphically shown on the Test Set CRT display.
- Results of tests and pass/fail indications are displayed on the Test Set CRT, and can be printed, or collected in an HP Palmtop, PC or terminal, disk drive or memory card.
- The software allows the operator to change the TEST sequence, channels, pass/fail limits (specifications), parameters and equipment configurations.
- RF path losses can be determined and corrected.
- Demo mode, to observe the test environment without connecting to a base station (set parm ZZ Demo to 1=demo).
- The user has the option to repeat a test on failure (as many times as desired), or continue testing.
- Tests can be run to measure cable fault and cable loss.

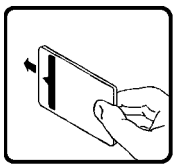
Finding the Information You Need

This manual describes the setup and use of the HP 11807B Software with the Test Set. The book is arranged in self contained chapters to meet the following objectives:



CONNECTIONS-CHAPTER 2

- Instructions for cabling test set.



USING THE SOFTWARE-CHAPTER 3

- How to load
- How to run
- How to customize
- Conceptual overview

TEST DESCRIPTIONS-CHAPTER 5

Definitions, special conditions and restrictions for:

- Tests
- Specifications-Pass/fail limits
- Parameters-Test conditions

REFERENCE-CHAPTER 6

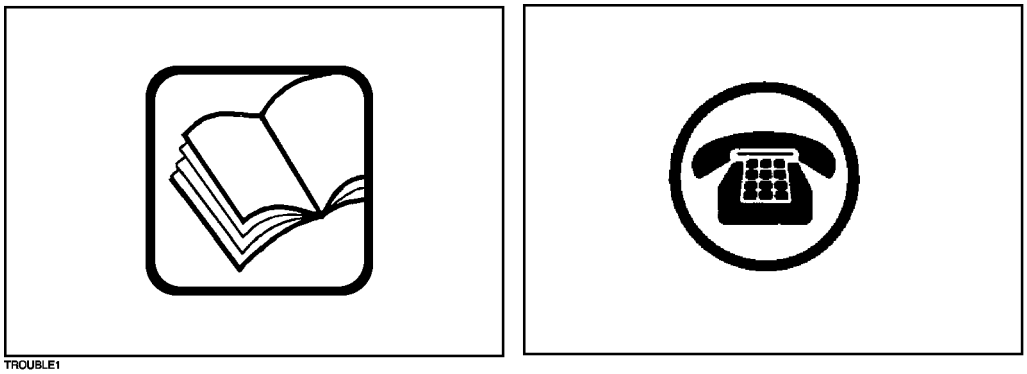
- Alphabetically listed
- Detailed descriptions of all the features and functions of the HP 11807B software.
- For the advanced level user.

PROBLEM SOLVING-CHAPTER 7

- Alphabetically listed
- Symptoms and possible corrections to frequent user problems.

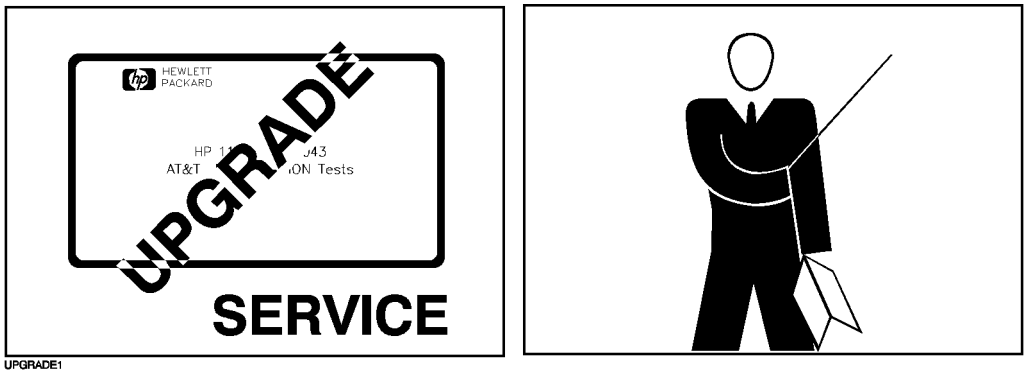
MANUAL1

Additional Services Available



TROUBLE1

Consult the Test Set User's Guide or call the HP 8921A Hotline 1-800-922-8920 (USA and Canada only) and give your software model number if you encounter a problem.



UPGRADE1

Contact your local HP Sales Representative for information about the Software Upgrade Service and the Start Up Assistance Training Course.

2

Making Connections

This chapter describes how to:

- make connections to the Hughes GMH 2000 BTS.
- determine path losses.

Equipment Needed

The following equipment is needed for testing:

- Hughes GMH 2000 BTS to test
- One of the following:
  - HP 8921A Cell Site Test Set (with appropriate firmware revision, described below)
  - HP 8921D Cell Site Test System
  - HP 8921A, Option 500, Dual-Mode Cellular Test System
- T1 test set
- LMT
- Cables and Connectors (described below)

Test Set Firmware

The HP 8921A firmware revision number must be A.08.00 or higher (although A.14.00 or higher is recommended). You can determine the revision of the firmware by pressing SHIFT CONFIG on the HP 8921A front panel. The revision number will be displayed in the CONFIGURE screen.

Cables and Connectors

For RF tests, use cables and adapters supplied by Hughes Network Systems or recommended in the Hughes GMH 2000 Base Transceiver Station Commissioning Test Procedure manual.

CAUTION: **Damage to Equipment**

The Test Set and other equipment in this test system can be damaged by transient RF power, continuous RF power, high voltage, electrostatic discharge from cables and other sources, and transients caused by lightning. Connections to equipment and power-on conditions must be chosen to reduce the risk of damage to the equipment.

The following cables are needed for Cable Fault, Cable Loss and Return Loss Tests.

Table 1 Cables/Adapters Needed

Description	Purpose	Quantity	Part Number
SWR bridge Type N(m)	For all VSWR measurements	1	Eagle[1] RLB150N3B or equivalent
BNC(m) to BNC(m) cable, 1 ft	SWR bridge source input/reflected out to Test set DUPLEX OUT and ANT IN	2	HP 08120-1838
N(m) to BNC(f) adapter	Adapter for Test Set RF IN/OUT connector for the SWR bridge and power divider	2	HP 1250-0780
6 dB Pad, BNC(f) to BNC(m)[2] or a	SWR bridge and cable loss matching to Test Set matching	2	HP 0955-0698
3 dB Pad Atten Coax 1 W[3]	SWR bridge and cable loss matching to Test Set matching	2	Mini-Circuits[4] CAT-3
50 Ω termination connector type as required	Termination for cable-under-test	1	None
Resistive power splitter 1 GHz, BNC(f), 3 dB	For cable fault locations	1	HP 0955-0733

1. Eagle, P.O. Box 4010, Sedona, AZ 86340, (Tel: 520-204-2597) (Fax: 520-204-2568)
2. A 3 dB pad may also be used for testing.
3. A 6 dB pad may also be used for testing.
4. Mini-Circuits, P. O. Box 350166, Brooklyn, NY 11235-0003, (Tel: 718-934-4500)

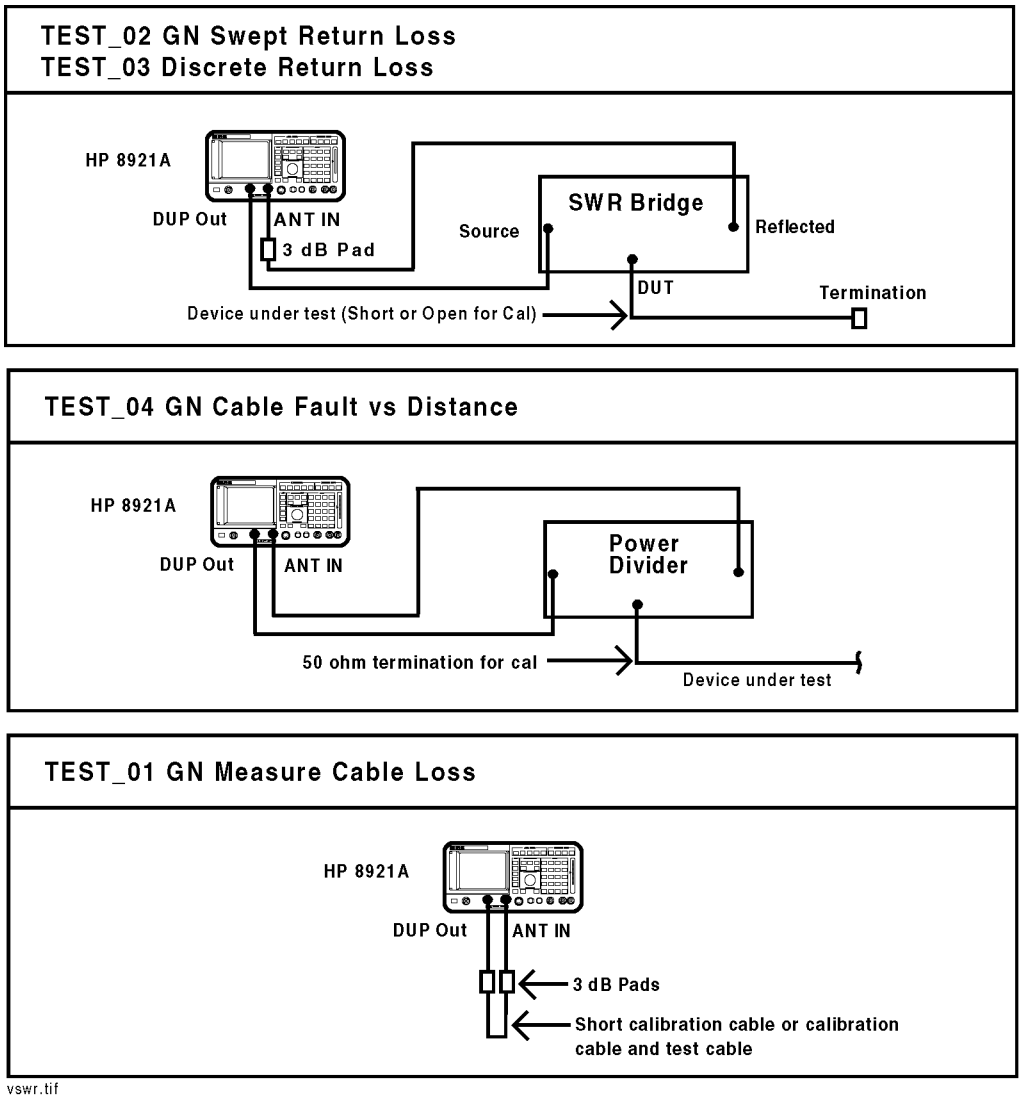
Determining Calibration Parameters

The accuracy of RF power measurements and receiver sensitivity measurements is affected by the loss of the cables connecting the transceiver and the Test Set. It is important therefore that the appropriate calibration factors are used. **TEST_01 - GN Measure Cable Loss** can be used to measure the calibration factors for the RX and TX path losses.

After running this test you must save the results to be used later in the RF tests:

- To save results as an RX loss, press k2 (**`RX loss`**).
- To save results as a TX loss, press k3 (**`TX loss`**).

If you do not wish to save the test results, press k1 (**`Not save`**).



vswr.tif

Figure 1 **Cable Fault, Cable Loss, and Return Loss Measurements Connections**

BTS Equipment Connections

Many arrangements of the test equipment and Hughes BTS equipment are possible. In this manual the following options are presented:

- Test setup for the HP 11807B Option 045 RF tests.
- Test setup for the HP 11807B Option 045 ATC power measurement (after testing the last channel for a TX chain).

After you set up your system, you must calibrate some system components. Tests should be run with the equipment connected the same way it was calibrated. See **"Determining Calibration Parameters" on page 26** in the previous section.

CAUTION: **Damage to the DUPLEX OUT Port**

The application of RF power greater than 200 mW (+23 dBm) can damage the test set DUPLEX OUT port. Be certain that signals applied to this port are less than 200 mW. If an RF power higher than about 200 mW is applied, an overpower relay will trip. Press MEAS RESET or turn the Test Set power off and on to reset it. To minimize the risk of high power being applied to the DUPLEX OUT connector, do not use a Type N to BNC adapter on the RF IN/OUT connector.

CAUTION: **Damage to the RF IN/OUT Port**

The application of RF power greater than 60 W can damage the test set RF IN/OUT port. Be certain that signals applied to this port are less than 60 W. Note that up to 100 W is acceptable for a 10 seconds/minute duty cycle.

RF Connections

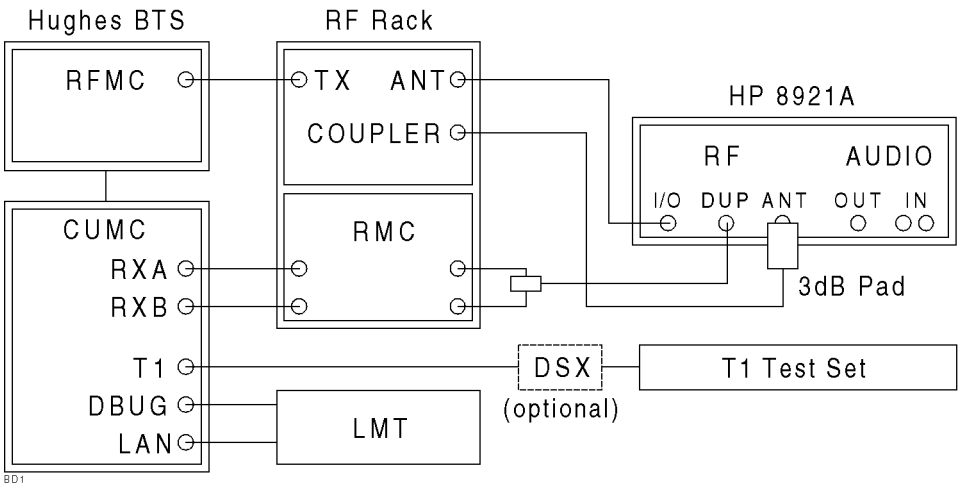


Figure 2 **HP 11807B Option 045 RF Connections**

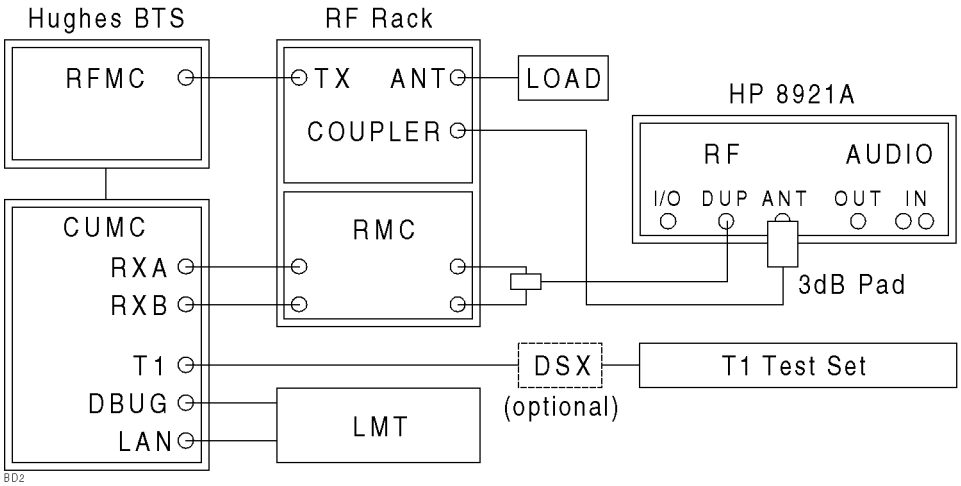


Figure 3 **HP 111807B Option 045 Power Measurement Connections**

Serial Port and Printer Connections

Serial Port Connections for Data Collection

The HP 11807B Option 045 software has the capability to save test results to an external computer via the test set serial port. See **table 2, "Data Entry Fields" on page 91** for information on how to configure the test set for this function.

The following pins are used by the Serial port:

- RJ-11 Pin 2 - Test Set Receive data
- RJ-11 Pin 4 - Ground
- RJ-11 Pin 5 - Test Set Transmit data

See **figure 4 on page 31**. The transmit data line (pin 5) for the Serial port is just below the uppermost pin on the RJ-11 connector on the rear panel of the Test Set.

Printer Connection

See "Printing," in chapter 6, on page 160 for information on how to set up the Test Set.

An HP-IB printer can be connected to the Test Set rear-panel HP-IB connector.

Serial Connection

A serial printer can be attached to the serial port. See f**figure 4 on page 31**. Use the following RJ-11 pins for this connection. This connection can be made with serial cable, part number HP 08921-61038 and is included with your software.

- RJ-11 Pin 2 - Test Set Receive data
- RJ-11 Pin 4 - Ground
- RJ-11 Pin 5 - Test Set Transmit data

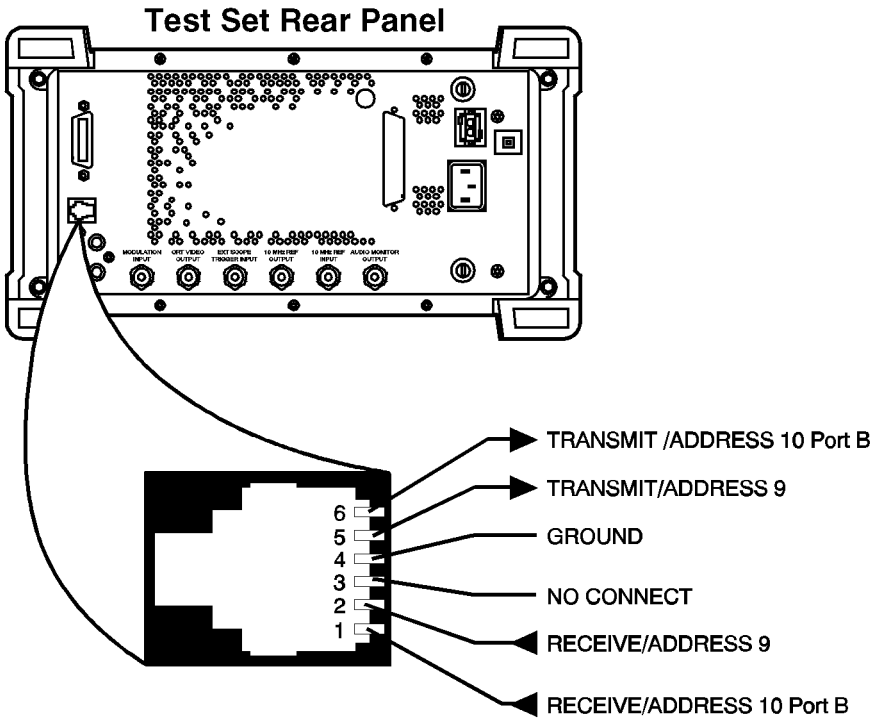


Figure 4 **Test Set RF-11 Serial Port Connections**

Parallel Connection

A parallel printer can be connected to the parallel port. Use the following **figure 5** for pin information. This cable may be ordered through Hewlett-Packard using part number HP 24542D.

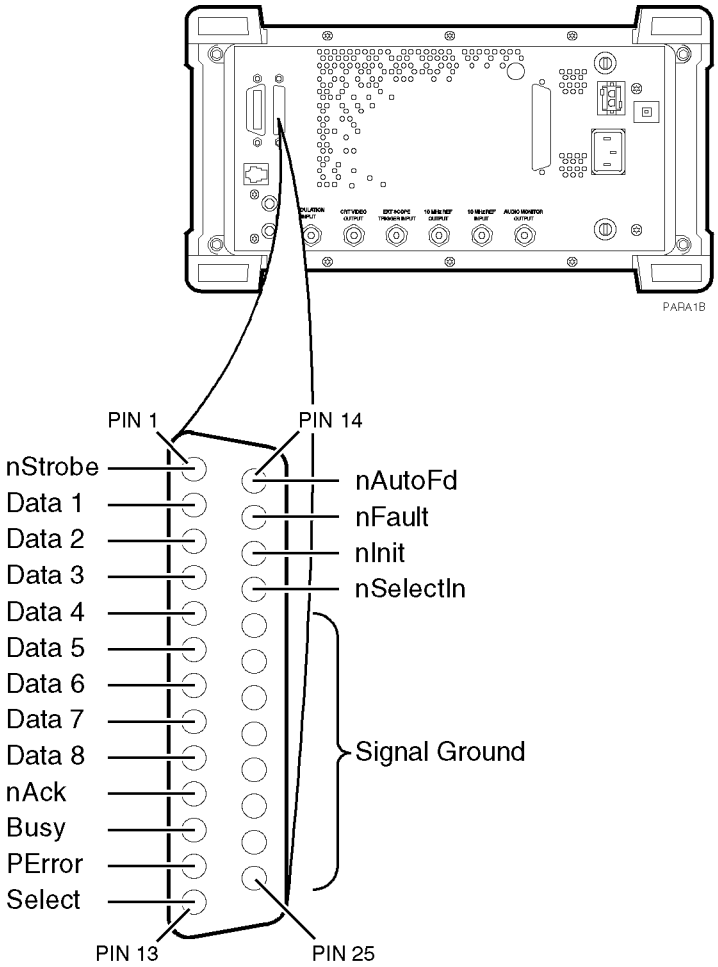


Figure 5 **Test Set Parallel Port Connections**

3

Using the Software with FW Above Rev. A.14.00

Firmware Enhancements

NOTE: The firmware revision A.14.00 in the HP 8921A and HP 8921D had several enhancements. This chapter applies to users with:

- **HP 8921A test sets with firmware revision above A.14.00**

The Test Set's firmware revision is displayed on the top right corner of the configuration screen.

- Press SHIFT CONFIG to display the configuration screen and read the firmware revision.

If you have an HP 8921A Test Set with firmware revision below A.14.00, refer to **chapter 4, "Using the Software with FW Below Rev. A.14.00," on page 61**. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired

Test Set or Test System is Defined As (One of the Following):

- HP 8921A Cell Site Test Set (firmware revision above A.14.00 is highly recommended)
- HP 8921D Cell Site Test System
- HP 8921A, Option 500, Dual-Mode Cellular Test System

Introduction

The software can be run on the factory default settings or customized to your individual needs and specific requirements. This chapter provides detailed information on how to load, run, and customize the software.

The Test Set has two methods of accessing on-line help. In each of the screens in the test environment, k4 (**Help**) accesses specific information about how to set up/use the current screen. SHIFT HELP accesses the master help file, with an alphabetical listing of help topics.

Testing Overview

Pressing TESTS will display what is called the TESTS (Main Menu) screen. To begin testing, you must first load the software and make connections. From this screen you have the option to:

Begin running tests:

- The factory default settings are acceptable for your application or
- The software has already been customized and saved to a memory card

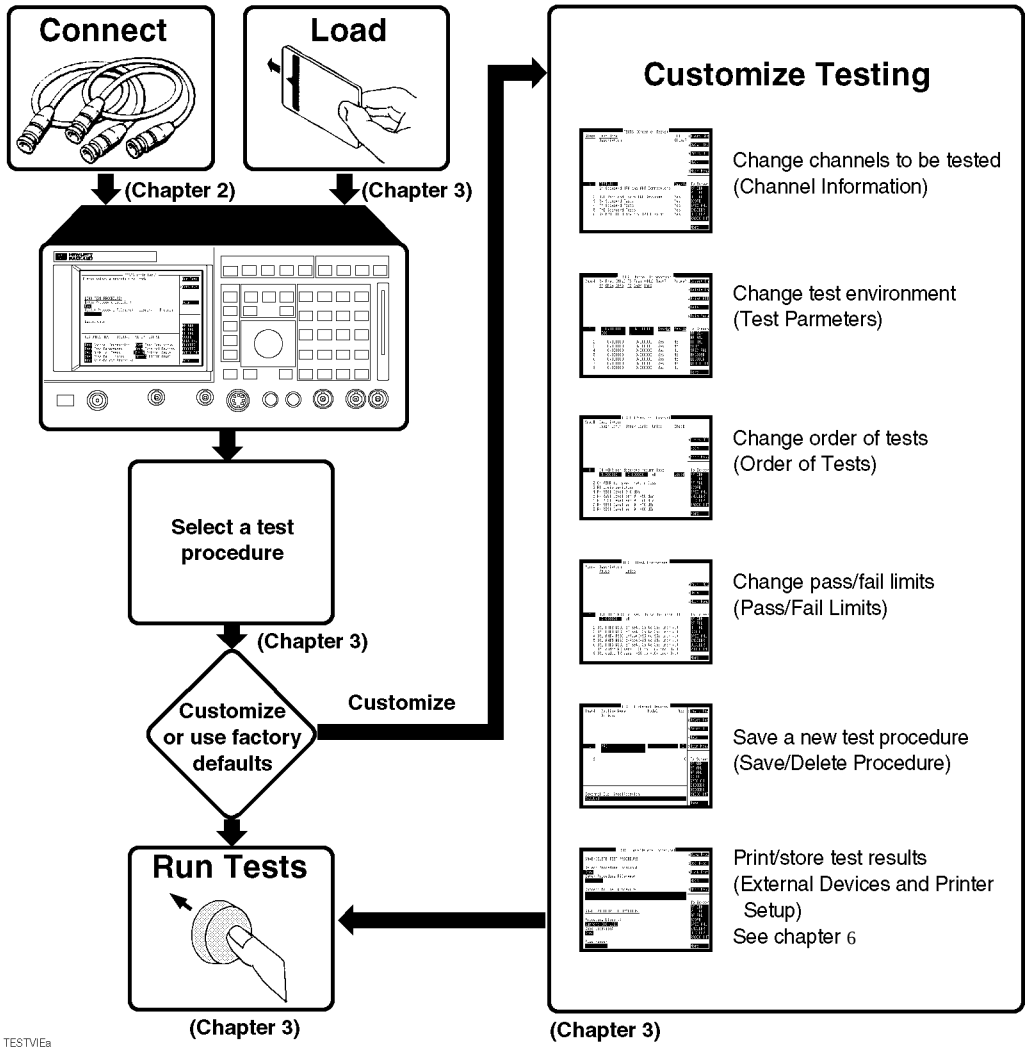
Customize the software:

- Decide which tests you desire to run (Order of Tests)
  - you may want to run all, some, or just one of the tests.
- Change the pass/fail limits for specific measurements (Pass/Fail Limits)
  - you may want the pass/fail limits to have tighter or looser specifications than the default settings.
- Change the test environment and conditions (Test Parameters)
  - decide output format.
  - enter specific information about radio equipment and/or environment.
- Save any or all of the above customized changes to a memory card (Save/Delete Procedure)

Set Up Test Set:

- Print test results or certain screens.
- Decide when and where test results are displayed (**`Test Execution Conditions/External Devices`**)

To Run Tests


Connect
Load
(Chapter 2)
(Chapter 3)
Select a test procedure
(Chapter 3)
Customize or use factory defaults
Customize
Run Tests
(Chapter 3)
TESTVIEa
Customize Testing
Change channels to be tested (Channel Information)
Change test environment (Test Parmeters)
Change order of tests (Order of Tests)
Change pass/fail limits (Pass/Fail Limits)
Save a new test procedure (Save/Delete Procedure)
Print/store test results (External Devices and Printer Setup)
See chapter 6
(Chapter 3)

Running Tests

Before you begin to load the software and run tests, you should have made the appropriate hardware connections. **See chapter 2, "Making Connections"** if you have not done so already.

The HP 11807B Software may be run with its factory default settings, or it may be customized to your specific needs (see **"Customizing Testing" on page 42**).

When TESTs begin to run, they are executed in the order in which they were entered into the Test Procedure.

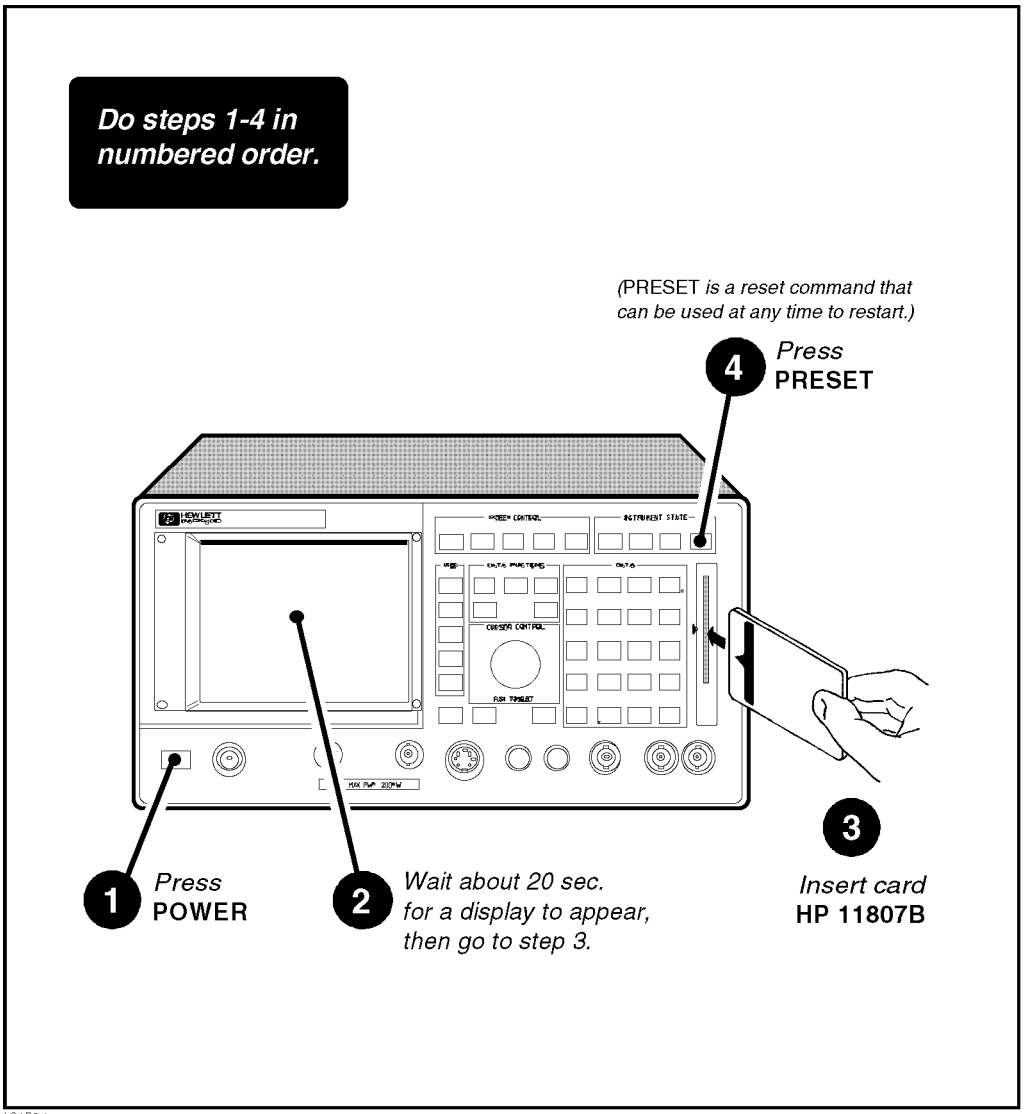
- Pressing CANCEL will pause the current test (press k2 (**`Continue`**)) to continue the test).

Loading the Software

Before you begin testing, you must load the software into the test set memory. To load the software, you must first select the location to load from (in this case, it will be **Card**) and a procedure filename. Your card comes pre-programmed with at least one procedure. The actual software program does not get loaded into the Test Set memory until k1 (**Run Test**) is selected. It will take approximately two minutes for the software program to be loaded at that time.

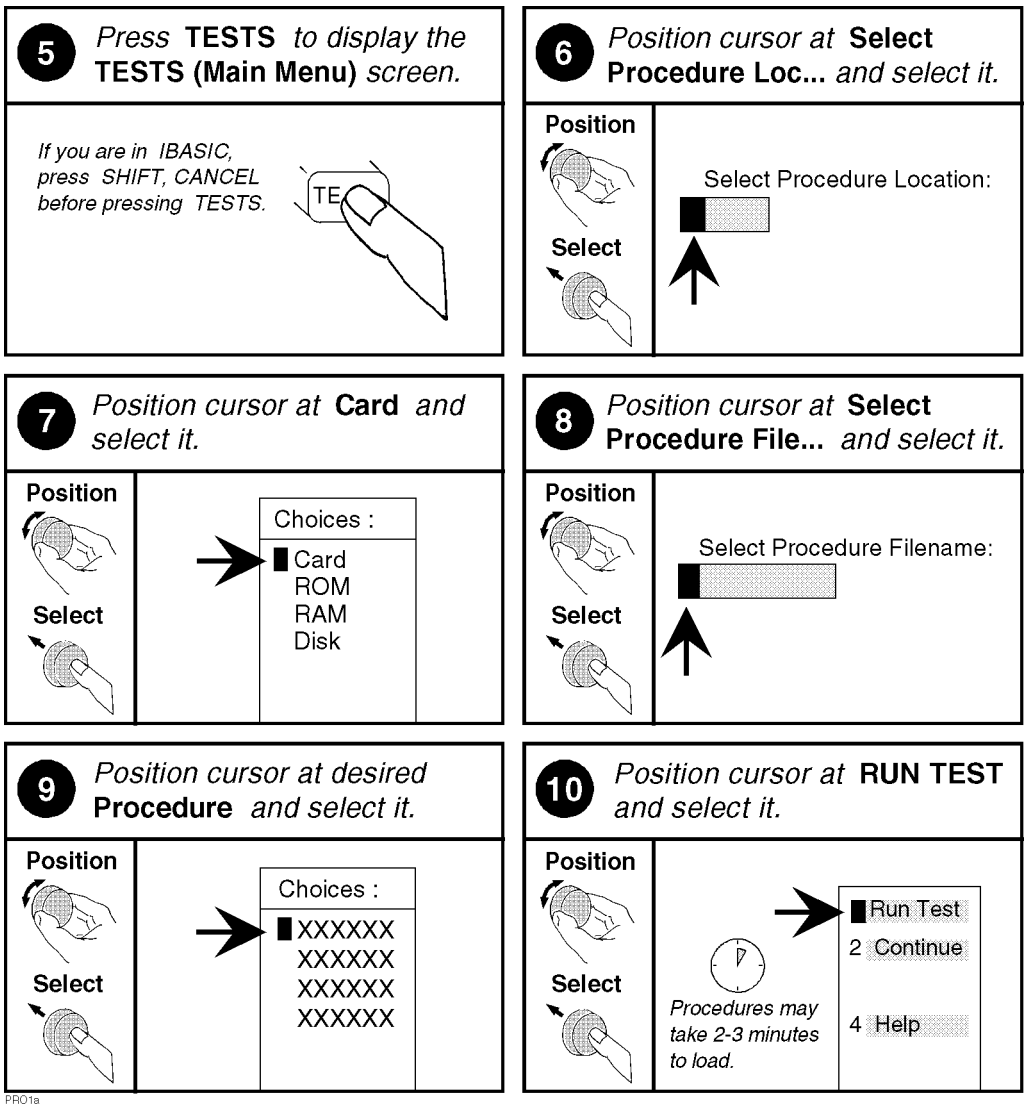
The software memory card can be removed after the program is loaded into the Test Set memory. The program will remain in memory after a power-down/ power-up cycle, unless it is manually deleted or a new program is loaded.

Starting Up



LOAD3-1

Continue on next page


5 Press TESTS to display the TESTS (Main Menu) screen.
If you are in IBASIC, press SHIFT, CANCEL before pressing TESTS.
TE
6 Position cursor at Select Procedure Loc... and select it.
Position
Select
Select Procedure Location:
7 Position cursor at Card and select it.
Position
Select
Choices :
Card
ROM
RAM
Disk
8 Position cursor at Select Procedure File... and select it.
Position
Select
Select Procedure Filename:
9 Position cursor at desired Procedure and select it.
Position
Select
Choices :
XXXXXX
XXXXXX
XXXXXX
XXXXXX
10 Position cursor at RUN TEST and select it.
Position
Select
Procedures may take 2-3 minutes to load.
Run Test
2 Continue
4 Help
PRO1a

Customizing Testing

Because of the diversity of individual testing needs, the software has been designed so that changes may be easily made from the Test Set's front panel. You may store these changes on a memory card so that you may skip these steps in the future. See **"Saving a Test Procedure" on page 53**.

Because your needs change, the software allows changes to its default settings whenever you need to make them. For example, tests may be inserted or deleted, and later after running the tests you can change the pass/fail limits or decide to test different channels.

Most testing customization is accomplished through the customization screens. These customization screens are accessed from the main TESTS (Main Menu) screen as shown in the following figure. Customizing procedures is explained later in this chapter.

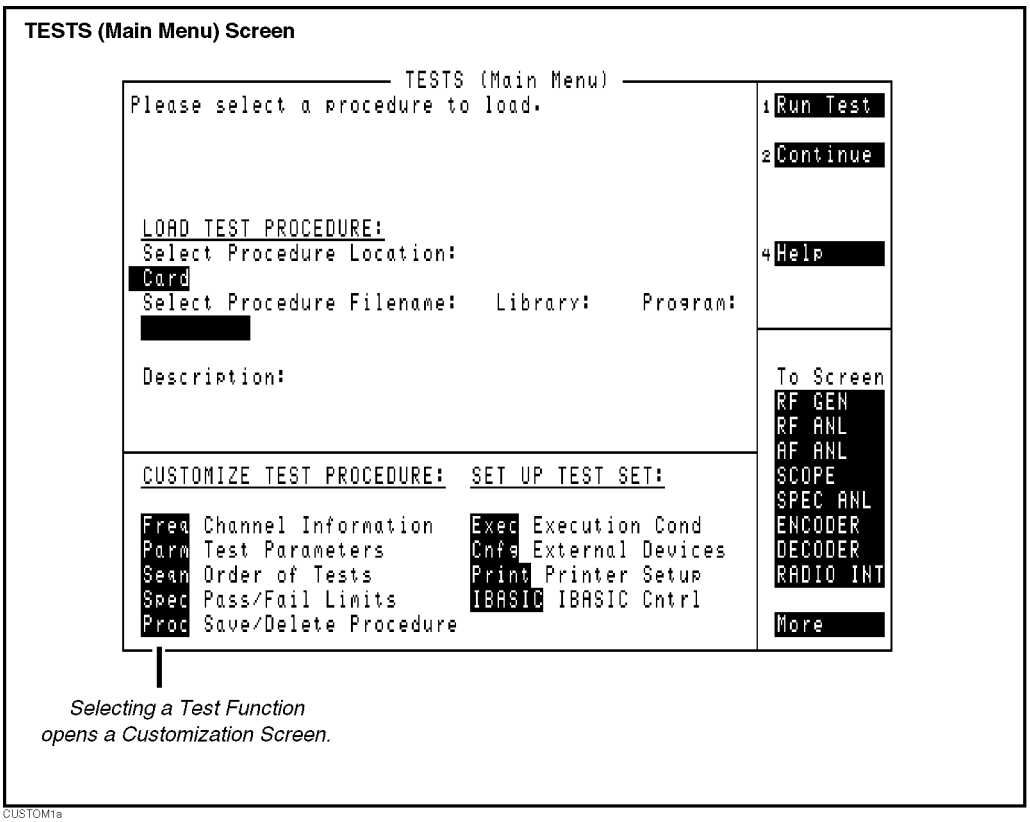
NOTE: External Devices, Printer Setup, and IBASIC will not be explained in this customizing section.

- External Devices is used when setting up functions such as data collection or message logging. **See "Data Collection (Saving and Retrieving Test Results)," in chapter 6, on page 149**.
- Printer Setup is used to print the test results. **See "Printing," in chapter 6, on page 160**.
- IBASIC is used when writing your own programs and is not explained in this manual. If you need to write your own IBASIC programs you may acquire the following manuals:
  - 8921A,D
    - *HP Instrument Basic User's Handbook* HP part number E2083-90000.
    - *HP 8921 Programming Manual* HP part number 08920-90031.

Beginning Software Customization

All software customization begins by accessing the TESTS (Main Menu) screen first and then selecting the **CUSTOMIZE TEST PROCEDURE** filed of your choice. Press TESTS on the front panel of the Test Set to access the TESTS (Main Menu) screen.

TESTS (Main Menu) Screen



Selecting a Test Function opens a Customization Screen.

CUSTOM1a

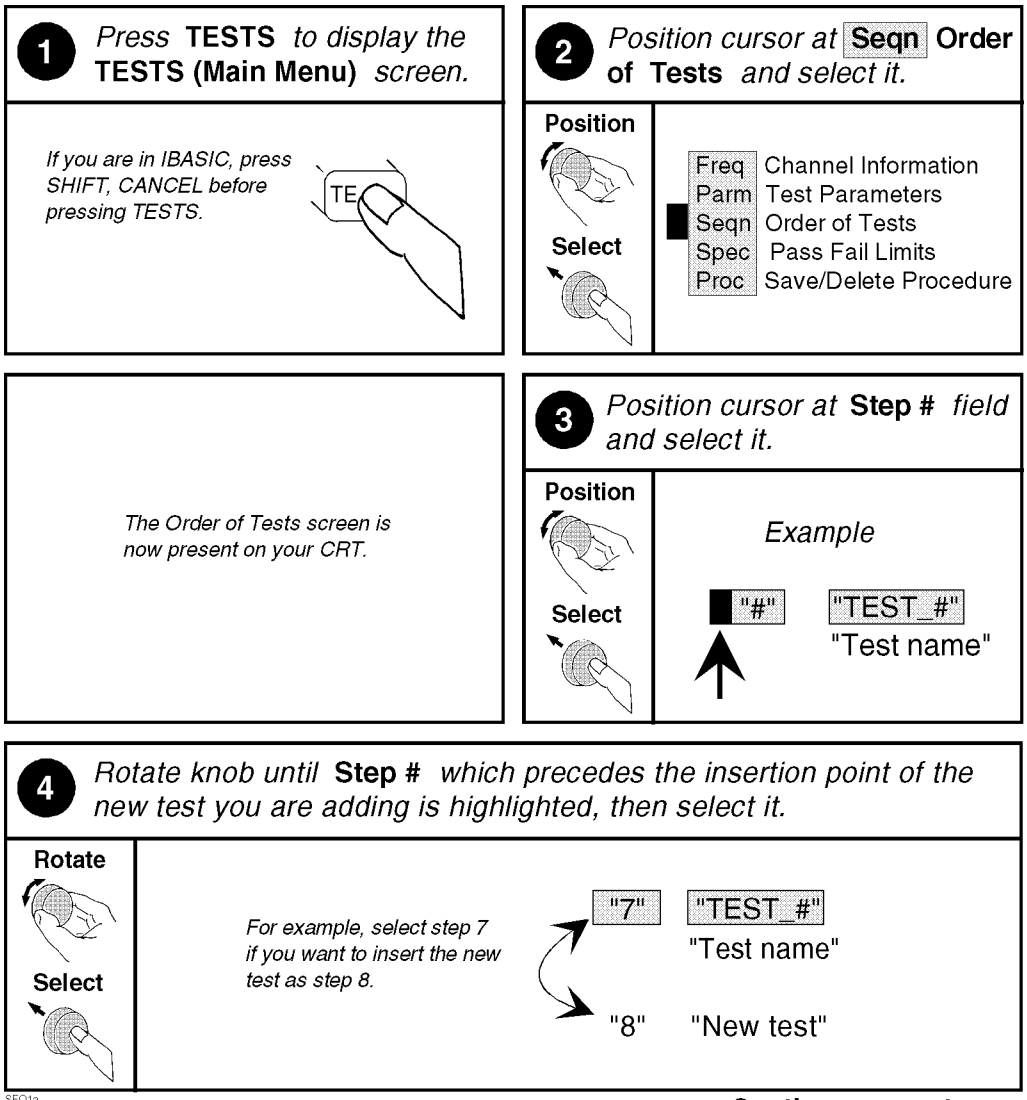
Changing the Order of Tests

You may define the order of tests to include all, some, or just one of the tests available. When the first test is finished, the next will run. The test sequence will remain in the Test Set's battery backed-up memory until another test sequence is loaded or set up. For information on saving a customized test sequence, see **"Saving a Test Procedure" on page 53**.

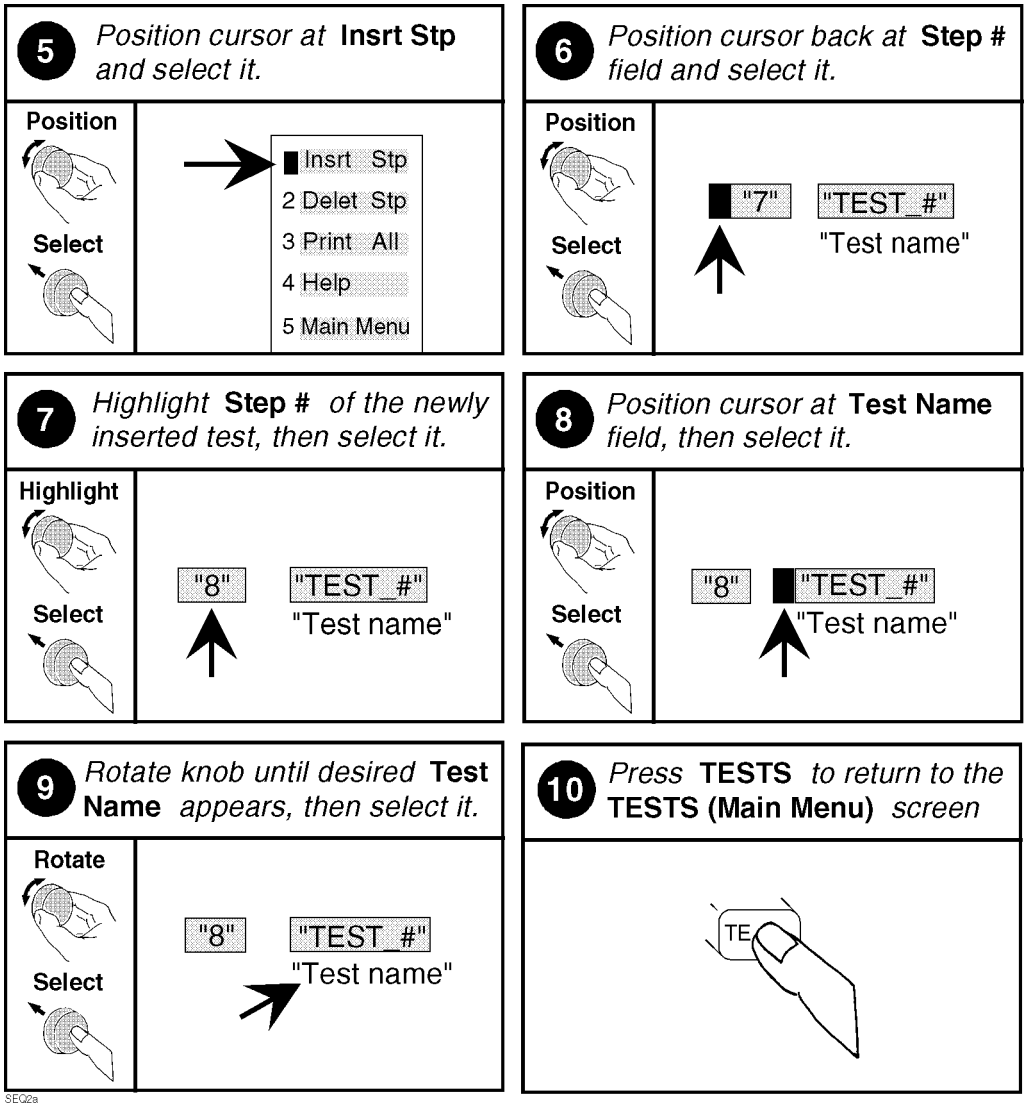
Defining the order of tests is accomplished by inserting or deleting tests from the list of tests that come with the software package. **See "Pass/Fail Limit (Specification) Descriptions," in chapter 5, on page 140**, for descriptions of tests included in this package.

The following describes how to create a new test sequence. The **`All Chans`** field is not used by this software package.

How to Change the Order of Tests



Continue on next page

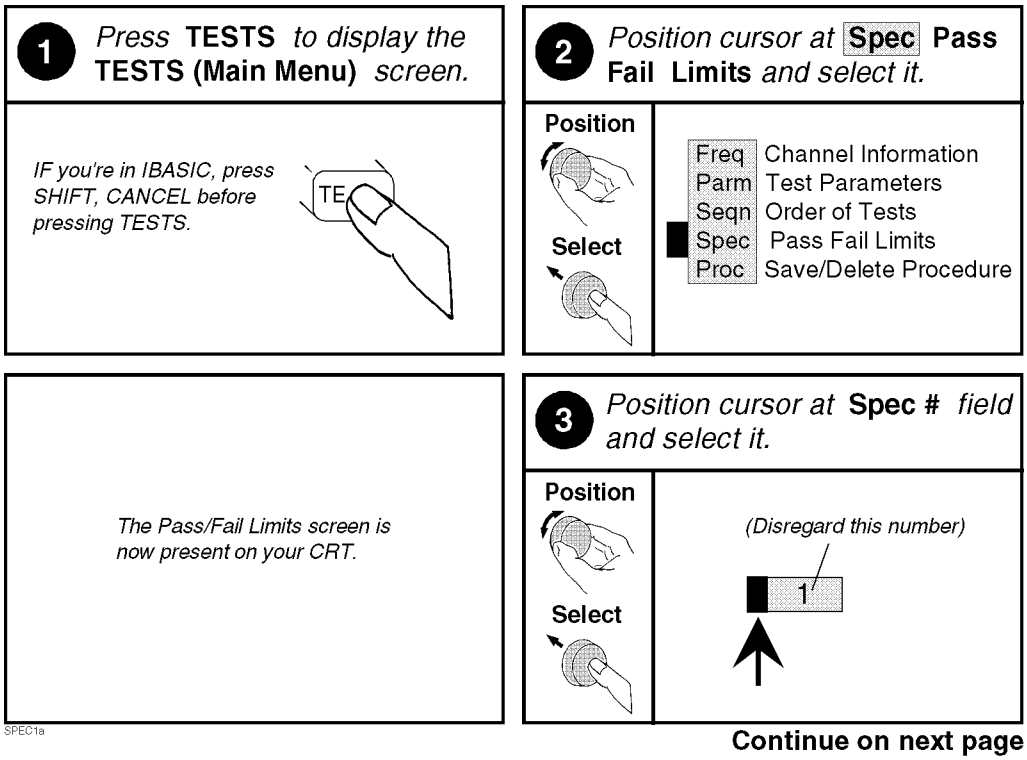

5
Position cursor at Insrt Stp and select it.
Position
Select
Insrt Stp
2 Delet Stp
3 Print All
4 Help
5 Main Menu
6
Position cursor back at Step # field and select it.
Position
Select
"7"
"TEST_#"
"Test name"
7
Highlight Step # of the newly inserted test, then select it.
Highlight
Select
"8"
"TEST_#"
"Test name"
8
Position cursor at Test Name field, then select it.
Position
Select
"8"
"TEST_#"
"Test name"
9
Rotate knob until desired Test Name appears, then select it.
Rotate
Select
"8"
"TEST_#"
"Test name"
10
Press TESTS to return to the TESTS (Main Menu) screen
TE
SEQ2a

Changing Pass/Fail Limits

Pass/Fail limits define the values a measurement's result is compared against to determine if the UUT meets its specified standards. Default values are set in the test software. These default values may be changed to suit your particular requirements.

The following describes how to change the pass/fail (upper and lower) limits. **See "Pass/Fail Limit (Specification) Descriptions," in chapter 5, on page 140** for descriptions of each pass/fail limit. For information on saving customized pass/fail limits, see **"Saving a Test Procedure" on page 53**.

How to Change Pass/Fail Limits



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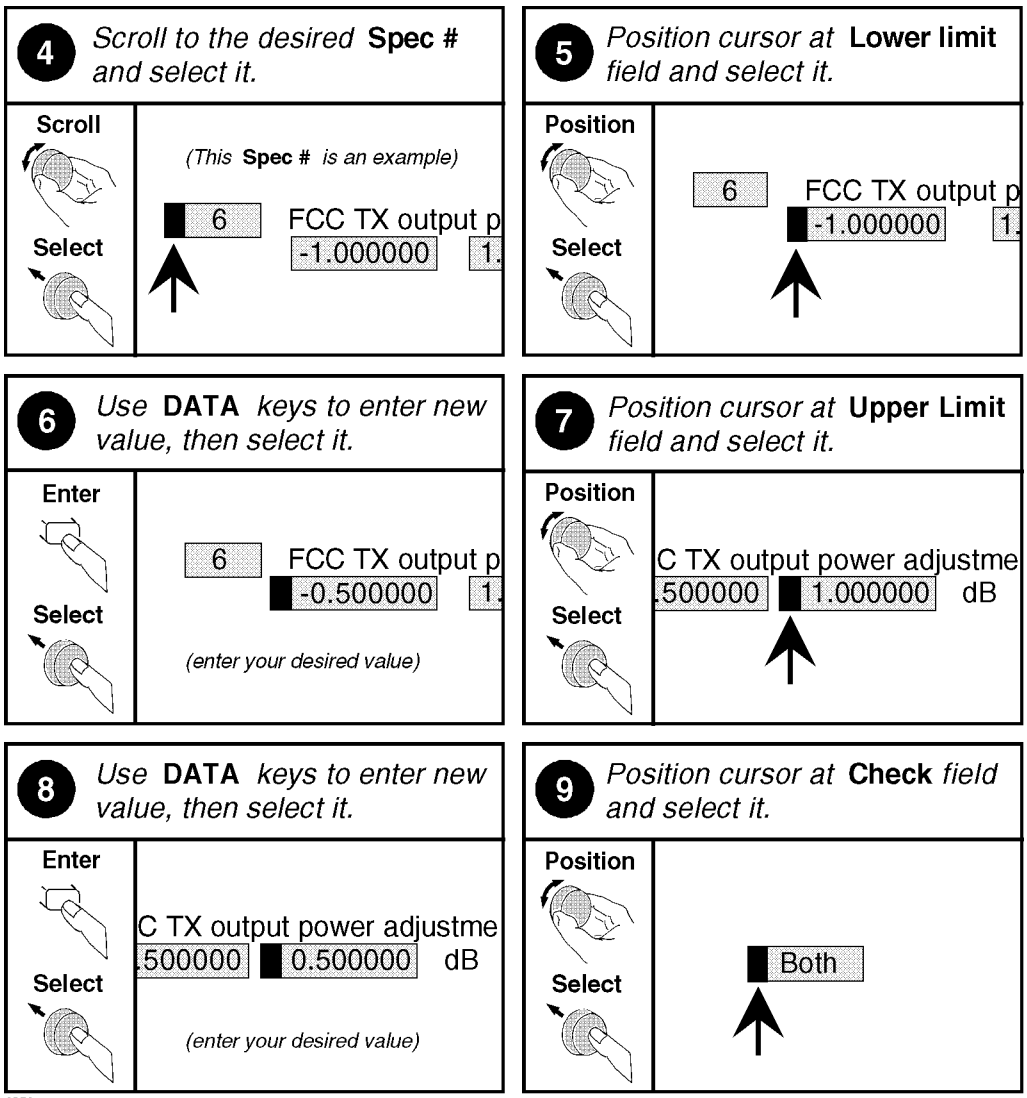
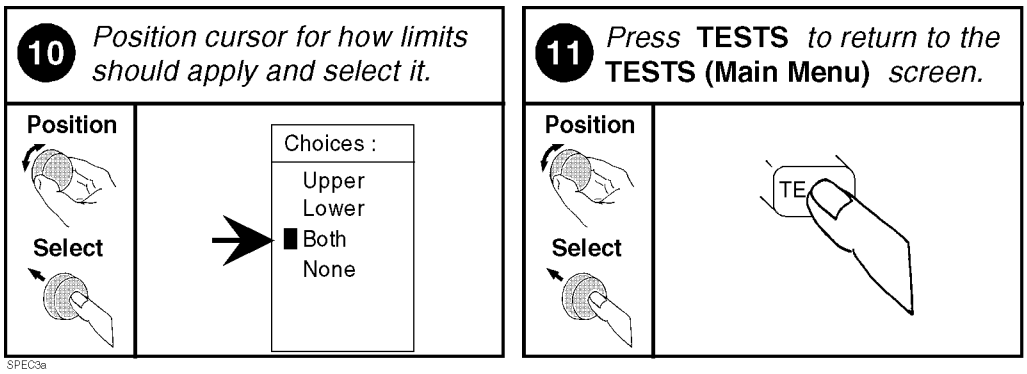


SPEC2a

Continue on next page

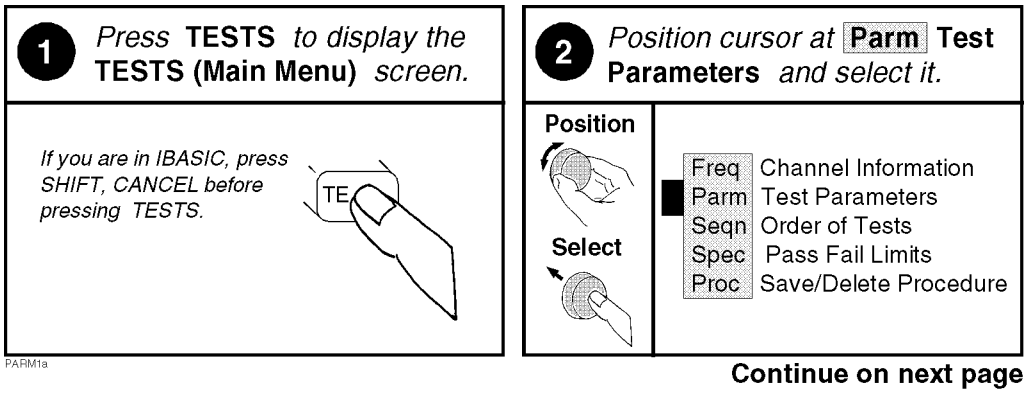

10
Position cursor for how limits should apply and select it.
Position
Select
Choices :
Upper
Lower
Both
None
11
Press TESTS to return to the TESTS (Main Menu) screen.
Position
Select
TE
SPEC3a

Changing the Test Parameters

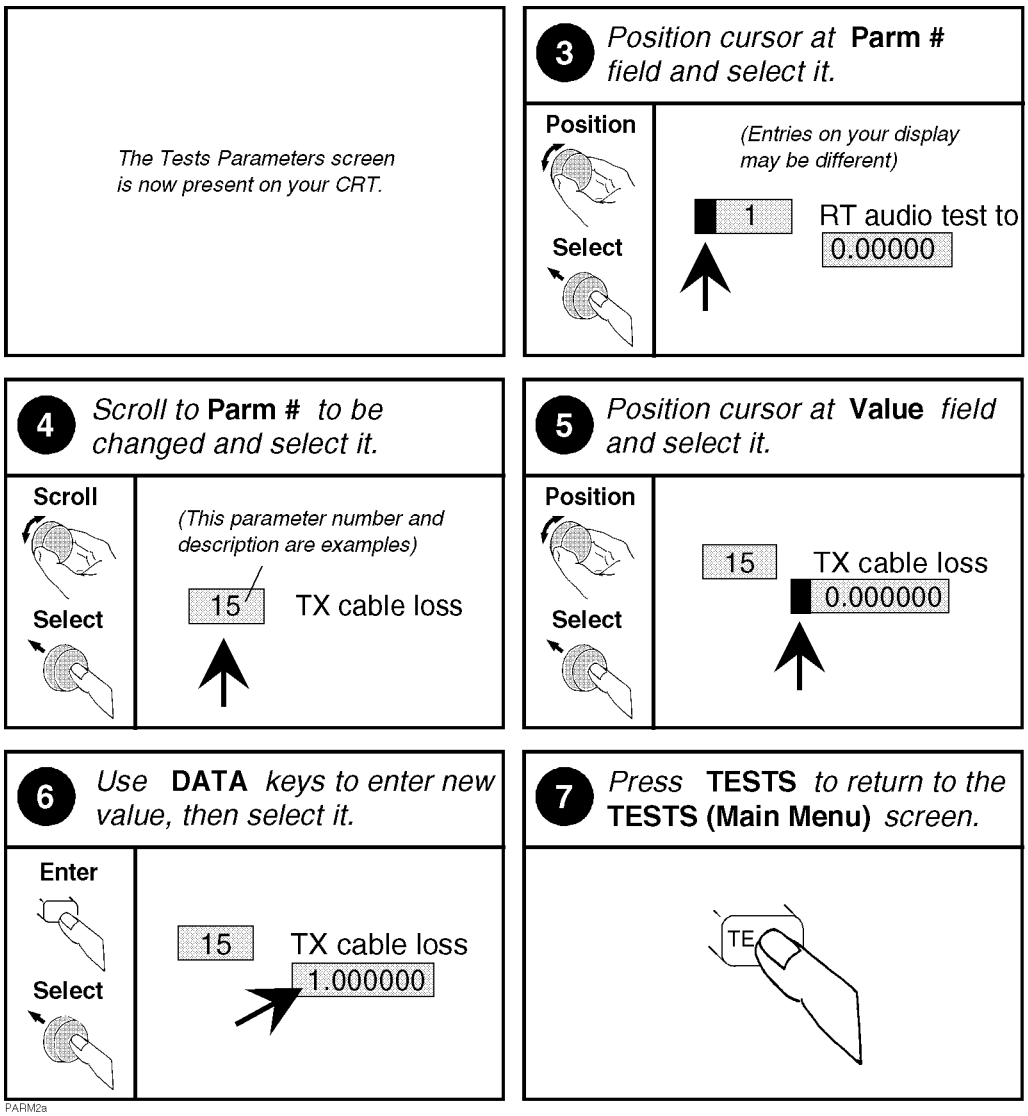
The software uses parameters to optimize the test environment and conditions for your testing situation. Many of the test parameters are determined by examining your test needs. The software comes with default settings for test parameters. Review the defaults for your particular needs. **See "Pass/Fail Limit (Specification) Descriptions," in chapter 5, on page 140** for descriptions of each test parameter. For information on saving customized test parameters, see **"Saving a Test Procedure" on page 53**.

The following describes how you can change test parameters through the Test Parameter screen to optimize your testing conditions.

How to Change the Test Environment and Conditions



Continue on next page

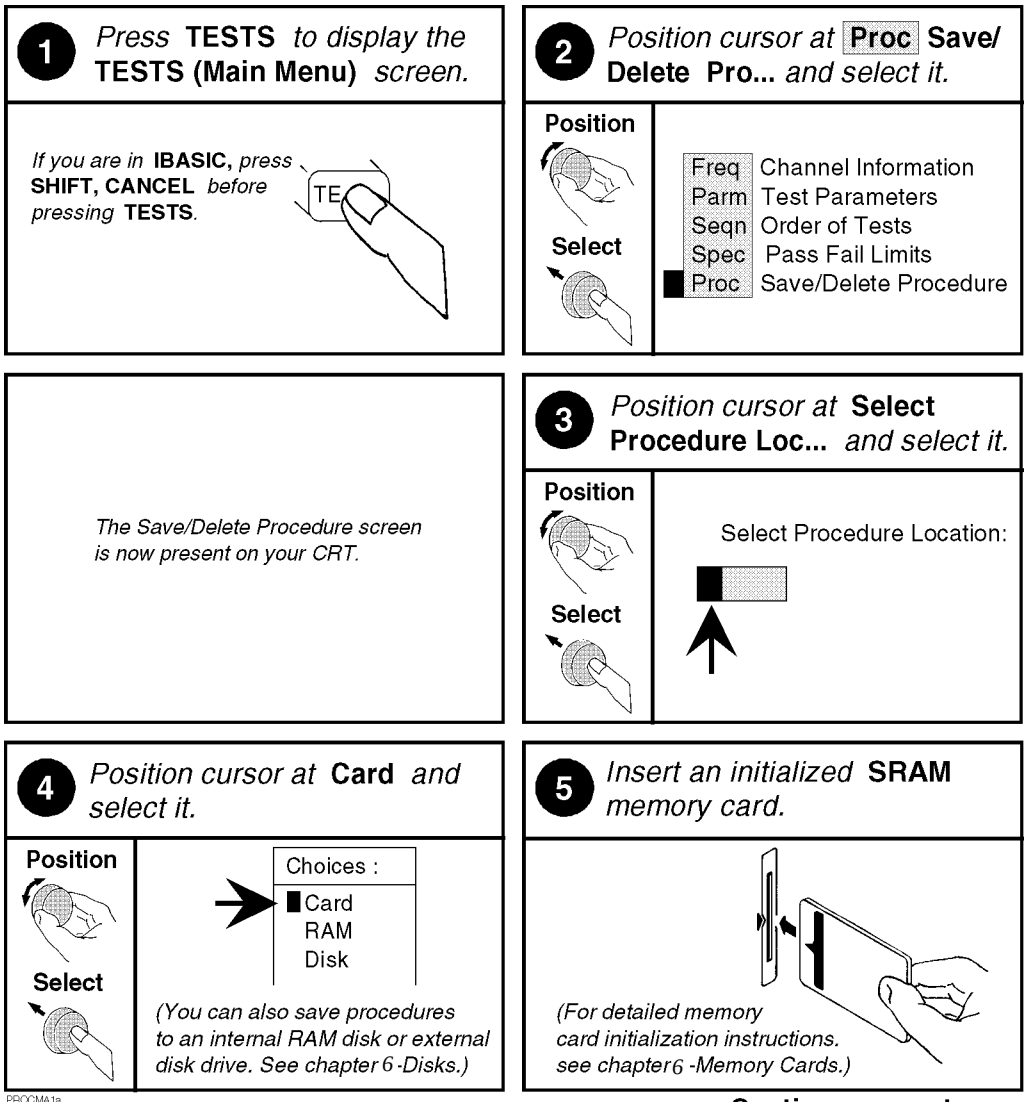

The Tests Parameters screen is now present on your CRT.
3 Position cursor at Parm # field and select it.
Position
Select
(Entries on your display may be different)
1
RT audio test to
0.00000
4 Scroll to Parm # to be changed and select it.
Scroll
Select
(This parameter number and description are examples)
15
TX cable loss
5 Position cursor at Value field and select it.
Position
Select
15
TX cable loss
0.000000
6 Use DATA keys to enter new value, then select it.
Enter
Select
15
TX cable loss
1.000000
7 Press TESTS to return to the TESTS (Main Menu) screen.
TE
PARM2a

Saving a Test Procedure

A Test Procedure is a collection of channel information, test parameters, testing order, and pass/fail limits saved in a file that customizes the test software to a specific application. You may save the file to a memory card or disk. When you save a procedure you will be saving channel information, test parameters, pass/fail limits, and testing order, plus a library that contains the names of all test parameters, pass/fail limits, and tests that are resident in the software. The library file comes from the software and cannot be modified. The library file will be automatically saved on the card or disk that is being used to store the new test procedure.

The following example shows how to save a new procedure to a memory card. For more information concerning procedures, **see "Procedures," in chapter 6, on page 172**.

How to Save a Test Procedure



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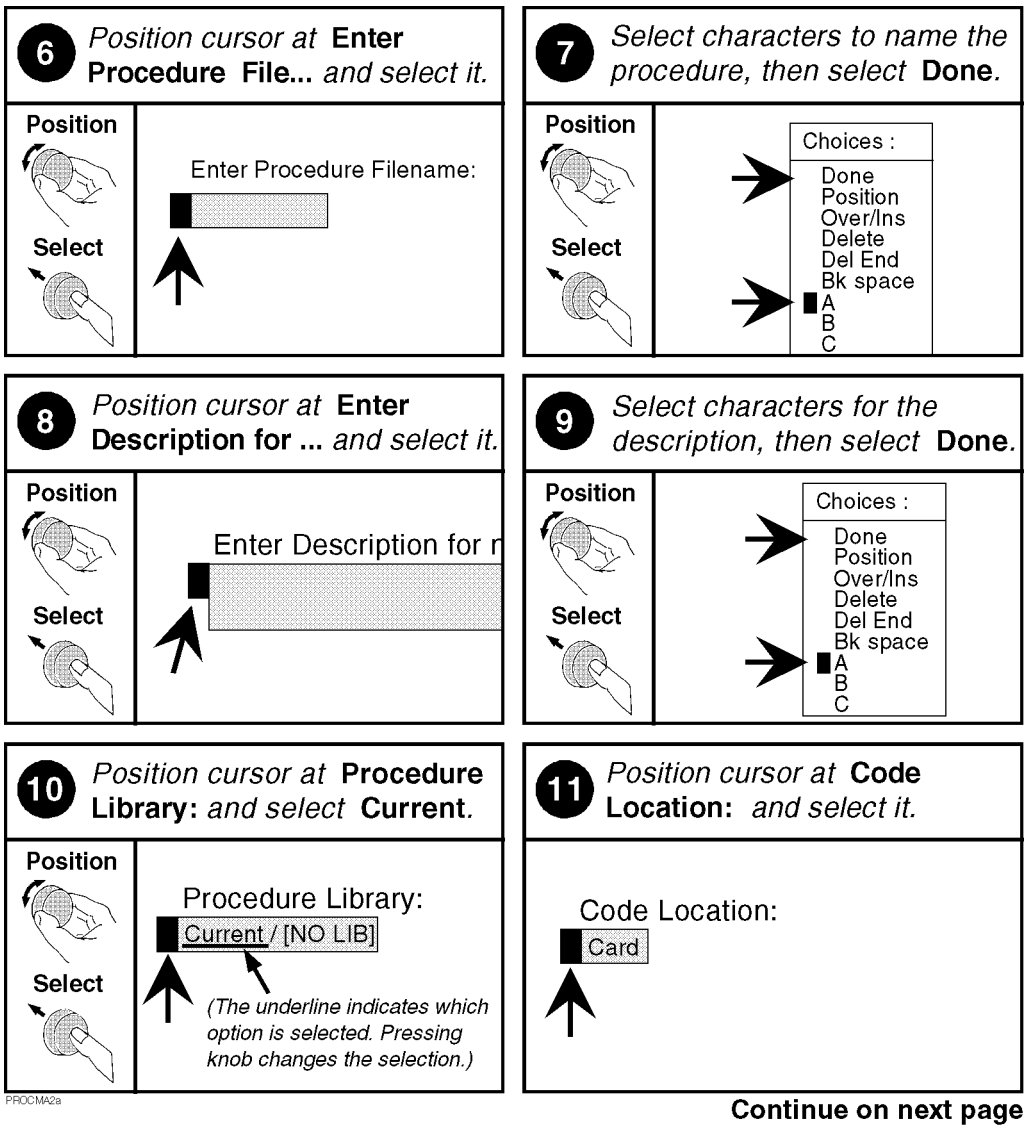
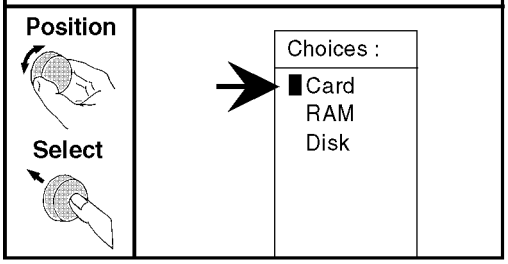
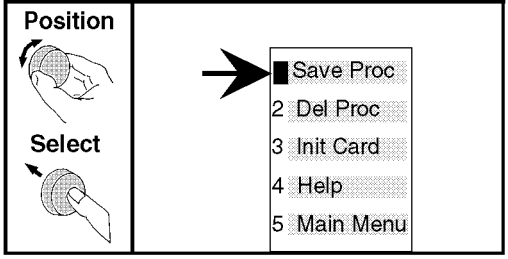


Continue on next page

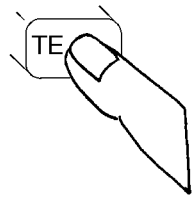
12 *Position cursor at* **Card** *and select it.*



13 *Position cursor at* **Save Proc** *and select it.*



14 *Press* **TESTS** *to return to the* **TESTS (Main Tests)** *screen.*



15 *To run the saved procedure, follow the instructions below.*

1) Insert the RAM card with your saved procedure.
2) On the **TESTS (Main Menu)** *screen, a) position cursor and select* **Select Procedure Location:,** *then select* **Card,** *b) position cursor and select* **Select Procedure Filename:,** *then select your saved file name.)*
3) Remove your RAM card and insert the original HP 11807B ROM memory card.
4) Press **Run Test** *.*

The original card contains the full program needed to run your procedure.

PROCMA3a

Changing Test Execution Conditions

Test Execution Conditions define where and when test output occurs. You may decide to:

- Display output on CRT only, or display on CRT and print hardcopy. (**Output Results To**)

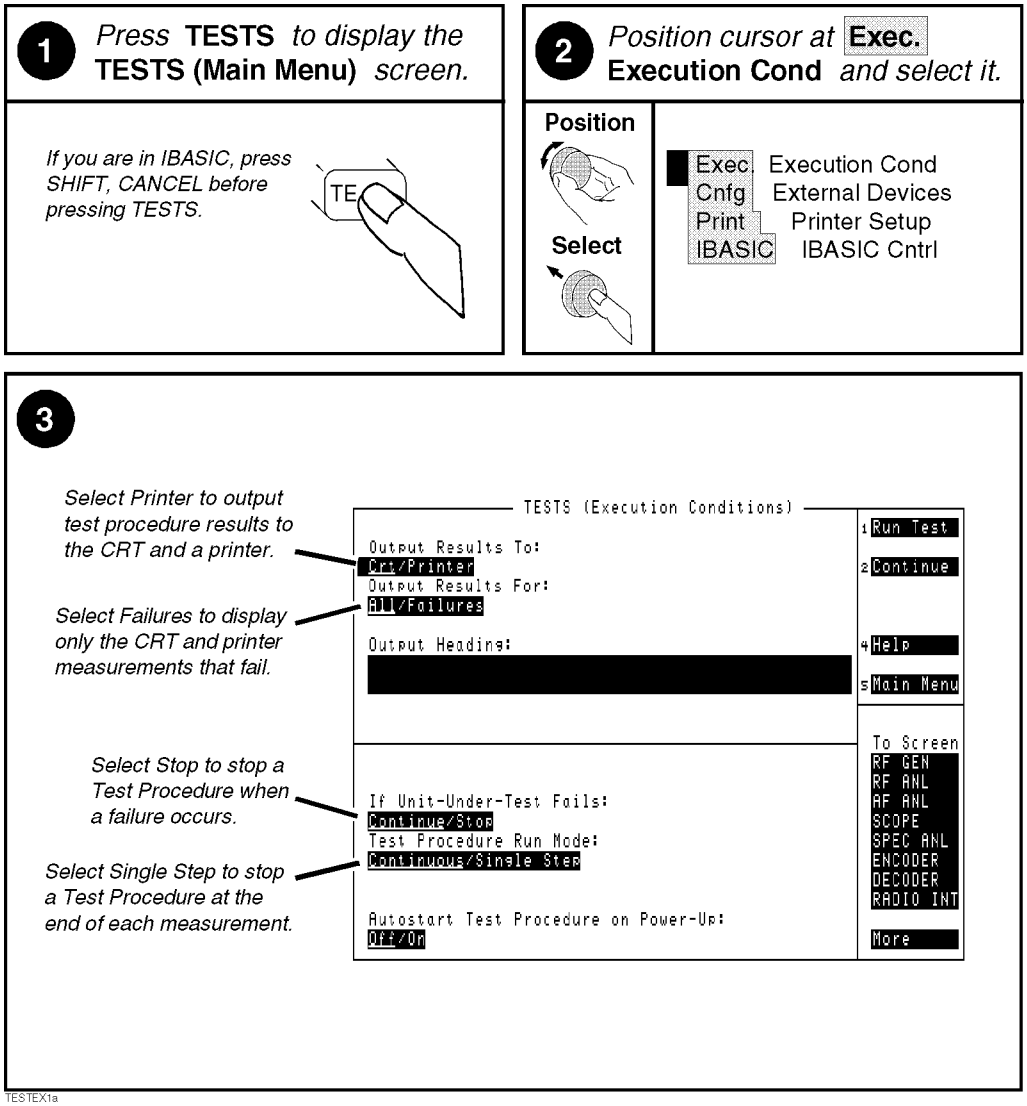
NOTE: If printing test results is desired, after selecting **Printer** additional steps are necessary to connect and configure the printer. **See "Printing," in chapter 6, on page 160**.

- Display (or print) only measurements that fail, or display (or print) all measurements that pass or fail. (**Output Results For**)
- Enter a title for an output heading for the displayed or printed results. (**Output Heading**)
- Stop testing when a measurement fails or continue through all of the tests without stopping. Note: if **Stop** is selected and the program pauses as a result of this, you will be given a choice to continue testing or repeat the measurement. (**If Unit-Under-Test Fails**)
- Pause between each measurement, or run through entire test. Note: if **Single Step** is selected and the program pauses as a result of this, you will be given a choice to continue testing or repeat the measurement. (**Test Procedure Run Mode**)
- Start the program automatically when the Test System is powered on. (**Autostart Test Procedure on Power-up**)

Test Execution Conditions is accessed from the **SETUP TEST SET:** list. To change a default setting, position the cursor to the desired field. Pressing the knob (”selecting”) will toggle the underlined selection.

Test Execution Conditions settings are not retained after a power-down/ power-up cycle, and will return to their default settings.

How to Change Test Execution Conditions



Printing and Saving Test Results

Printing and saving test results are features of the software which require additional equipment and configuration. **See "Printing," in chapter 6, on page 160** for detailed descriptions and instructions for these features.

4

Using the Software with FW Below Rev. A.14.00

Firmware Enhancement

NOTE: The firmware revision A.14.00 in the HP 8921A and HP 8921D had several enhancements. This chapter applies to users with:

- **HP 8921A test sets with firmware revision below A.14.00**

The test set's firmware revision is displayed on the top right corner of the configuration screen.

- Press SHIFT CONFIG to display the configuration screen and read the firmware revision.

If you have an HP 8921A with firmware revision above A.14.00, refer to **chapter 4, "Using the Software with FW Below Rev. A.14.00," on page 61**. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired.

Test Set or Test System is Defined As (One of the Following):

- HP 8921A Cell Site Test Set (firmware revision above A.14.00 is highly recommended)
- HP 8921D Cell Site Test System
- HP 8921A, Option 500, Dual-Mode Cellular Test System

Introduction

The HP 11807B Software can be run on the factory default settings or customized to your individual needs and specific requirements.

This chapter provides detailed information on how to load, run, and customize the software.

Testing Overview

Pressing TESTS will display what is called the TESTS screen. From this TESTS screen you have the option to:

Begin running tests:

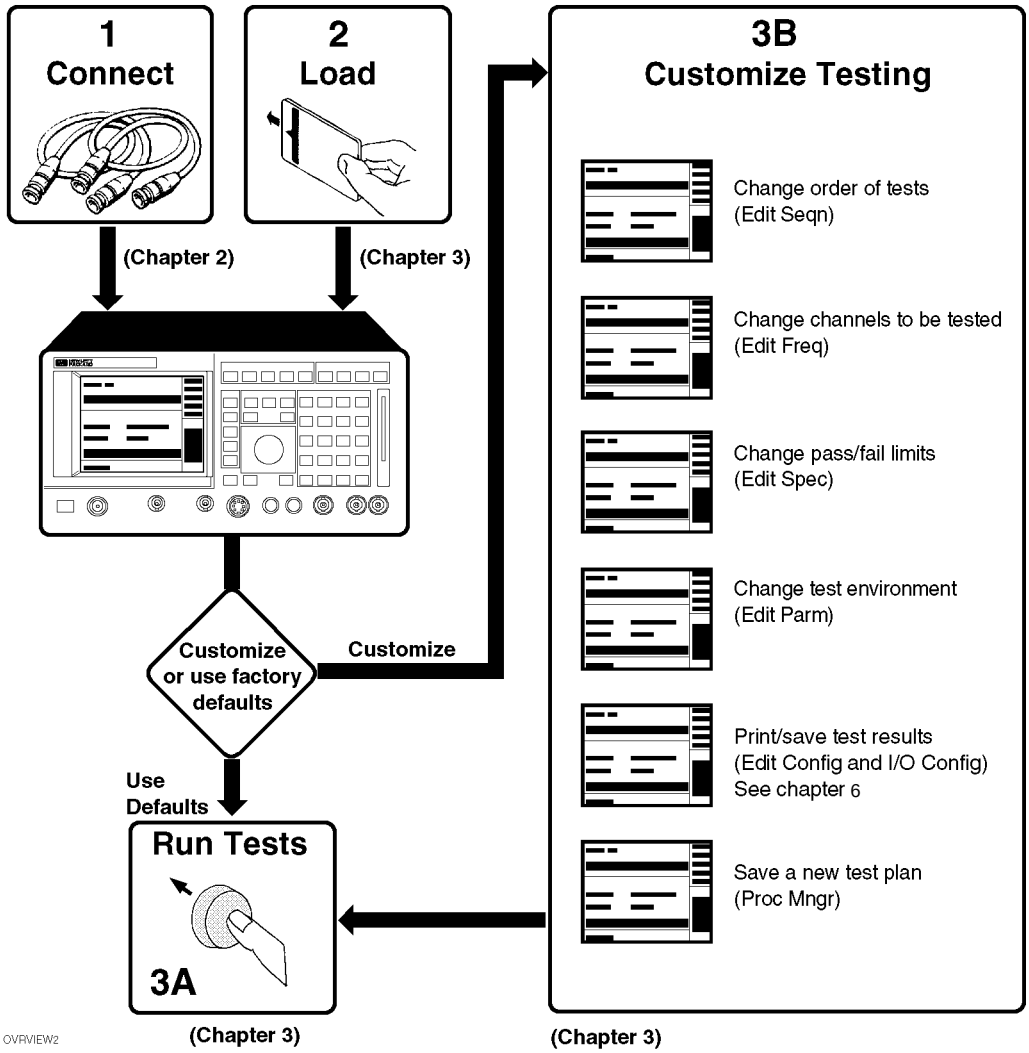
- The factory default settings are acceptable for your application or
- The software has already been customized for your cell site, and saved to an SRAM card

or

Customize the software:

- Decide which tests you desire to run (Edit Sequence)
  - you may want to run all, some, or just one of the tests.
- Change the pass/fail limits for specific measurements (Edit Specifications)
  - you may want the pass/fail limits to have tighter or looser specifications than the default settings.
- Change the test environment and conditions (Edit Parameters)
  - define if certain values should be measured or calculated.
  - decide output format.
  - enter specific information about cell site equipment and/or environment.
- Save any or all of the above customized changes (to an SRAM card)
- Select options:
  - Print test results or certain screens.
  - Decide when and where test results are displayed (**`Test Execution Conditions`**)

To Run Tests


1
Connect
2
Load
(Chapter 2)
(Chapter 3)
Customize
or use factory
defaults
Customize
Use
Defaults
Run Tests
3A
(Chapter 3)
3B
Customize Testing
Change order of tests
(Edit Seqn)
Change channels to be tested
(Edit Freq)
Change pass/fail limits
(Edit Spec)
Change test environment
(Edit Parm)
Print/save test results
(Edit Config and I/O Config)
See chapter 6
Save a new test plan
(Proc Mngr)
(Chapter 3)
OVRVIEW2

Running Tests

Before you begin to load the software and run tests, you should have made the appropriate hardware connections. **See chapter 2, "Making Connections"** if you have not done so already.

The HP 11807B Software may be run with its factory default settings, or it may be customized to your specific needs (see **"Customizing Testing" on page 70**).

When TESTs begin to run, they are executed in the order in which they were entered into the Test Procedure.

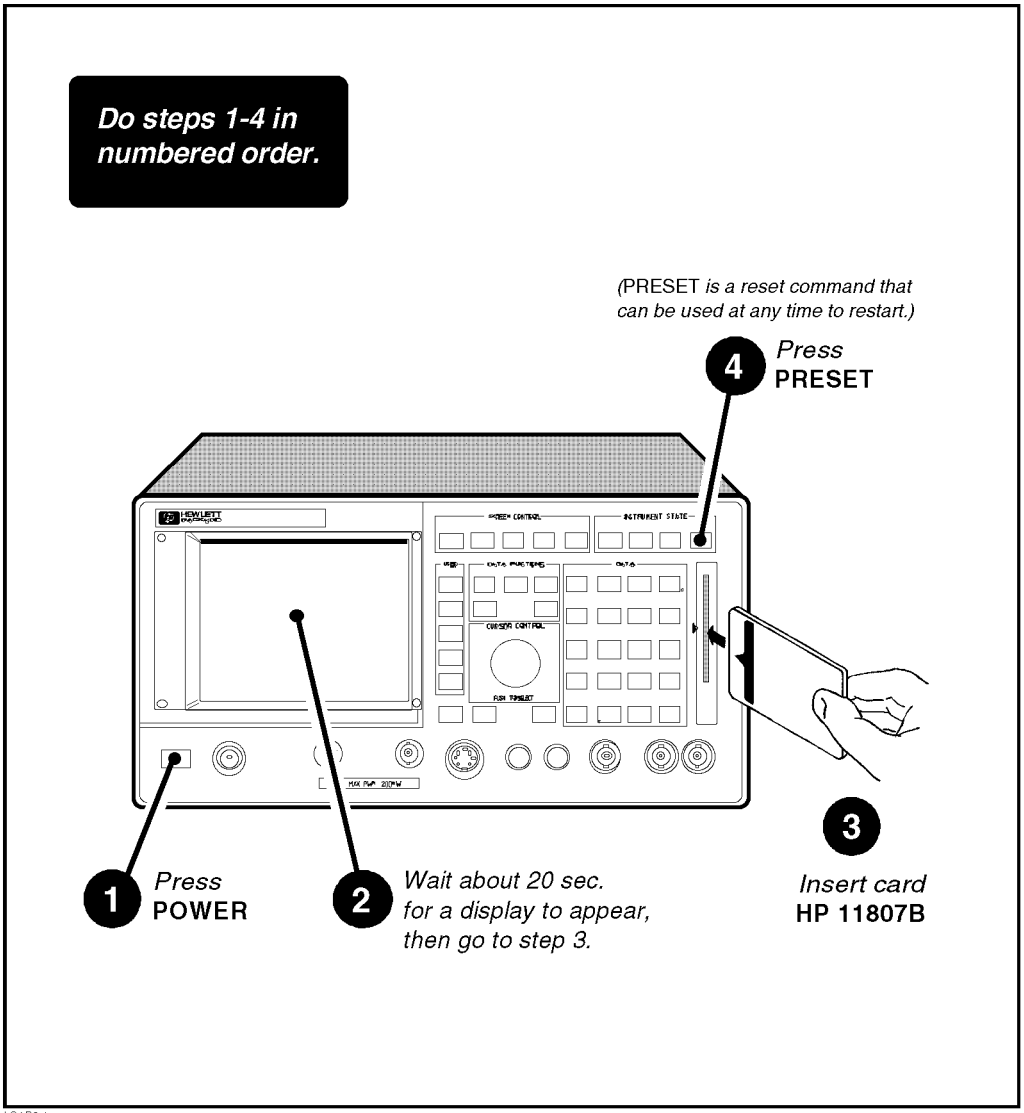
- Pressing CANCEL will pause the current test (press k2 (**`Continue`**) to continue the test).

Loading the Software

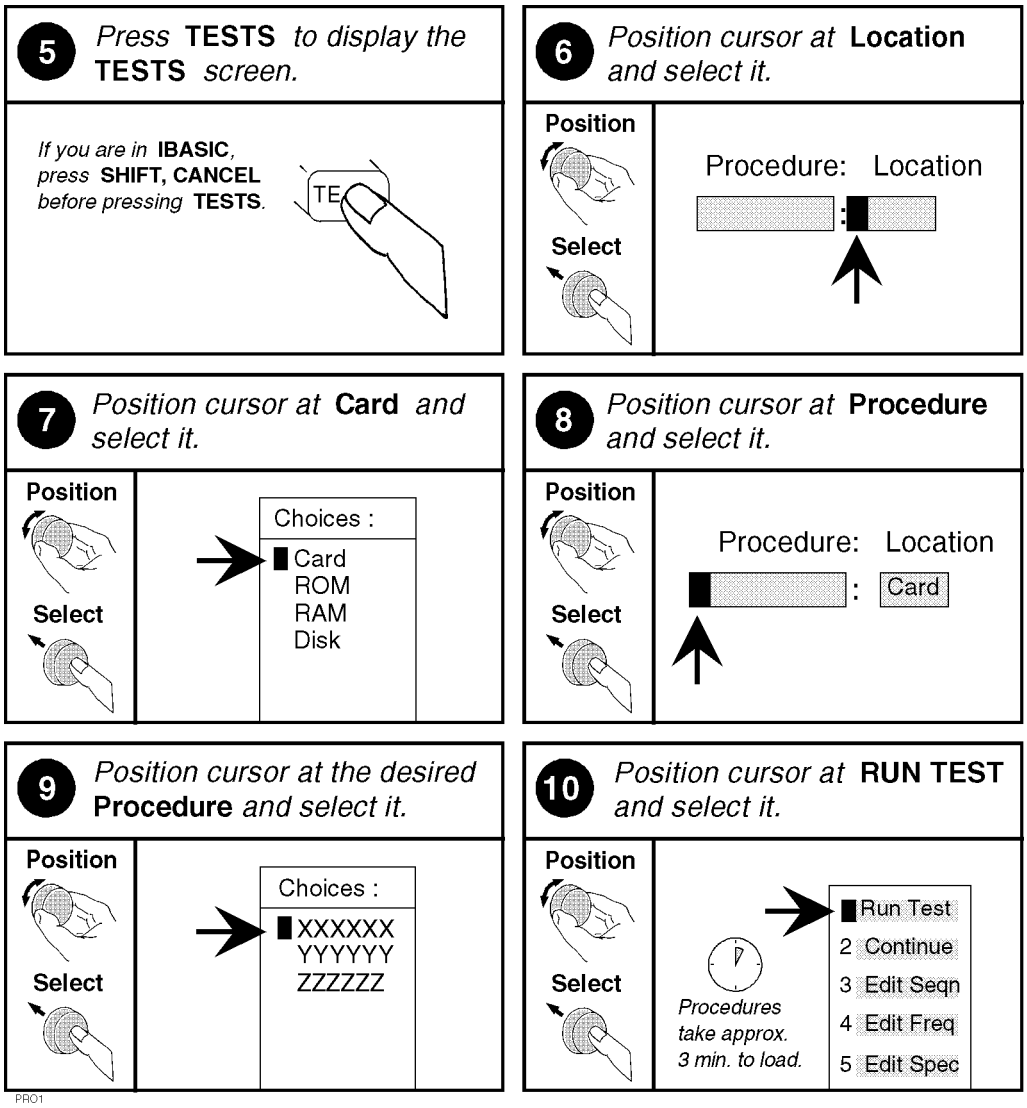
Before you begin testing, you must load the software into the test set memory. To load the software, you must first select the location to load from (in this case, it will be **Card**) and a procedure filename. Your card comes pre-programmed with at least one procedure. The actual software program does not get loaded into the test set memory until k1 (**Run Test**) is selected. It will take approximately two minutes for the software program to be loaded at that time.

The software memory card can be removed after the program is loaded into the Test Set memory. The program will remain in memory after a power-down/ power-up cycle, unless it is manually deleted or a new program is loaded.

Starting Up



Continue on next page


5 Press TESTS to display the TESTS screen.
If you are in IBASIC, press SHIFT, CANCEL before pressing TESTS.
TE
6 Position cursor at Location and select it.
Position
Select
Procedure: Location
7 Position cursor at Card and select it.
Position
Select
Choices :
Card
ROM
RAM
Disk
8 Position cursor at Procedure and select it.
Position
Select
Procedure: Location
: Card
9 Position cursor at the desired Procedure and select it.
Position
Select
Choices :
XXXXXX
YYYYYY
ZZZZZZ
10 Position cursor at RUN TEST and select it.
Position
Select
Procedures take approx. 3 min. to load.
Run Test
2 Continue
3 Edit Seqn
4 Edit Freq
5 Edit Spec
PRO1

Customizing Testing

The HP 11807B Software may need some customizing before it performs in a way that is necessary for your testing needs. Because of the diversity of individual testing needs, the HP 11807B Software has been designed so that changes may be easily made from the Test Set front panel. You may store these changes on an SRAM card so that you may skip these steps in the future. See **"Saving a Test Procedure (Procedure Manager)" on page 82**.

You may customize your software at any time. Because your needs change, the software allows changes to its default settings when you need to make them and in any order that you choose. For example, tests may be inserted or deleted, and later after running the tests you can change the pass/fail limits or decide to test different channels.

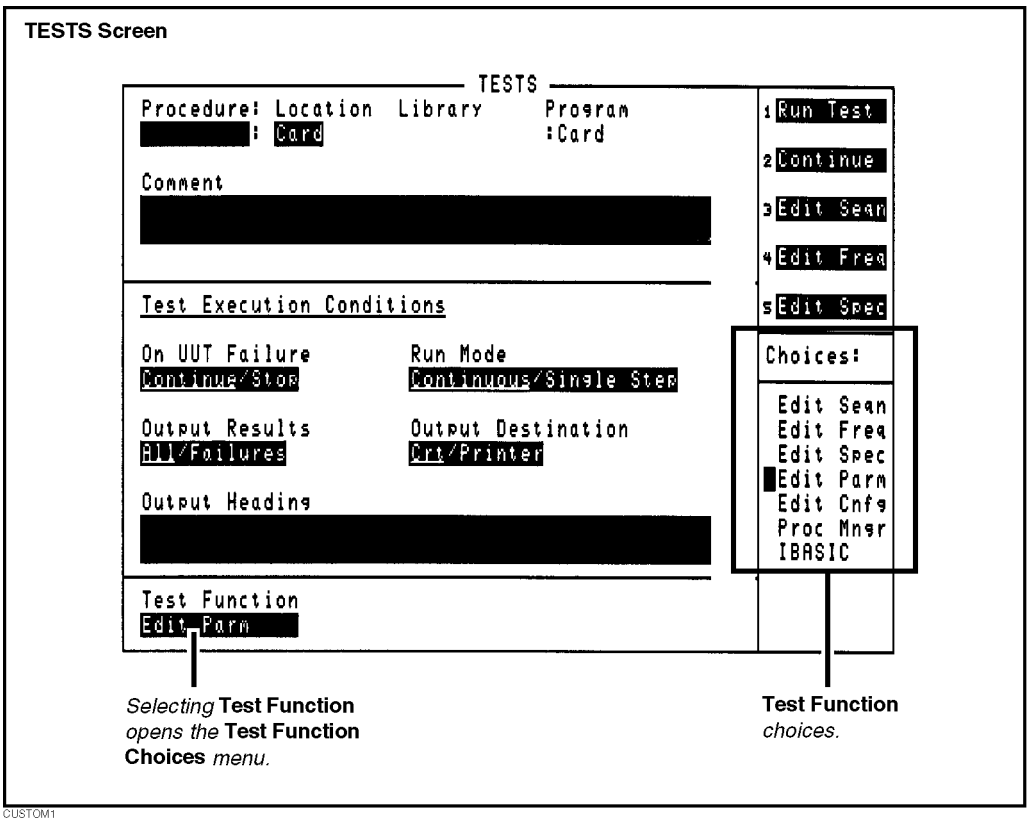
Most testing customization is accomplished through the HP 8921As' Test Function screens. These Test Function screens are accessed from the main TESTS screen as shown in the following figure. All Test Functions are explained in this chapter by function.

NOTE:

Edit Configuration (Edit Cnfg) and IBASIC will not be explained in this customizing section.

- Edit Configuration is used when setting up printers, data collection, and message logging which is explained in **"Printing" on page 160** and **"Data Collection (Saving and Retrieving Test Results)" on page 149**.
- IBASIC is used when writing your own programs and is not explained in this manual. If you need to write your own IBASIC programs you may acquire the following manuals:
  - 8921A,D
    - *HP Instrument Basic User's Handbook* HP part number E2083-90000.
    - *HP 8921 Programming Manual* HP part number 08920-90031.

How to Customize Testing



Changing a Sequence of Tests (Edit Sequence)

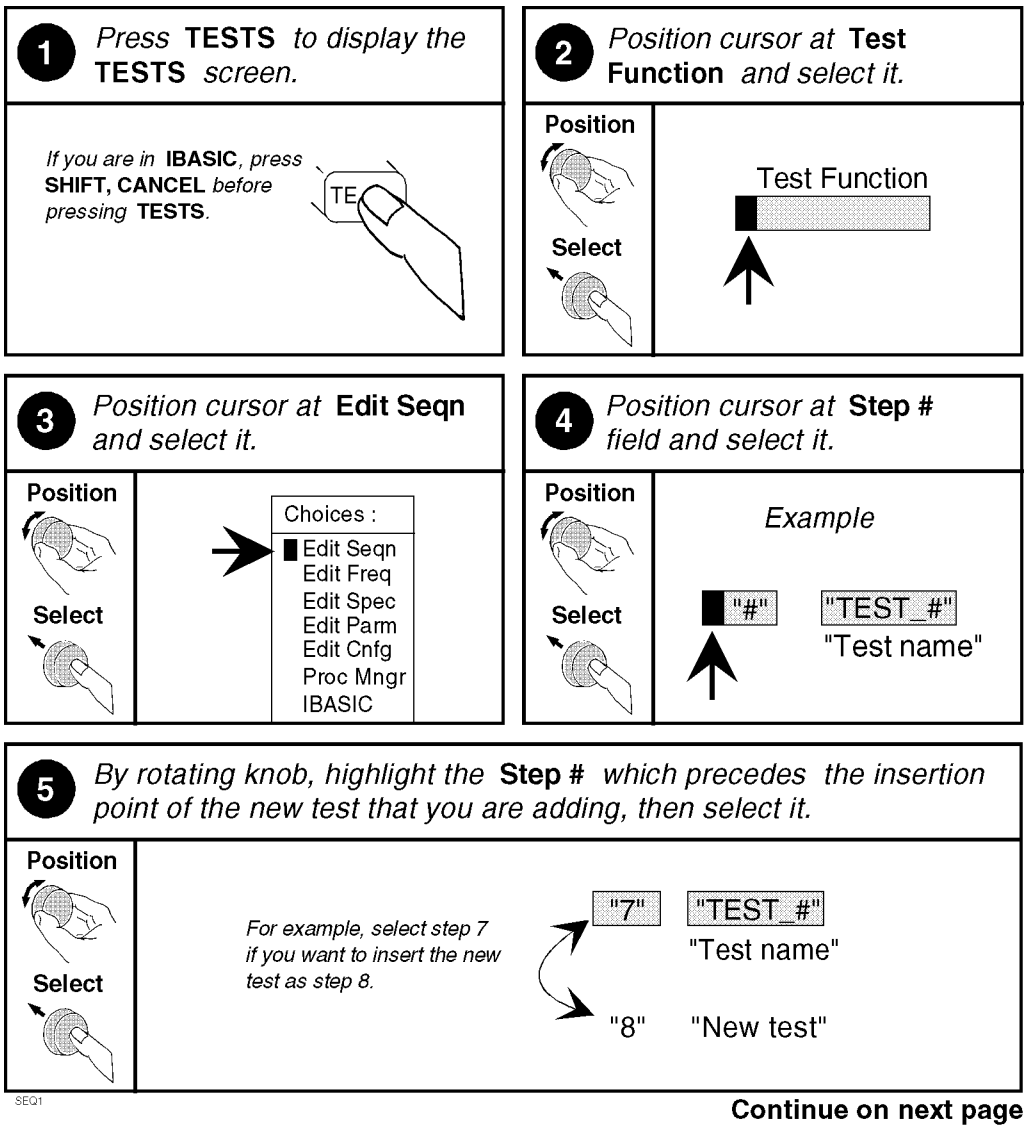
You may define a test sequence to include all, some, or just one of the tests available. When the first test is finished, the next will run. The test sequence will remain in the Test Set's battery backed-up memory until another test sequence is loaded or set up. For information on saving a customized test sequence, see **"Saving a Test Procedure (Procedure Manager)" on page 82**.

Creation of a test sequence is accomplished by inserting or deleting tests from the list of tests that come with the HP 11807B Software package. **See chapter 5, "Test, Procedure, Parameter, and Pass/Fail Limit Descriptions"**, for a tests list and descriptions.

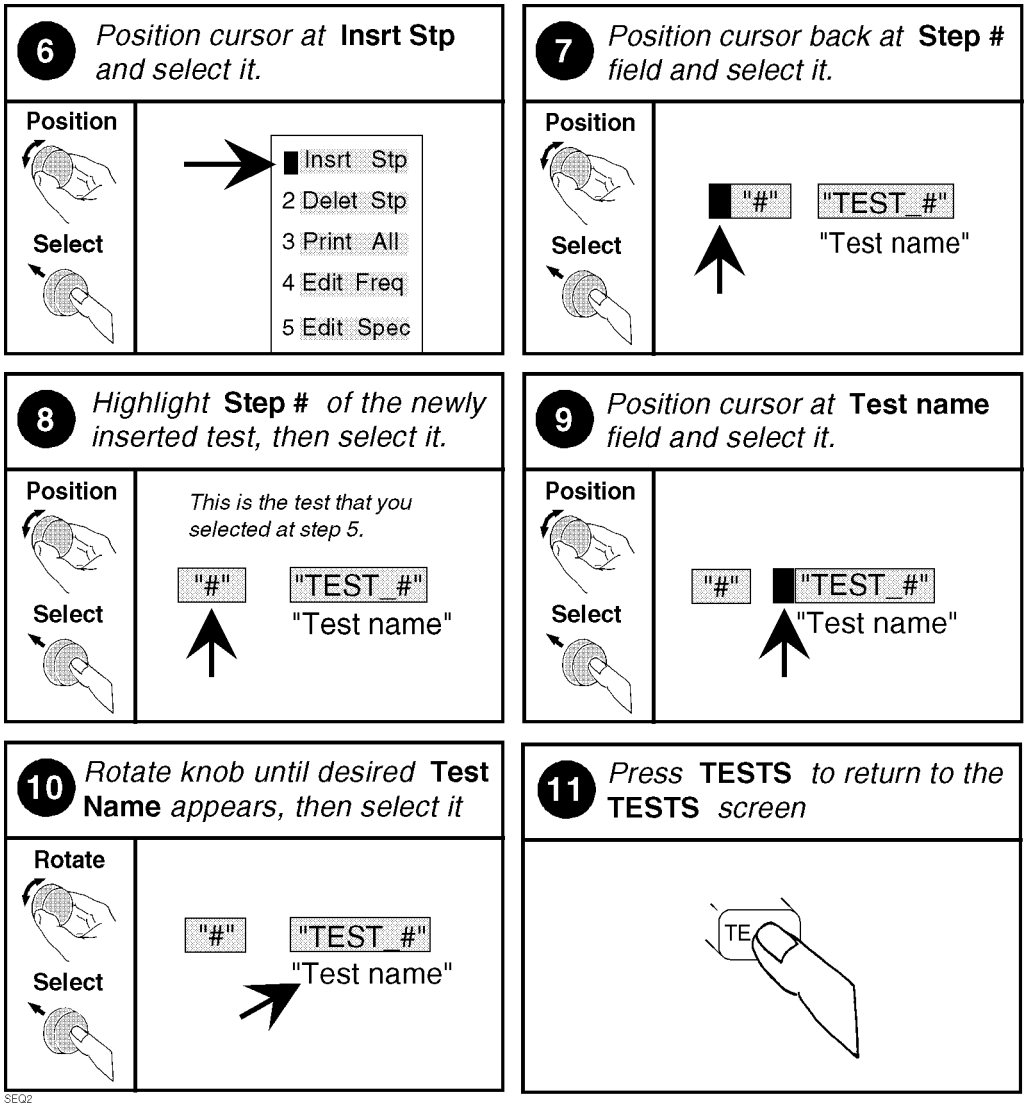
The **`All Chans?`** field is not used with this software package.

The following describes how to create a new test sequence.

How to Change a Sequence of Tests



Continue on next page

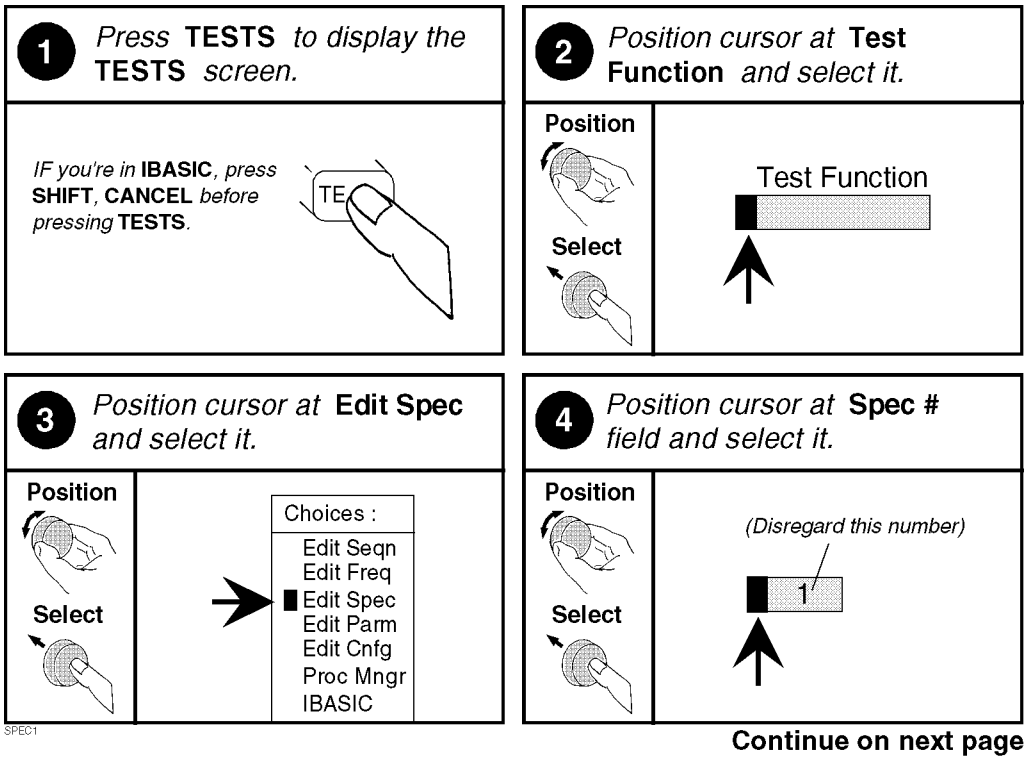

6
Position cursor at Insrt Stp and select it.
Position
Select
Insrt Stp
2 Delet Stp
3 Print All
4 Edit Freq
5 Edit Spec
7
Position cursor back at Step # field and select it.
Position
Select
"#"
"TEST_#"
"Test name"
8
Highlight Step # of the newly inserted test, then select it.
Position
Select
This is the test that you selected at step 5.
"#"
"TEST_#"
"Test name"
9
Position cursor at Test name field and select it.
Position
Select
"#"
"TEST_#"
"Test name"
10
Rotate knob until desired Test Name appears, then select it
Rotate
Select
"#"
"TEST_#"
"Test name"
11
Press TESTS to return to the TESTS screen
TE
SEQ2

Changing Pass/Fail Limits (Edit Specifications)

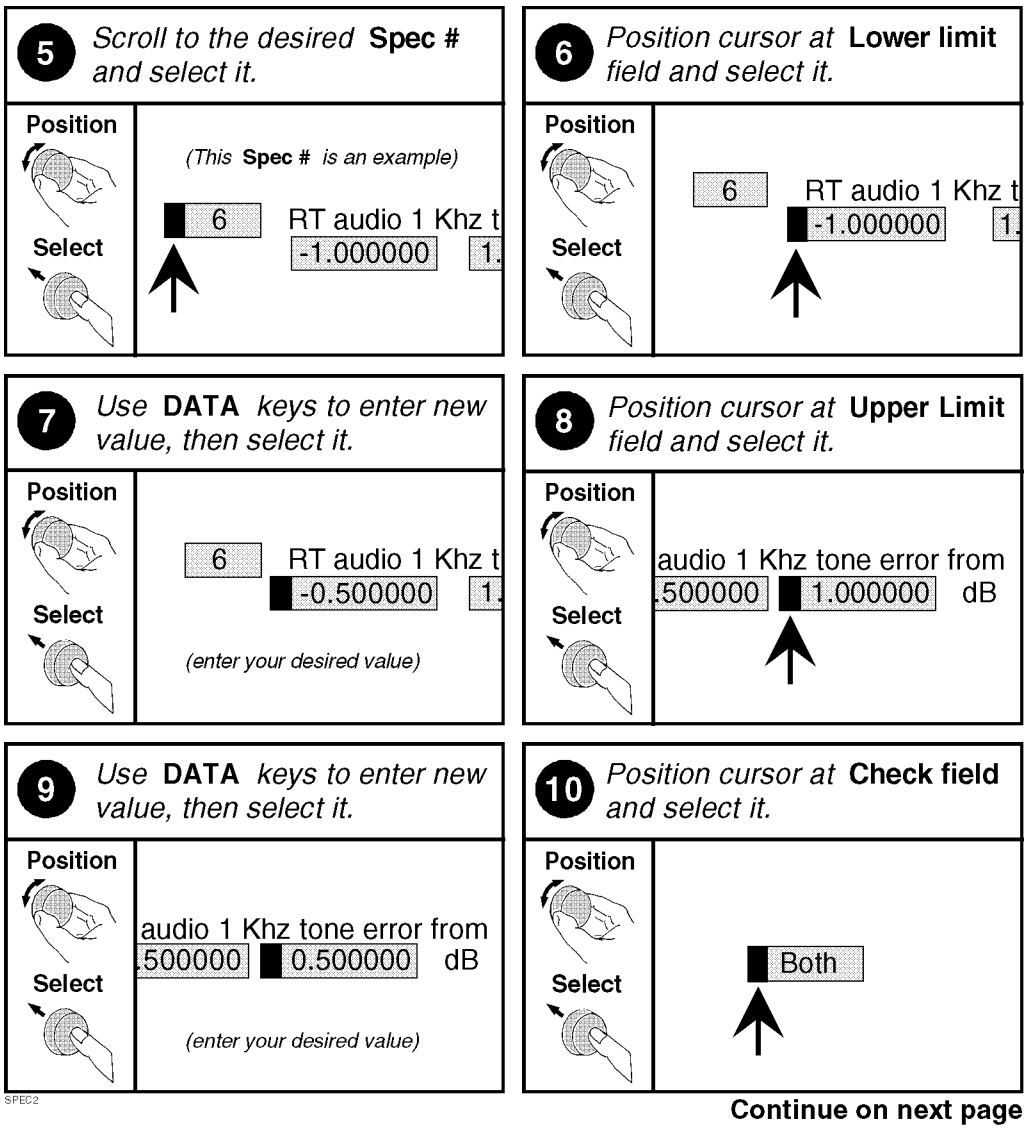
Specifications are values that set pass/fail limits for tests. Default values are available in the test software. These default values may be changed to suit your particular requirements.

The following describes how to change the pass/fail (upper and lower) limits in the Test Set's Edit Specifications screen. **See "Pass/Fail Limit (Specification) Descriptions," in chapter 5, on page 140** for descriptions and default values for each specification. For information on saving customized specifications, see **"Saving a Test Procedure (Procedure Manager)" on page 82**.

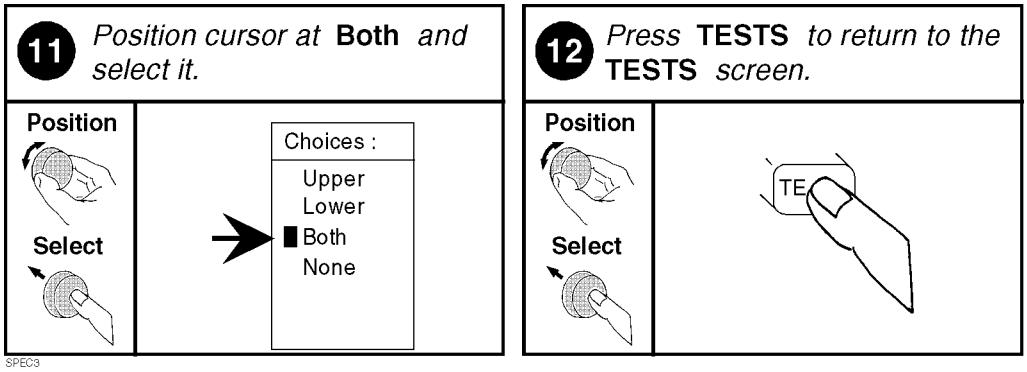
How to Change Pass/Fail Limits



Continue on next page



Continue on next page

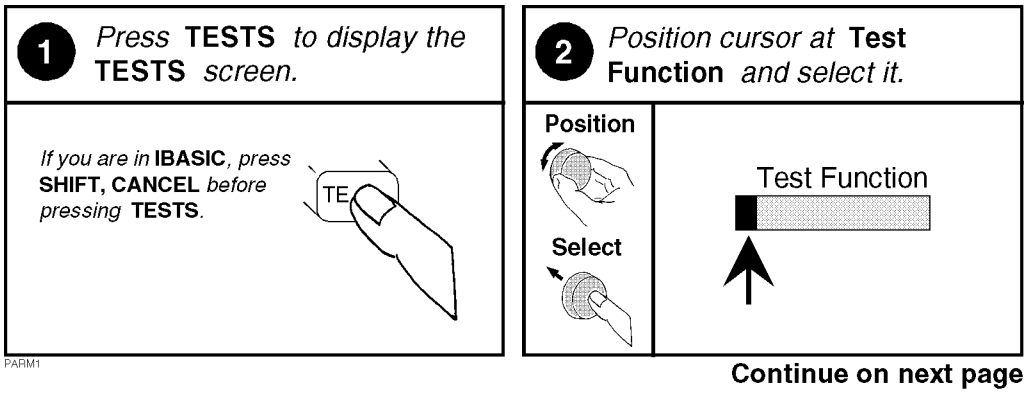

11
Position cursor at Both and select it.
Position
Select
Choices :
Upper
Lower
Both
None
12
Press TESTS to return to the TESTS screen.
Position
Select
TE
SPEC3

Changing the Test Environment and Conditions (Edit Parameters)

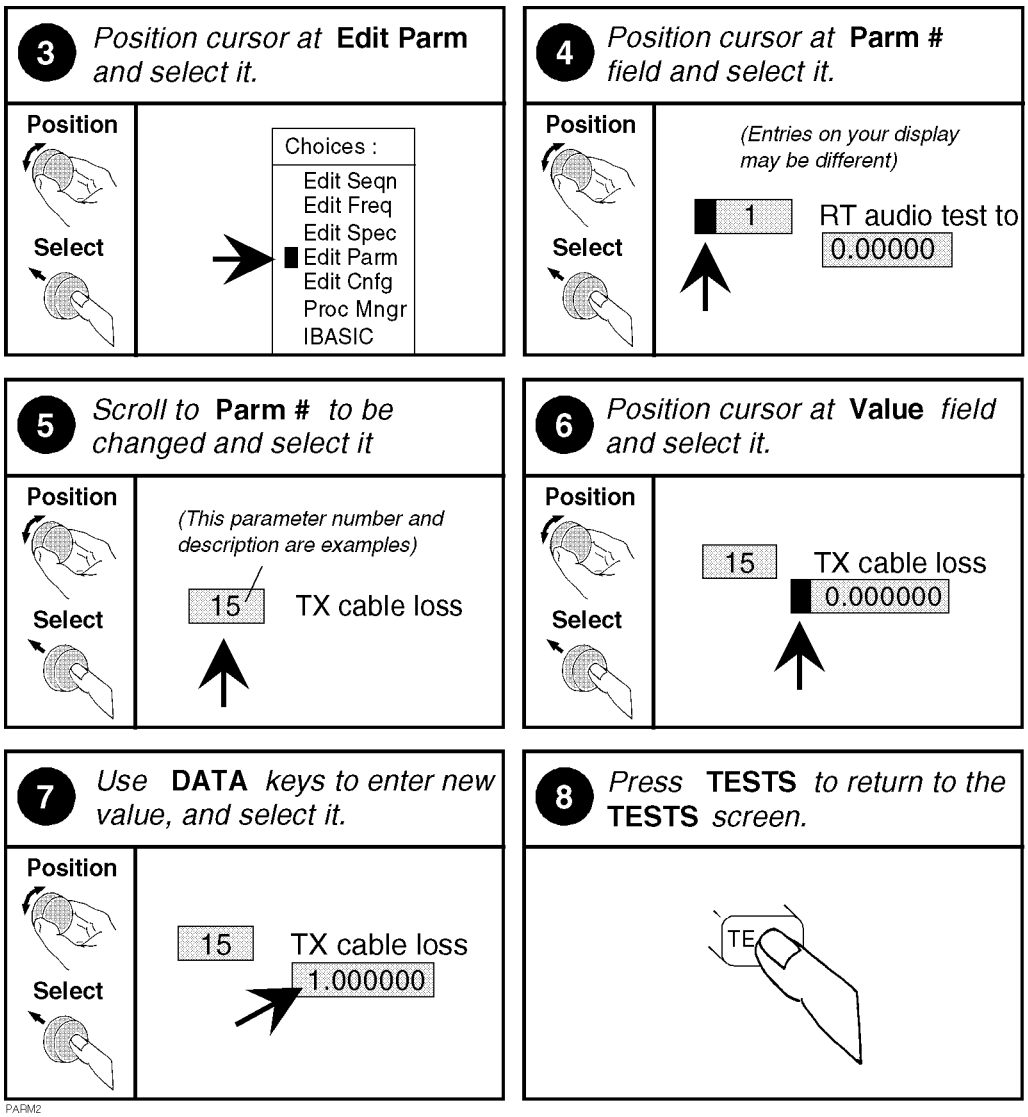
The software uses parameters to optimize the test environment and conditions for your testing situation. Many of the parameters are determined by examining your test needs. The HP 11807B Software comes with default settings for parameters. The defaults should be reviewed for your particular needs. See **"Parameter Descriptions" on page 137** for descriptions and default values for each parameter. For information on saving customized parameters, see **"Saving a Test Procedure (Procedure Manager)" on page 82**.

The following describes how you can change parameters through the Edit Parameter screen to optimize your testing conditions.

How to Change the Test Environment and Conditions



Continue on next page


3 Position cursor at Edit Parm and select it.
Position
Select
Choices :
Edit Seqn
Edit Freq
Edit Spec
Edit Parm
Edit Cnfg
Proc Mngr
IBASIC
4 Position cursor at Parm # field and select it.
Position
Select
(Entries on your display may be different)
1
RT audio test to
0.00000
5 Scroll to Parm # to be changed and select it
Position
Select
(This parameter number and description are examples)
15
TX cable loss
6 Position cursor at Value field and select it.
Position
Select
15
TX cable loss
0.000000
7 Use DATA keys to enter new value, and select it.
Position
Select
15
TX cable loss
1.000000
8 Press TESTS to return to the TESTS screen.
TE
PARM2

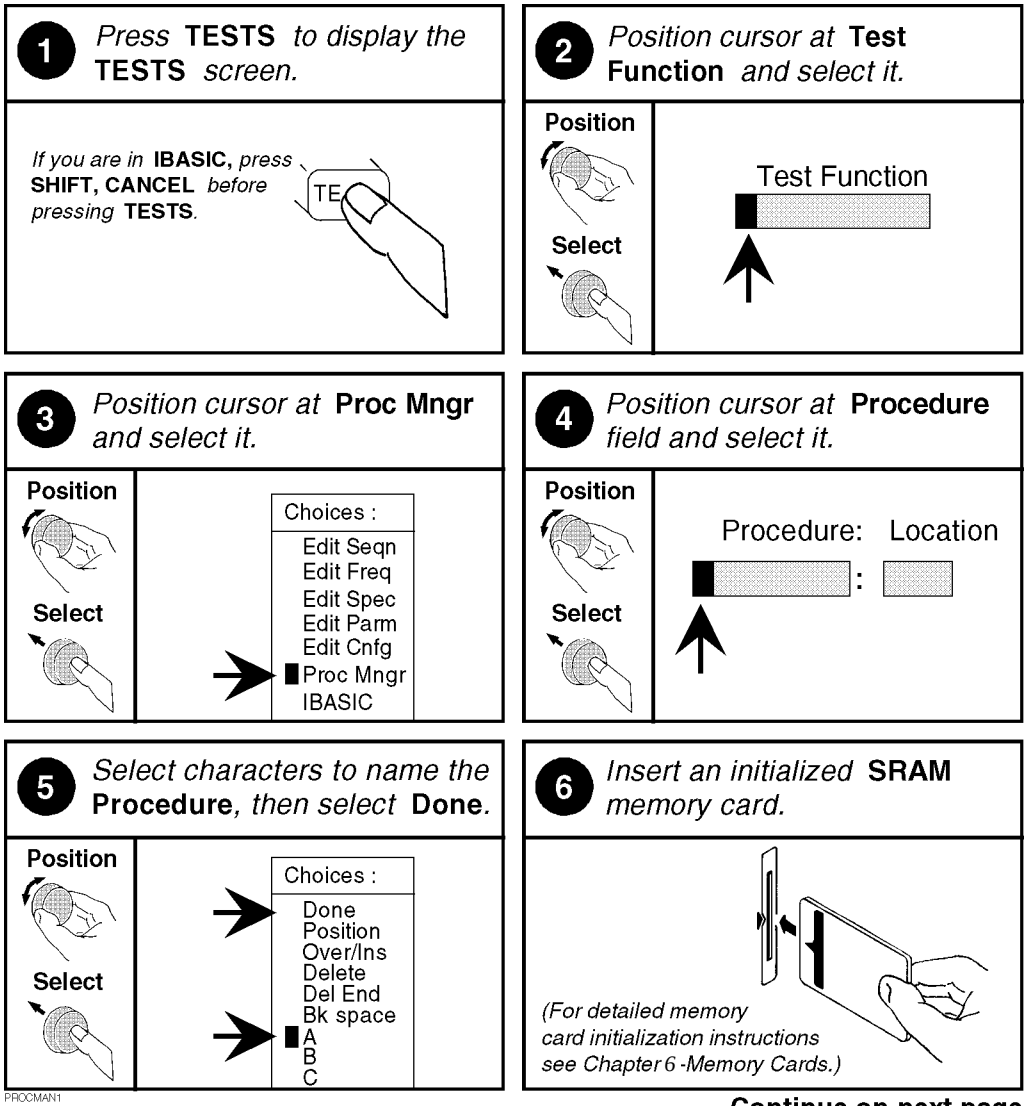
Saving a Test Procedure (Procedure Manager)

A Test Procedure is a collection of pass/fail limits (specifications), the test environment and conditions (parameters), and a TEST sequence, saved in a file that customizes the test software to a specific application. You may save the file to a memory card or disk.

When you save a Procedure you will be saving parameters, specifications, and a test sequence, plus a library that contains the names of all parameters, specifications, and tests that are resident in the HP 11807B Software. The library file comes from the HP 11807B Software and cannot be modified. The library file will be automatically saved on the card or disk that is being used to store the new test procedure.

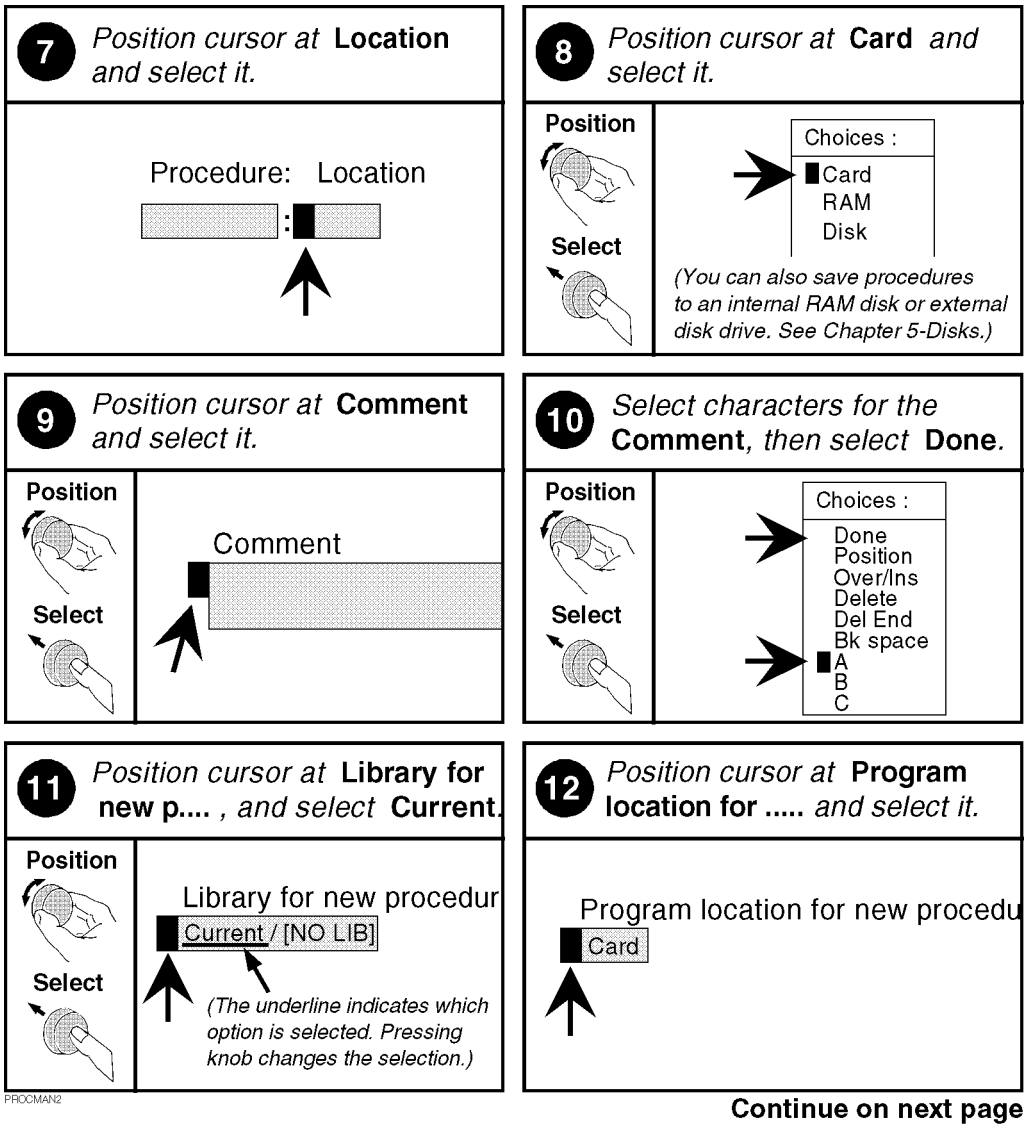
The following example shows how to save a new procedure to a memory card. For more information concerning procedures, **see "Procedures," in chapter 6, on page 172**.

How to Save a Test Procedure



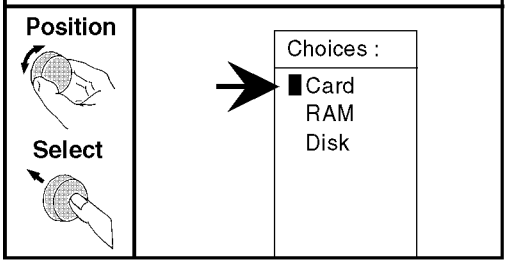
PROCMAN1

Continue on next page

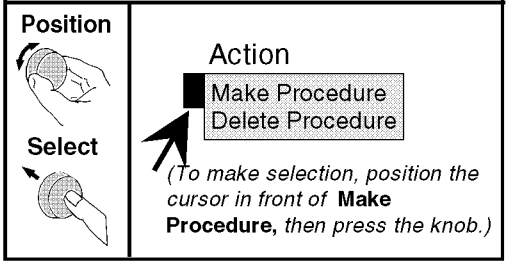


Continue on next page

13 *Position cursor at* **Card** *and select it.*

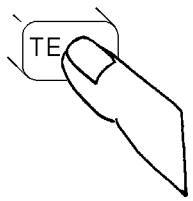


14 *Position cursor at* **Action** *and select* **Make Procedure**.



(To make selection, position the cursor in front of **Make Procedure,** *then press the knob.)*

15 *Press* **TESTS** *to return to the* **TESTS** *screen.*



To run the saved procedure;

1) Load the **Procedure**
2) Insert the original HP 11807B memory card
3) Press **Run Test**.

The original card contains the full program needed to allow your procedure to run.

PROCMAN3

Changing Test Execution Conditions

`Test Execution Conditions` define where and when test output occurs. You may decide to:

- Stop testing when a measurement fails or continue through all of the tests without stopping. Note: if ‘‘Stop" is selected and the program pauses as a result of this, you will be given a choice to continue testing or repeat the measurement. (**`On UUT Failure`**)
- Display (or print) only measurements that fail, or display (or print) all measurements that pass or fail. (**`Output Results`**)
- Pause between each measurement, or run through entire test. Note: if ‘‘Single Step" is selected and the program pauses as a result of this, you will be given a choice to continue testing or repeat the measurement. (**`Run Mode`**)
- Display output on CRT only, or display on CRT and print hardcopy. (**`Output Destination`**)

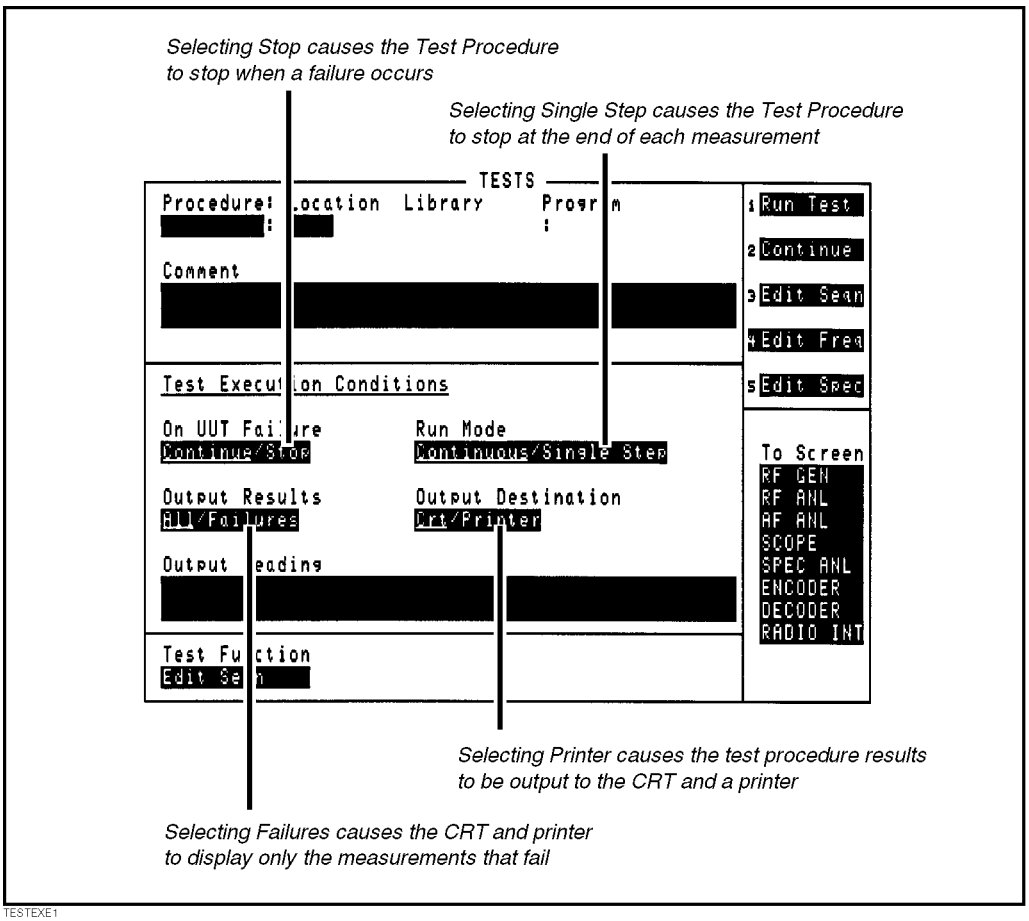
NOTE: If printing test results is desired, after selecting **`Printer`** additional steps are necessary to connect and configure the printer. **See "Printing," in chapter 6, on page 160.**

- Enter a title for an output heading for the displayed or printed results. (**`Output Heading`**)

`Test Execution Condition`’is located on the TESTS screen. Press TESTS to display them. To change a default setting, position the cursor to the desired field. Pressing the knob ("selecting") will toggle the underlined selection.

`Test Execution Conditions` settings are not retained after a power-down/ power-up cycle, and will return to their default settings.

How to Change Test Execution Conditions



TESTEXE1

Printing and Saving Test Results

Printing and saving test results are features of the HP 11807B software which require additional equipment and configuration. **See "Printing," in chapter 6, on page 160** for detailed descriptions and instructions for these features.

5

Test, Procedure, Parameter, and Pass/Fail Limit Descriptions

Tests are a series of measurements and one or more tests make up a procedure (see **chapter 3, "Using the Software with FW Above Rev. A.14.00"**). While you may change the tests that make up a procedure, you may not change the measurements the test will perform. Generally, the order in which the tests are run is not important.

This chapter describes each test, procedure, associated parameters and pass/fail limits.

Procedure Descriptions

The HP 11807B Option 045 card comes preprogrammed with fourteen procedures, optimized for the specific uses described.

COMBINED

The COMBINED procedure is used to verify the proper operation of the TX and the RX paths.

The full procedure is run on one channel at a time to minimize test reconfigurations. **TEST_17 - SCA Freq Resp, MIN/MAX & RX tests** is performed on the low-band, mid-band, and high-band frequencies. Tests 10-14 are then performed on the cut channels only. After k1 (**`Run Test`**) is selected, a data entry screen appears on the CRT. Enter the appropriate information and select k5 (**`Begin Tst`**). A connection diagram will appear on the CRT. Press k2 (**`Continue`**) when all connections are made. As measurements are performed, instructions for controlling the LMT and T1 Test Set will be displayed on the CRT between the highlighted lines. Complete the instructions and press k2 (**`Continue`**).

When the procedure is completed on the first radio, the user will be asked if that was the last radio in the TX chain to be tested. If the user selects the procedure to run again on another radio, the data entry screen reappears. If the user selects 1=**`Yes`** (the radio was the last in the TX chain), then the last channel is set to the desired hatchplate power. The Test Set then switches to the spectrum analyzer to adjust the ATC power on all the channels in the TX chain and perform the IM test.

Table 2 Data Entry Fields

Entry Field	Description
Begin test	Select to start testing, after all entries are made to this screen (same as pressing k5 (**`Begin Tst`**)).
Data Collection	Allows user to save test results if desired. User has three choices: off - for no data collection card - to save results to an SRAM card, or serial - to send a printer or PC over the serial port.
*Cut channel number	User must enter the cut channel number to be tested. If cut channel is not yet available, be sure to use frequencies that are 21 channels apart.
SPM number	Enter the serial number of the SPM (slot processor module). For use with data collection.
MDM number	Enter the serial number of MDM#1 (modulator downconverter module). For use with data collection.
MDM/DEM number	Enter the serial number of MDM#2 or the DEM (demodulator module). For use with data collection.
CU channel (1-4)	Enter the channel number for the channel-under-test (one based).
CU#	Enter the channel unit number for the channel-under-test.
CUMC#	Enter the CUMC (channel unit modular chassis) number for the chassis that contains the CU under test.
Hardware Type	Select the appropriate hardware type: DACU, QACU, or DMCU for the channel-under-test.
*T1 LMT timeslot (1-23)	User must enter the T1 LMT timeslot, 0 based[1]
*SAT frequency	User must select the appropriate SAT frequency: 5970, 6000, or 6030
*SCA type	User must select the single channel amplifier type: SCA-I or SCA-II.
*TX cut chan power (Watts)	User must enter the hatchplate power for the cut channel.

Table 2 Data Entry Fields

Entry Field	Description
*More Cell Site Information	Displays a second screen with additional field entries. This screen contains entries which are used for the whole BTS. Therefore, the fields on this screen need to be edited only on the first channel tested for each BTS. The fields from the second screen appear below.
Done	Select after all entries are made to return to the first data entry screen (same is k5 (**Done**).
Cell site name	Enter the name of the cell site (up to twelve characters). For use with data collection.)
Cell site identifier	Enter an identifier for the cell site (up to three alpha-numeric characters). For use with data collection.
BTS#	Enter the number of the Base Transceiver Station (1-6). For use with data collection.
Sector	Select the sector type: omni, alpha, beta, or gamma.
*Freq Band	User must select the frequency band: A or B
LMT Version	Enter the LMT software version used for these tests (up to twelve characters). For use with data collection.
*TX cable loss (dB)	User must enter the loss of the test cable used to connect the Test Set RF IN/OUT port to the end of the hatchplate TX cable. The value in this field is used to correct the measurements made at the hatchplate with the Test SEt. This value can be set automatically when you run **TEST_01 - GN Measure Cable Loss**.
*RX cable loss (dB)	User must enter the loss of the test cables and the 2:1 power divider used to connect the DUPLEX OUT port to the RMC inputs. The value in this field is used to correctly set the output of the Test Set for the RSSI and RX Sensitivity tests. This value can be set automatically when you run **TEST_01 - GN Measure Cable Loss**.

1. **See "Entering and Referring to Slot Numbers" on page 99**.

NOTE: The fields marked with '*' affect the test results and must be set. The fields not marked with '*' are saved with the test results for record keeping, when the data collection function is turned on.

Tests Performed

- **TEST_17 - SCA Freq Resp, MIN/MAX & RX tests**
- **TEST_10 - TX Frequency**
- **TEST_11 - TX Voice Deviation/Audio Level**
- **TEST_12 - TX SAT Frequency and Deviation**
- **TEST_13 - TX Maximum Voice Deviation**
- **TEST_14 - TX Spec Anal ATC Pwer & IM Test**

QUICK

The QUICK procedure verifies the proper operation of the TX and RX paths, without testing the RF frequency response. *All tests are performed on the cut channels only*, greatly reducing the total testing time.

After k1 (**`Run Test`**) is selected, a data entry screen appears on the CRT. Enter the appropriate information and select k5 (**`Begin Tst`**). A connection diagram will appear on the CRT. Press k2 (**`Continue`**) when all connections are made. As measurements are performed, instructions for controlling the LMT and T1 Test Set will be displayed on the CRT between the highlighted lines. Complete the instructions and press k2 (**`Continue`**).

When the procedure is completed on the first radio, the user will be asked if that was the last radio in the TX chain to be tested. If the user selects the procedure to run again on another radio, the data entry screen reappears. If the user selects 1=**`Yes`** (the radio was the last in the TX chain), then the last channel is set to the desired hatchplate power. The Test Set then switches to the spectrum analyzer to adjust the ATC power on all the channels in the TX chain and perform the IM test.

See **table 2, "Data Entry Fields" on page 91** in the previous procedure description.

Tests Performed

- **TEST_18 - RX Sensitivity/SINAD**
- **TEST_19 - RX Deviation/Audio Level**
- **TEST_20 - RX RSSI**
- **TEST_08 - TX MIN/MAX Output Power**
- **TEST_10 - TX Frequency**
- **TEST_11 - TX Voice Deviation/Audio Level**
- **TEST_12 - TX SAT Frequency and Deviation**
- **TEST_13 - TX Maximum Voice Deviation**
- **TEST_14 - TX Spec Anal ATC Pwer & IM Test**

TX_LOSS

The TX_LOSS procedure measures the TX loss without a filter mask. Therefore, default values for plotting the upper and lower mask limits are not set up in the **Channel Information** screen.

Tests Performed

TEST_15 - TX Path Insertion Loss (for NGA)

TX_BPF

The TX_BPF procedure performs the full band pass TX filter test. Default values for plotting the upper and lower mask limits are set up in the **Channel Information** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete.

Tests Performed

TEST_15 - TX Path Insertion Loss (for NGA)

To Change Upper and Lower Mask Limits:

Instructions for using HP 8921A test sets with firmware revisions below A.14.00 are in parenthesis.

Users are able to enter data points to plot the curves of both the upper and lower mask limits. For each data point used to plot a mask limit curve, the x and y coordinates are entered separately.

Data points for the Upper Mask Limit should be entered into the **Upper** column (or **RX** column). Data points for the Lower Mask Limit should be entered into the **Lower** column (or **TX** column).

Frequency, which is the **X** coordinate, is entered in the top of the highlighted field. Power, which is the **Y** coordinate, is entered in the bottom of the highlighted field.

Up to fifty data points can be entered. The mask can be a continuous plot, or can be segmented by selecting **Yes** in the **Start new mask:** field (or **Test?** and **Prime** fields) each time a new segment is desired.

Entries to this screen can be saved in a procedure. **See "Saving a Test Procedure," in chapter 3, on page 53**.

- Press TESTS.
- Select **Freq** **Channel Information** from the **Customize Test**

Procedure: list (or **Edit Freq** from the **Test Function** field).

- Position the cursor to the **Entry#** (or **Chan#**) field and select it.
- Scroll to the desired entry number and select it.
- Position the cursor to the **Upper Freq** field (or **RX Freq**) and select it.
- Enter the value for the frequency coordinate of the data point for upper mask.
- Position the cursor to the **Lower Freq** (or **TX Freq**) field and select it.
- Enter the value for lower frequency data point (the x coordinate).
- Position the cursor to the **Upper Limit** (or **RX Chan Info**) field and select it.
- Enter the value for the upper power limit data point, in dB (the y coordinate).
- Position the cursor to the **Lower Limit** (**TX Chan Info**) field and select it.
- Enter the value for the Lower power limit data point, in dB (the y coordinate).
- Repeat the above steps for each data point desired.
- After the last data point is entered, enter –1 in the next available **Upper Freq** (or **RX Freq**) field.

TX_RE_BPF

The TX_RE_BPF procedure performs the relaxed full band pass TX filter test. Default values for plotting the upper and lower mask limits are set up in the **Channel Information** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete. See the description of the **TX_BPF** procedure for details on changing the default values for the upper and lower mask limits.

Tests Performed

TEST_15 - TX Path Insertion Loss (for NGA)

RX_LOSS

The RX_LOSS procedure measures the RX loss without a filter mask.

Tests Performed

TEST_22 - RX Path Insertion Loss

RX_FLTR

The RX_FLTR procedure performs the RX preselector filter mask test. Default values for plotting the upper and lower mask limits are set up in the **`Channel Information`** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete. See the description of the **TX_BPF** procedure for details on changing the default values for the upper and lower mask limits.

Tests Performed

TEST_22 - RX Path Insertion Loss

RXA_FLTR

The RXA_FLTR procedure performs the RX A-client selection filter mask test. Default values for plotting the upper and lower mask limits are set up in the **`Channel Information`** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete. See the description of the **TX_BPF** procedure for details on changing the default values for the upper and lower mask limits.

Tests Performed

TEST_22 - RX Path Insertion Loss

RXB_FLTR

The RXB_FLTR procedure performs the RX B-client selection filter mask test. Default values for plotting the upper and lower mask limits are set up in the **`Channel Information`** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete. See the description of the **TX_BPF** procedure for details on changing the default values for the upper and lower mask limits.

Tests Performed

TEST_22 - RX Path Insertion Loss

RXB_EN_FL

The RXB_EN_FL procedure performs the RX enhanced B-client selection filter mask test. Default values for plotting the upper and lower mask limits are set up in the **`Channel Information`** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete. See the description of the **TX_BPF** procedure for details on changing the default values for the upper and lower mask limits.

Tests Performed

TEST_22 - RX Path Insertion Loss

RXB_CL_FL

The RXB_CL_FL procedure performs the RX B-client selection filter mask test. Default values for plotting the upper and lower mask limits are set up in the **`Channel Information`** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete. See the description of the **TX_BPF** procedure for details on changing the default values for the upper and lower mask limits.

Tests Performed

TEST_22 - RX Path Insertion Loss

RX_GAIN

The RX_GAIN procedure performs the RX path gain test. Default values for plotting the upper and lower mask limits are set up in the **`Channel Information`** screen. The values entered are plotted along with the test results on the SPECTRUM ANALYZER screen when the measurement is complete. See the description of the **TX_BPF** procedure for details on changing the default values for the upper and lower mask limits.

Tests Performed

TEST_21 - RX Path Gain

CAB_LOSS

The CAB_LOSS procedure performs the cable loss test to normalize out the test cables. Any number of cables may be tested.

Tests Performed

TEST_01 - GN Measure Cable Loss

ANT_SWEEP

The ANT_SWEEP procedure performs the return loss test. A return loss bridge is required.

Tests Performed

TEST_02 - GN Swept Return Loss

Entering and Referring to Slot Numbers

The T1 timeslot that the cut channel will use must be entered into the **`T1 LMT timeslot (1-23)`** field on the data entry screen. This field uses a zero based system. Slot numbers entered on this screen may range from 1-23, because slot **`0`** is not used for audio. When the test is running, the software prompts the user to insert signals into a T1 slot, expressing it in a ONE based system. The software automatically translates the slot number entered in the data entry screen (zero based) to a one based slot number scheme when prompting the user.

For example, if **`3`** is entered into the **`T1 LMT timeslot (1-23)`** data entry field, when the user is prompted to insert quiet T1, the slot number will be displayed as **`4`**.

NOTE: In the zero based scheme, slot **`0`** is not used for audio. In the one based scheme, slot **`1`** is not used for audio.

TEST_01 - GN Measure Cable Loss

This test measures the loss of a cable or device by sweeping it over the specified frequency range. The user is prompted to enter the frequency range over which the cable is to be swept.

This test requires two 3 dB (or 6 dB) pads. The pads are put on the antenna and duplex ports on the Test Set to improve the mismatch of the ports. A reference level is obtained by connecting a short calibration cable between the pads on the Duplex and Antenna ports. Next, the test cable is added between the calibration cable and one of the pads, and a measurement is made of the addition loss from the reference level. The trace of the cable loss over the frequency range swept is displayed. The average loss is also displayed on the screen.

You may repeat this measurement for each of the test cables. Each time the measurement is complete, you will be given the option to save the value as an RX loss, TX loss, or not to save the value. If you decide to save the value, it will be used when you run any of the RF tests, and will remain in the Test Set's memory until you change it. You may change it by running the test again and saving the new test result, or by manually changing it on the data entry screen when you run any of the RF tests.

To view the trace real time at the end of the test

- Press CANCEL
- Press TESTS
- Position the cursor to SPEC ANL on the **`To Screen`** menu and select it

Parameters Used

- **GN return loss & cable loss RF level (dBm)**

Pass/Fail Limits Used

- **GN return loss (dB)**

TEST_02 - GN Swept Return Loss

NOTE: **Test Signal Can Cause Interference**

This test radiates a test signal when it is used to test antennas or cables with antennas attached to them. Verify that the level and frequency span used for the test cannot result in interference to another antenna nearby. Set the parameter *GN RF lev for VSWR and cable loss tests (dBm)* for the minimum level that provides good resolution for the measurement you are making. Set the frequency range carefully.

After a single sweep is taken, the tracking generator RF level is not changed. A CW signal is therefore being applied to the antenna.

If you are in an area with other receive antennas nearby, you may want to use **TEST_03 - GN Discrete Channel Return Loss**. This test measures the return loss at a frequency offset from a selectable range of AMPS channels. The offset (in kHz) from the AMPS channels can be set.

This test measures the return loss of a cable or device in the swept mode. A SWR bridge and a 3-dB (or 6-dB) pad are connected to the Test Set. The pad is used to improve the mismatch between the SWR bridge and the ANT IN port on the Test Set. The user is prompted at the start of the test to enter the start and stop frequencies. A reference level is measured with a short or open and the return loss is measured with the cable or antenna-under-test. The trace showing return loss over the frequency band selected is displayed on the screen. The measurement value returned is the worst case return loss in the sweep.

A single sweep is taken shortly after the test starts. The RF level of the signal generator is subsequently kept at the test level.

The trace can be viewed real time at the end of the test by pressing CANCEL, TESTS, and selecting **`Spec Anl`** from the **`To Screen`** menu. To print this screen, press SHIFT PRINT (a compatible printer must be connected, and the Test Set must be configured appropriately. **See "Printing," in chapter 6, on page 160**.

VSWR can be calculated from the return loss. The following **table 3** and **table 4** contain some of the values from a calculation.

Table 3 Return Loss (0 to 20 dB) to VSWR

Return Loss (dB)	0	2	4	6	8	10	12	14	16	18	20
VSWR	infinity	8.7	4.4	3.0	2.3	1.92	1.67	1.50	1.38	1.29	1.22

Table 4 Return Loss (20 to 40 dB) to VSWR

Return Loss (dB)	20	22	24	26	28	30	32	34	36	38	40
VSWR	1.22	1.17	1.13	1.11	1.08	1.07	1.05	1.04	1.03	1.03	1.02

The following formula can be used to determine the VSWR from the return loss (=RL in dB):

$$VSWR = \frac{1 + 10^{\frac{-RL}{20}}}{1 - 10^{\frac{-RL}{20}}}$$

VSWR is sometimes stated as a ratio. For example: 1.2:1 or “one point two to one” VSWR. The first number is given in the tables and formula. The second number is always one.

Estimating Antenna Return Loss

If you are measuring the return loss of an antenna connected to the end of a known good feed line, you can approximately determine the return loss of the antenna by subtracting twice the line loss. For example, if you measure a return loss of 24 dB and the line is known to have 2 dB loss, the estimated return loss of the antenna is 20 dB. This estimate is in error if the coaxial line and connectors do not have a return loss somewhat greater than 24 dB.

Parameters Used

- **GN return loss & cable loss RF level (dBm)**

Pass/Fail Limits Used

- **GN return loss (dB)**

TEST_03 - GN Discrete Channel Return Loss

This test measures the return loss for discrete channels. This test is performed at channels entered by the user and offset by a frequency to make the measurement between actual channels. A reference level is measured on the spectrum analyzer with a short or open on the SWR bridge DUT port. The return loss is then measured with the cable or antenna-under-test on the SWR bridge DUT port.

This test should be used when there is a chance that a full frequency sweep of the band to be tested may cause interference. In this test, the chance of interference is greatly reduced by selecting an offset that sets a CW test frequency in between the assigned AMPS channels. For example, selecting an offset of 15 kHz places the test signal between adjacent AMPS channels.

See **TEST_02 - GN Swept Return Loss** for a return loss to VSWR conversion table and formula and a way to estimate the return loss of an antenna connected to the end of a feed line.

Parameters Used

- **GN return loss & cable loss RF level (dBm)**

Pass/Fail Limits Used

- **GN return loss (dB)**

TEST_04 - GN Cable Fault vs Distance

NOTE: **Test Signal Can Cause Interference**

When testing cables attached to antennas, test signals will be radiated. Verify that the signal used for the test cannot result in interference to another antenna. The software reduces the signal generator's level except when it is needed to actually perform the measurement.

This test operates over a wide frequency band. The test will always operate with a center frequency of 505 MHz. The frequency span however will be determined by the length of the cable measured. Longer cables will use a narrower frequency span. The frequency span will equal 990 MHz for cables less than 50 feet long and equal approximately 99 MHz for cables 500 feet long. It is always safe to assume that the frequency span is less than or equal to 990 MHz.

This test displays the return loss of a transmission line as a function of the distance down the line. A frequency-swept signal from the DUPLEX OUT port is applied through a resistive power divider to the cable-under-test. Signals reflected from faults in the cable are combined with the DUPLEX OUT signal in the power divider and applied to the ANT IN port. The changing interference of the forward and reflected signals, over the swept frequency band, contains information about the distance to one or more faults. The software uses a Fast Fourier Transform (FFT) to convert the frequency domain into the distance domain. The distance displayed on the Test Set's CRT is the physical distance to the fault with correction for the velocity factor of the cable.

Cable Fault Performance

Measurements of the cable fault location can typically be made up to 500 feet on low-loss cables and 300 feet on higher-loss cables. Resolution of the fault location is approximately 0.4 feet for cable lengths up to 50 feet and then linearly increases to 4 feet for a 500 foot cable.

Selecting Cable Type

When this test is run, a screen will appear which will prompt you for the following information:

- Cable length
- Cable length units
  - Pressing the knob will toggle the selection between feet and meters.
- Cable class
  - Pressing the knob will provide for Heliax, RG, and custom options.
- The next prompt varies depending on the selection for cable class:
  - If Custom is selected, you will be prompted to enter the cable's velocity of propagation constant and attenuation per 100 feet (or meters). The propagation velocity must be a value between 0 and 1.
  - If RG is selected, you will be prompted to enter the cable type with the example [RG 58/U = 58]. You must enter a value between 0 and 1000.
  - If Heliax is selected, you will be prompted to enter the cable type. A list will appear with choices of foam, air, and flex of varying thickness. Push the knob to select the desired cable type.
- Select **`Begin Test`** when all the appropriate entries have been made.
- Connect the cables as instructed, and press k5 (**`continue`**).

NOTE: **Velocity Factors and Attenuation**

Cables that use polyethylene dielectric typically have a propagation velocity of 0.66, cables that use a teflon dielectric typically have a propagation velocity of 0.70. If the cable attenuation is unknown, enter 0 dB per 100 feet (or meters). Entering 0 dB/100 will produce return loss values lower than actual, but fault distance can be accurately detected.

NOTE:

Typical Cable Fault Return Loss Measurements

Return loss is a ratio of input power to reflected power. For example, if 100 Watts was applied to a cable and 10 Watts was returned, the return loss is 10 dB (10 log (100/10)). In the same example, if 1 Watt was returned, the return loss would be 20 dB (10 log (100/1)). Typical return loss measurements for the cable loss test are listed below:

- Open-Circuit Cable = 0 dB
- Short-Circuit Cable = 0 dB
- 50-Ohm Terminated Cable = 20 to 30 dB
- Antenna = 10 to 20 dB

Return loss measurements below 25 dB should be considered excellent. For best results, the cable output should be terminated in 50 ohms.

Entering Cable Length

The greatest accuracy is obtained when you enter a cable length slightly greater than the actual cable length, considering length uncertainty. If you are not sure of the cable length, enter a value 1.5 times the estimated length. Depending on the return loss of the antenna or device at the end of the cable, you may see a high relative mismatch displayed at the actual length of the cable.

Interpreting Cable Fault Location Results

Distance to the cable fault is accurately quantified when you select the USER **`Disp data`** field. The return loss levels and distance at which the faults occur are displayed. Numeric data for the six smallest return loss values of data from the graph are listed. Values greater than 25 dB can be ignored. The smallest return loss is most likely the location of a cable fault. Other numeric data points, particularly if they are further down the line from a point of high relative mismatch, can be ignored. Data points on the fringe of a point of high relative mismatch are usually attributable to the single fault.

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

There are no pass/fail limits used in this test.

TEST_05 - GN Memory Card Initialization

This “test” may be used to easily initialize an SRAM memory card. No measurements are performed.

To Initialize a Memory Card Using TEST_05

1. Run TEST_05
2. Insert Card to be initialized. (Make sure the write-protect switch is not in the “safe” position).
3. If you do not want to continue with the initialization procedure, press k2 (**`Exit`**). If you would like to continue, press k1 (**`continue`**).
4. Select DOS or LIF format. Press k1 (**`DOS`**) or k2 (**`LIF`**).

NOTE: If you are using the card for data collection, it is better to initialize with DOS format because DOS will dynamically allocate the needed file size.

5. All data on the card will be lost. Are you ready to initialize the card? Press k1 (**`Yes`**) to continue or k2 (**`No`**) to exit.
6. The message **`Card is initialized`** will appear on the CRT when the initialization is complete.

NOTE: With Test Set firmware revisions above A.14.00, memory card initialization can be easily performed using the **`Save/Delete Procedure`** screen (this may be quicker than running TEST_05). Press TESTS and select the **`Save/Delete Procedure`** screen. Press k3 (**`Init Card`**).

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

There are no pass/fail limits used in this test.

TEST_06 - GN Data Collection File Transfer

This “test” may be used to easily transfer data collection (test results) files from an SRAM card over the serial or HPIB port. You do not need to write an IBASIC program. No measurements are performed.

To Transfer Data Collection Files

1. Run TEST_06.
2. Insert the memory card containing the test results.
3. Press k2 (**`Continue`**).
4. Select the appropriate output port: serial port toggles with HPIB, Addr 701.
5. Make sure the appropriate cables are connected, and serial or HPIB settings are correct on the I/O CONFIGURE Screen (**`To Screen`** menu, select **`More`**, **`IO CONFIG`**.
6. Select the files to transfer.
7. Select **`Transfer Selected Files`**.
8. Once the files are transferred, if you would like to delete the files from the card, select **`Purge (Delete) Selected Files`**.
9. Press k5 (**`Exit`**) to exit this “test”.

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

There are no pass/fail limits used in this test.

TEST_07 - GN Copy Procedures to RAM Memory

This program will copy up to 30 files of procedures and libraries from a card to the internal RAM memory. You can then access the procedures by selecting **`Location: RAM`** on the TESTS Main Menu Screen.

You can select to copy all the files on the card, or if you choose k2 (**`No`**), the software will display each file individually for you to decide.

This program will initialize the internal RAM memory. Files in the internal RAM :MEMORY,0,0 will be lost. If this program is terminated prematurely, the internal RAM memory may be initialized with nothing in the RAM memory. LIF format cards will format RAM as LIF and DOS format cards will format RAM as DOS.

This will enable you to access the copied procedures by selecting procedure location RAM on the main menu screen. You no longer need to have the card to select procedures. You still need to have the card to load the software program. However, once the software program is loaded, you can remove the card. The software program will remain loaded in the instrument as long as you don't load a different program.

NOTE: Procedures are not software programs. There can be multiple procedures with one program. The library on the TESTS screen is the name of the software program.

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

There are no pass/fail limits used in this test.

TX Measurement without Audio

Figure 6 highlights the path and the direction of the RF signal during the transmitter measurements without audio (TEST_08, 09, 10, and 12).

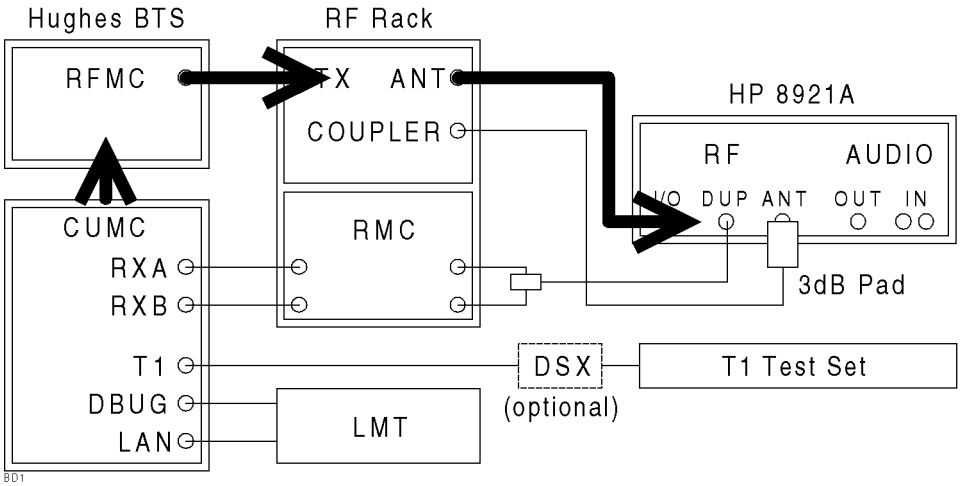


Figure 6 **RF Signal Path and Direction for TX Measurements Without Audio**

TEST_08 - TX MIN/MAX Output Power

This test checks the high and low output power of the TX single channel amplifier (SCA). See **figure 6** for information on the signal path and direction.

- The LMT IS-54 channel is set to the cut channel-under-test.
- Using the LMT, the power is set to the maximum level and the user is prompted to key the carrier.
- Using the LMT, SAT is turned off.
- Using the T1 Test Set, quiet T1 is inserted in the slot specified in the data entry screen.
- High power is checked, and the absolute measurement result is displayed in dBm and in watts.
- Using the LMT, the power is changed to the minimum level.
- Low power is checked, and the relative measurement result is displayed.

Three outputs are displayed for each channel tested:

- TX SCA high power in dBm
- TX SCA high power in watts
- TX SCA MIN/MAX low power error (dBm)

Power measurement accuracy depends on the accuracy of the values entered for the path losses. Path losses may be measured using **TEST_15 - TX Path Insertion Loss (for NGA)** .

Parameters Used

- **TX Min/Max power difference for SCA-I (dB)**
- **TX Min/Max power difference for SCA-II (dB)**
- **TX pow at ANT use Watt Meter [0=no 1=yes]** (Using Watt Meter is experimental for limited use)

Pass/Fail Limits Used

- **TX SCA freq resp or MIN/MAX high power (dBm)**
- **TX SCA MIN/MAX SCA-I power error (dB)**
- **TX SCA MIN/MAX SCA-II power error (dB)**

TEST_09 - TX Output Power

This test is used to adjust the transmit power of a channel to the desired output power at the hatchplate of the cell site. The adjusted TX power is measured and compared with the expected value (TX cut channel power value entered in the initial data entry screen) to calculate the TX power error. See **figure 6** for information on the signal path and direction.

- The LMT IS-54 channel is set to the cut channel-under-test.
- Using the LMT, SAT is turned off.
- Using the T1 Test Set, quiet T1 is inserted in the slot specified in the data entry screen.
- A power meter will be displayed on the CRT. Use the LMT and trim pot on the SCA-II PA's to adjust the power level until the needle is between the longer spec lines.
  - Use k4 to adjust the sound level. The setting toggles between Tns off, Tns quiet, and Tns loud.
- TX power is measured.

Three outputs are displayed for each channel tested:

- TX power error (dBm)
- TX power in Watts
- TX power in dBm

Power measurement accuracy depends on the accuracy of the values entered for the path losses. Path losses may be measured using **TEST_15 - TX Path Insertion Loss (for NGA)**.

Parameters Used

- **TX pow at ANT use Watt Meter [0=no 1=yes]** (limited use, experimental parameter)

Pass/Fail Limits Used

- **TX Output power error (dB)**

TEST_10 - TX Frequency

This test measures the TX carrier frequency and computes the frequency error based on the cut channel number entered in the initial data entry screen. See **figure 6** for information on the signal path and direction.

- The LMT IS-54 channel is set to the cut channel-under-test.
- Using the LMT, the power is set to the specified level (Watts) and the user is prompted to key the carrier.
  - If this test is run in a procedure after **TEST_16 - SCA Frequency Response & MIN/MAX**, power is set to the maximum level.
  - If this test is not run in a procedure after TEST_16, the power level will be set to the value entered in the data entry screen.
- Using the LMT, SAT is turned off.
- Using the T1 Test Set, quiet T1 is inserted in the slot specified in the data entry screen.
- TX carrier frequency is measured, and the calculated frequency error is displayed.

One output is displayed for each channel tested:

- TX Carrier frequency error (Hz)

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

- **TX frequency error (Hz)**

TX Audio Measurements

Figure 7 highlights the path and the direction of the RF signal during the transmitter audio measurements (TEST_11 and TEST_13).

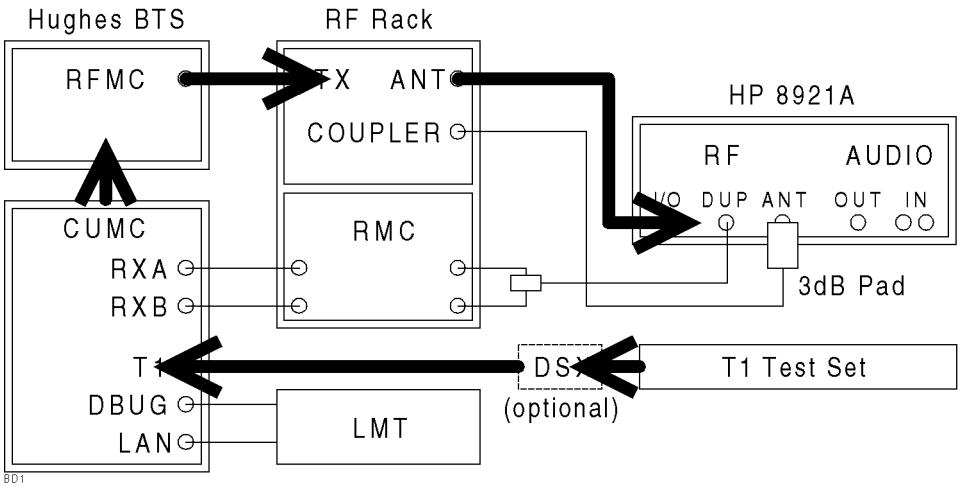


Figure 7 **RF Signal Path with Direction for TX Audio Measurements**

TEST_11 - TX Voice Deviation/Audio Level

This test is used to verify that the channel-under-test is providing the correct FM deviation for a set audio level input into the channel unit. The audio level is input to the channel-under-test, via the T1 line with the T1 Test Set. The HP 8921A Test Set demodulates RF carrier on the channel-under-test, and verifies that the correct deviation is generated for the injected audio level. Deviation is checked at the high and low audio levels. The high and low audio parameters are the levels prompted to the user for setting the T1 Test Set. See **figure 7** for information on the signal path and direction.

- The LMT IS-54 channel is set to the cut channel-under-test.
- Using the LMT, power is set to the specified level (Watts) and the user is prompted to key carrier.
  - If this test is run in a procedure after **TEST_16 - SCA Frequency Response & MIN/MAX**, power is set to the maximum level.
  - If this test is not run in a procedure after TEST_16, the power level will be set to the value entered in the data entry screen.
- Using the LMT, SAT is turned off.
- Using the T1 Test Set, an audio signal is injected into the CUMC.
  - The audio frequency is determined by parameter **RT audio test frequency (Hz)**. (Default= 1004 Hz)
  - The TX audio level is determined by parameter **TX audio high test level (dBm)**. (Default=–0.5 dBm)
  - The slot is determined by the entry on the data screen.
- High deviation is measured, and the results are displayed for TX voice frequency and TX audio distortion.
- Using the T1 Test Set, an audio signal is injected into the CUMC.
  - The audio frequency is determined by parameter **RT audio test frequency (Hz)**. (Default= 1004 Hz)
  - The TX audio level is determined by parameter **TX audio low test level (dBm)**. (Default=–18 dBm)
  - The slot is determined by the entry on the data screen.
- Low deviation is measured, and the results are displayed for TX voice frequency and TX audio distortion.

Six outputs are displayed for each channel tested:

- TX voice high deviation (kHz)
  - TX voice frequency (Hz)
  - TX audio distortion (%)
- TX voice low deviation (kHz)
  - TX voice frequency (Hz)
  - TX audio distortion (%)

There are no manual adjustments for frequency deviation and audio level.

Parameters Used

- **RT audio test frequency (Hz)**
- **TX audio high test level (dBm)**
- **TX audio low test level (dBm)**

Pass/Fail Limits Used

- **TX audio distortion (%)**
- **TX audio frequency (Hz)**
- **TX frequency deviation high (kHz)**
- **TX frequency deviation low (kHz)**

TEST_12 - TX SAT Frequency and Deviation

This test verifies that the channel-under-test can generate SAT at the correct frequency and deviation. The Test Set is used as a receiver, and measures the SAT deviation and frequency. See **figure 6** for information on the signal path and direction.

- The LMT IS-54 channel is set to the cut channel-under-test.
- Using the LMT, the power is set to the specified level (Watts) and the user is prompted to key the carrier.
  - If this test is run in a procedure after **TEST_16 - SCA Frequency Response & MIN/MAX**, power is set to the maximum level.
  - If this test is not run in a procedure after TEST_16, the power level will be set to the value entered in the data entry screen.
- Using the LMT, SAT is set to the frequency specified in the data entry screen.
- Using the T1 Test Set, quiet T1 is inserted in the slot specified in the data entry screen.
- TX SAT frequency error and TX SAT peak deviation measurements are made, and the results are displayed.

Two outputs are displayed for each channel tested:

- TX SAT frequency error at (SAT frequency)
- TX SAT peak deviation at (SAT frequency)

There are no adjustments for SAT frequency or deviation.

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

- **TX SAT deviation (kHz)**
- **TX SAT frequency error (Hz)**

TEST_13 - TX Maximum Voice Deviation

This test verifies that the transmit limiter is functioning properly and that no spurious emissions are generated out of the channel-under-test. The T1 Test Set is used to inject a high audio level specified by parameter **TX audio high test level (dBm)**. This level should be set to exceed the transmitter's limits, invoking the use of the deviation limiter. The Test Set will demodulate the RF carrier from the channel-under-test to measure the deviation. After the first measurement, the user has the option of going to the spectrum analyzer to make a visual verification of spurious emissions. SAT will be turned on at first to verify maximum overall deviation, and then it will be turned off to check the voice limiter. See **figure 7** for information on the signal path and direction.

- The LMT IS-54 channel is set to the cut channel-under-test.
- Using the LMT, the power is set to the specified level (Watts) and the user is prompted to key the carrier.
  - If this test is run in a procedure after **TEST_16 - SCA Frequency Response & MIN/MAX**, power is set to the maximum level.
  - If this test is not run in a procedure after TEST_16, the power level will be set to the value entered in the data entry screen.
- Using the LMT, SAT is set to the frequency specified in the data entry screen.
- Using the T1 Test Set, a high audio level (determined by the parameter above) is inserted to the slot specified in the data entry screen.
- Instructions for using the Spectrum Analyzer will appear on the display. If you have firmware revision A.12.04 or above, you have the option to go to the Spectrum Analyzer display at this point for visual verification of spurious emissions.
  - Verify that no spurious signals are greater than 60 dB down from the carrier at frequencies greater than 1 channel above or below the carrier.
  - The transmit carrier will have skirts that fall in adjacent channels. Verify that the level of these skirts are at least 25 dB down from the peak.
  - Verify that no signals are present when all carriers are turned off. (Some signals may be due to the local cell).
- TX maximum deviation with SAT is measured and the result is displayed.
- Next, using the LMT, SAT is turned off.
- TX maximum deviation without SAT is measured and the result is displayed.

Two outputs are displayed for each channel tested:

- TX maximum deviation with SAT (kHz)
- TX maximum deviation without SAT (kHz)

NOTE: The use of the Spectrum Analyzer in this test (to pause and return to testing) requires HP 8921A firmware revision 12.04 or greater.

There are no manual adjustments necessary.

Parameters Used

- **TX audio high test level (dBm)**

Pass/Fail Limits Used

- **TX maximum deviation with SAT (kHz)**
- **TX maximum deviation without SAT (kHz)**

TEST_14 - TX Spec Anal ATC Pwer & IM Test

This test is intended to be run as the last test in procedure. It loops testing back to the data entry field to test a new channel, or adjusts the power on all the channels in the TX chain under test.

If the adjusted TX output power is set on the last channel to the desired hatchplate power, then the Test Set switches to the spectrum analyzer to adjust the ATC power on all the channels in the TX chain, and performs the IM test.

This test begins by prompting the user with the question: “Is this the last channel tested for a TX chain?” If there are additional channels in the TX chain to be tested, the test procedure will loop back to the initial data entry screen for the next channel in the TX chain.

If there are no additional channels in the TX chain, the TX output power test will be run to set that last channel to the desired hatchplate power and adjust power on all TX chain channels.

- The LMT IS-54 channel is set to the cut channel-under-test.
- Using the LMT, SAT is turned off.
- Using the T1 Test Set, insert quiet T1 in the slot specified in the data entry screen.
- A power meter will be displayed on the CRT. Use the LMT and trim pot on the SCA-II PA’s to adjust the power level until the needle is between the longer spec lines.
    - Use k4 to adjust the sound level. The setting toggles between Tns off, Tns quiet, and Tns loud.
- The output power test results will be compared against the value entered in the data entry screen, and TX power error will be calculated.

Next, the Test Set will switch to the spectrum analyzer mode. The user is given the choice to disable the spectrum analyzer calibration after setting the reference level. Disabling the calibration provides better level accuracy at only this reference level. Select k1 (**Yes**) or k2 (**No**). The spectrum analyzer screen will be displayed. Verify that the reference level is 1 dB above the peak of the carrier. If not, line up the carrier to the first horizontal graticule (grid line) below the top of the screen.

CAUTION: Do NOT leave RFMC ANT output connected to the Test Set. Connect RFMC ANT to a dummy load of sufficient size to handle all the carriers.

- To set the ATC power, turn on all the carriers for the tested chain.
- Adjust all the carriers to 1 dB below the top of the spectrum analyzer. This now references all the power levels on each chain in the TX chain to the power set on the last channel.
- To perform the IM test, verify there are no out of spec IM product with all carriers turned on . (The spectrum analyzer scale is 10 dB/div).
- One by one, turn off each carrier.
- Continue inspecting for IM products until all carriers are turned off.

Four outputs are displayed at the end of this test:

- TX Power error (dBm)
- TX Power in Watts
- TX Power in dBm
- IM products present (YES/NO)

Parameters Used

- **TX pow at ANT use Watt Meter [0=no 1=yes]** (limited use, experimental parameter)

Pass/Fail Limits Used

- **TX Output power error (dB)**

TEST_15 - TX Path Insertion Loss (for NGA)

This test checks the frequency response of the transmit signal path from the output of the combiner network to the cell site hatchplate, and also checks the insertion loss.

NOTE: The dynamic range of the spectrum analyzer is approximately 60 to 70 dB for this sweep test. Therefore, the insertion loss of the filter may be better than it appears in the out of band areas.

Filter masks for the HNS specified transmit filters can be overlaid on the displayed frequency response plot. To edit the displayed filter mask curves, see the description of procedure **TX_BPF** for instructions.

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

- **TX path insertion loss (dB)**

TEST_16 - SCA Frequency Response & MIN/MAX

This test performs both the Single Channel Amplifier (SCA) Frequency Response and the SCA MIN/MAX tests.

The SCA Frequency Response measurement verifies remote channel selection operation of the channel unit (CU) output's transmit chain. This transmit chain includes the single channel amplifier (SCA) and the auto tune combiner (ATC).

A carrier is keyed up at full power at low, mid, and high-band frequencies. Output power is checked at the hatchplate at each frequency. The three values are compared to each other to verify that the BTS has the correct transmit frequency response, reporting TX SCA power flatness.

This measurement is performed in either the A- or B-band frequencies (specified on the data entry screen), on each CU channel .

The SCA MIN/MAX test confirms that the SCAs and the ATCs can operate over their entire operational range. This test is run at only the low-band frequency.

- The LMT IS-54 channel is set to the low-band frequency.
- Using the LMT, the power is set to the maximum level and the user is prompted to key the carrier.
- Using the LMT, SAT is turned off.
- Using the T1 Test Set, quiet T1 is inserted in the slot specified in the data entry screen.
- TX SCA High Power is measured, and the results are displayed in dBm and Watts.
- Using the LMT, the power is changed to the minimum level.
- TX SCA Low Power is measured, and the results for TX SCA MIN/MAX low power error (dB) will be displayed. Power error is calculated as follows: (High – Low Power) – parameter TX Min/Max power difference for SCA.
- This loop is repeated for mid-band and high-band frequencies, checking only the high power.
- After high power is checked at all three frequencies, TX SCA power flatness is calculated and reported. Flatness is calculated as follows: The three measured values for high power are averaged. Of those three values, the maximum delta from the average is considered the flatness.

Two outputs are displayed for each channel tested:

- TX SCA high power in dBm
- TX SCA high power in watts

Additionally:

- TX SCA MIN/MAX low power error (dBm) is reported for the low-band frequency.
- TX SCA power flatness is reported.

Power measurement accuracy depends on the accuracy of the values entered for the path losses. Path losses may be measured using **TEST_15 - TX Path Insertion Loss (for NGA)**.

Parameters Used

- **TX Min/Max power difference for SCA-I (dB)**
- **TX Min/Max power difference for SCA-II (dB)**
- **TX pow at ANT use Watt Meter [0=no 1=yes]** (limited use, experimental parameter)

Pass/Fail Limits Used

There are no pass/fail limits used in this test.

- **TX SCA freq resp or MIN/MAX high power (dBm)**
- **TX SCA MIN/MAX SCA-I power error (dB)**
- **TX SCA MIN/MAX SCA-II power error (dB)**

TEST_17 - SCA Freq Resp, MIN/MAX & RX tests

This performs Power, RX Sensitivity, RX Deviation/Audio Level, and RX RSSI tests at low, mid and high frequencies on a channel unit.

How TEST_17 is Performed

TEST_17 is performed in the following order:

1. Channel: Low
   a. Measure maximum power
   b. Measure minimum power
   c. TEST_18 RX Sensitivity SINAD
   d. TEST_19 RX Deviation/Audio Level
   e. TEST_20 RX RSSI
2. Channel: Mid
   a. Measure maximum power
   b. TEST_18 RX Sensitivity SINAD
   c. TEST_20 RX RSSI
3. Channel: High
   a. Measure maximum power
   b. Calculate TX SCA flatness
   c. TEST_18 RX Sensitivity SINAD
   d. TEST_20 RX RSSI

Parameters Used

- **RT audio test frequency (Hz)**
- **RX deviation high test level (kHz)**
- **RX deviation low test level (kHz)**
- **RX deviation/audio RF level for test (dBm)**
- **RX RSSI high detection level (dBm)**
- **RX RSSI low detection level (dBm)**
- **RX Sensitivity modulation deviation (kHz)**
- **RX Sensitivity nominal RF level (dBm)**
- **RX Sensitivity threshold RF level (dBm)**
- **TX Min/Max power difference for SCA-I (dB)**
- **TX Min/Max power difference for SCA-II (dB)**
- **TX pow at ANT use Watt Meter [0=no 1=yes]** (limited use, experimental parameter)

Pass/Fail Limits Used

- **GN return loss (dB)**
- **RX audio level at high deviation (dBm)**
- **RX audio level at low deviation (dBm)**
- **RX RSSI RF high level error (dBm)**
- **RX RSSI RF high level error on chan 333 (dBm)**
- **RX RSSI RF high level error on chan 334 (dBm)**
- **RX RSSI RF high level error on chan 566 (dBm)**
- **RX RSSI RF high level error on chan 716 (dBm)**
- **RX RSSI RF high level error on chan 799 (dBm)**
- **RX RSSI RF high level error on chan 991 (dBm)**
- **RX RSSI RF low level error (dBm)**
- **RX RSSI RF low level error on chan 333 (dBm)**
- **RX RSSI RF low level error on chan 334 (dBm)**
- **RX RSSI RF low level error on chan 566 (dBm)**
- **RX RSSI RF low level error on chan 716 (dBm)**
- **RX RSSI RF low level error on chan 799 (dBm)**
- **RX RSSI RF low level error on chan 991 (dBm)**
- **RX sensitivity at nominal RF level (dB)**
- **RX sensitivity at threshold RF level (dB)**
- **TX SCA freq resp or MIN/MAX high power (dBm)**
- **TX SCA MIN/MAX SCA-I power error (dB)**
- **TX SCA MIN/MAX SCA-II power error (dB)**

RX Measurements

Figure 8 highlights the path and the direction of the RF signal during the receiver measurements (TEST_18 and TEST_19).

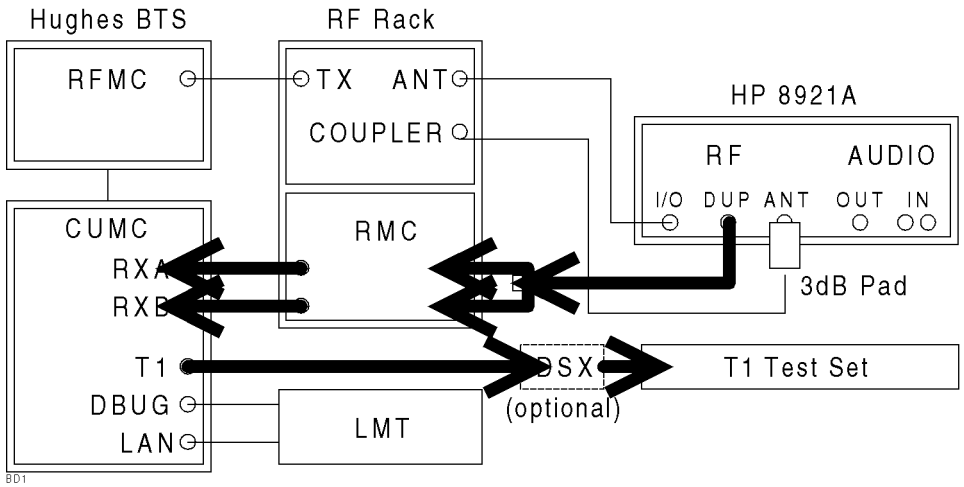


Figure 8 **RF Signal Path and Direction for Receiver Measurements**

TEST_18 - RX Sensitivity/SINAD

This test verifies that both receiver A and receiver B are working correctly and provides the specified nominal and threshold sensitivities. The Test Set injects a reference signal into the RMC that supports the channel-under-test. The frequency of that tone is specified by parameter **RT audio test frequency (Hz)** (default=1004 Hz). The signal level out of the service monitor is first set at the nominal sensitivity level and then to the threshold sensitivity level at the input of the RMC. The test channel receives the test signal and demodulates it. The resulting audio tone will be inserted into the selected T1 timeslot. The T1 Test Set drops out the selected T1 timeslot and the S/N measurement of the channel-under-test is made. The sensitivity measurement is then repeated on the RMC B. See **figure 8** for information on the signal path and direction.

- The LMT IS-54 channel is set to the appropriate channel.
  - When run in a procedure as TEST_18, the channel is set to the cut channel-under-test.
  - When this measurement is performed in TEST_17, the channel is set to the low, mid, and high-band frequencies.
- Using the LMT, SAT is set to the frequency specified in the data entry screen.
- Using the T1 Test Set, quiet T1 is inserted in the slot specified in the data entry screen.
- RMC B is turned off.

  1. The Test Set's RF level is set at the sensitivity nominal level specified by the parameter **RX Sensitivity nominal RF level (dBm)**. The audio modulation is specified by parameters **RT audio test frequency (Hz)** and **RX Sensitivity modulation deviation (kHz)**. The SAT tone is specified in the data entry screen.
  2. The T1 Test Set performs the S/N measurement. The Test Set prompts the user to enter the measured S/N value.
  3. The Test Set's RF level is lowered to the threshold level, specified by the parameter **RX Sensitivity threshold RF level (dBm)**. Again, the audio modulation is specified by parameters **RT audio test frequency (Hz)** and **RX Sensitivity modulation deviation (kHz)**. The SAT tone is specified in the data entry screen.
  4. The T1 Test Set performs the S/N measurement. The Test Set prompts the user to enter the measured S/N value.

- RMC B is turned back on, and RMC A is turned off.
- Steps 1-4 are repeated on RMC B.

Parameters Used

- **RT audio test frequency (Hz)**
- **RX Sensitivity modulation deviation (kHz)**
- **RX Sensitivity nominal RF level (dBm)**
- **RX Sensitivity threshold RF level (dBm)**

Pass/Fail Limits Used

- **RX sensitivity at nominal RF level (dB)**
- **RX sensitivity at threshold RF level (dB)**

TEST_19 - RX Deviation/Audio Level

This test verifies that the channel-under-test correctly converts the deviation on received frequency to the correct audio level. The Test Set injects a reference signal in the base station receiver, including a tone specified by parameter **RT audio test frequency (Hz)** (default=1004) set to high and low deviation. See **figure 8** for information on the signal path and direction.

- The LMT IS-54 channel is set to the appropriate channel.
  - When run in a procedure as TEST_18, the channel is set to the cut channel-under-test.
  - When this measurement is performed in TEST_17, the channel is set to the low, mid, and high-band frequencies.
- Using the LMT, SAT is set to the frequency specified in the data entry screen.
- Using the T1 Test Set, quiet T1 is inserted in the slot specified in the data entry screen.
- The Test Set RF level is set at the level specified by the parameter **RX deviation/audio RF level for test (dBm)**. The audio tone is specified by parameter **RT audio test frequency (Hz)** at the deviation specified by parameter **RX deviation high test level (kHz)**. The SAT tone is specified in the data entry screen.
- The T1 Test Set measures the audio level. The Test Set Test Set prompts the user to enter the measured value.
- The Test Set's audio deviation is changed to the level specified by the parameter **RX deviation low test level (kHz)**.
- The T1 Test Set measures the audio level. The Test Set Test Set prompts the user to enter the measured value.

Parameters Used

- **RT audio test frequency (Hz)**
- **RX deviation high test level (kHz)**
- **RX deviation low test level (kHz)**
- **RX deviation/audio RF level for test (dBm)**

Pass/Fail Limits Used

- **RX audio level at high deviation (dBm)**
- **RX audio level at low deviation (dBm)**

RX RSSI

Figure 9 highlights the path and the direction of the RF signal during the receiver RSSI measurement (TEST_20).

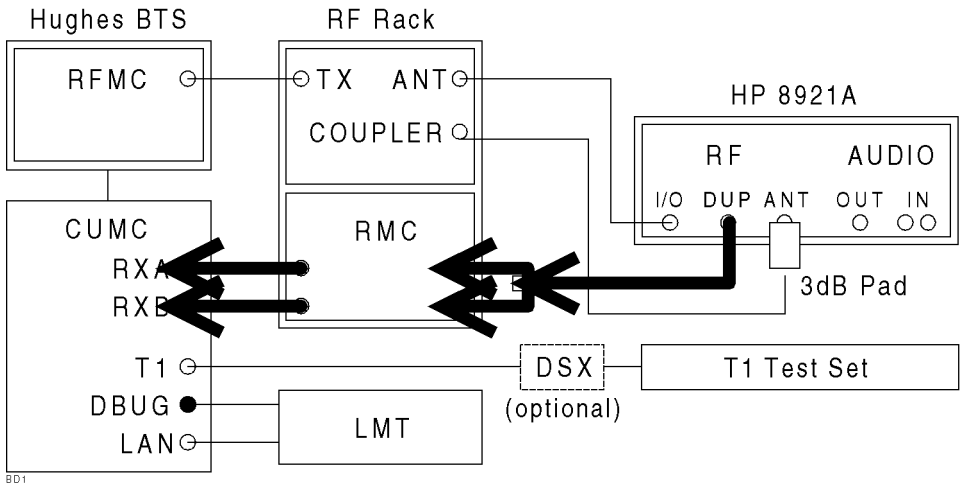


Figure 9 **RF Signal Path and Direction for RSSI Measurement**

TEST_20 - RX RSSI

This test verifies the channel-under-test properly measures the received signal power level on both diversity paths. The test is also run at high and low power levels to verify that the receiver properly reacts to changes in input signal level. The Test Set injects a test signal of a known power level (including losses) into the RMC that supports the receive channel-under-test. A command is executed on the channel unit (CU), which then displays the current RSSI power on both diversity paths. See **figure 9** for information on the signal path and direction.

- The LMT IS-54 channel is set to the appropriate channel.
  - When run in a procedure as TEST_20, the channel is set to the cut channel-under-test.
  - When this measurement is performed in TEST_17, the channel is set to the low, mid, and high-band frequencies.
- Using the LMT, set SAT to the frequency specified in the data entry screen.
- Using the T1 Test Set, insert quiet T1 in the slot specified in the data entry screen.
- The Test Set RF level is set at the level specified by the parameter **RX RSSI high detection level (dBm)** (default=–75). The audio tone is specified by parameter **RT audio test frequency (Hz)** at 2.9 kHz deviation. The SAT tone is specified in the data entry screen.
- With the debug terminal, read RSSI A and B. The Test Set Test Set prompts the user to enter the measured values.
- The Test Set RF level is lowered to the level specified by the parameter **RX RSSI low detection level (dBm)** (default=–90). Again, the audio tone is specified by parameter **RT audio test frequency (Hz)** at 2.9 kHz deviation. The SAT tone is specified in the data entry screen.
- With the debug terminal, read RSSI A and B. The Test Set Test Set prompts the user to enter the measured values.

Parameters Used

- **RT audio test frequency (Hz)**
- **RX RSSI high detection level (dBm)**
- **RX RSSI low detection level (dBm)**

Pass/Fail Limits Used

- **RX RSSI RF high level error (dBm)**
- **RX RSSI RF high level error on chan 333 (dBm)**
- **RX RSSI RF high level error on chan 334 (dBm)**
- **RX RSSI RF high level error on chan 566 (dBm)**
- **RX RSSI RF high level error on chan 716 (dBm)**
- **RX RSSI RF high level error on chan 799 (dBm)**
- **RX RSSI RF high level error on chan 991 (dBm)**
- **RX RSSI RF low level error (dBm)**
- **RX RSSI RF low level error on chan 333 (dBm)**
- **RX RSSI RF low level error on chan 334 (dBm)**
- **RX RSSI RF low level error on chan 566 (dBm)**
- **RX RSSI RF low level error on chan 716 (dBm)**
- **RX RSSI RF low level error on chan 799 (dBm)**
- **RX RSSI RF low level error on chan 991 (dBm)**

TEST_21 - RX Path Gain

This test checks the frequency response and loss/gain of the receive signal path from the shelter hatchplate to the RMC, and from the RMC to the RCV test output, for each CUMC.

- Run TEST_21.
- Enter the desired start frequency and stop frequency.
- Press k5 (**`Begin Tst`**).
- Make connections shown on the display, and press k2 (**`Continue`**).
- The frequency response will be plotted on the display.

Filter masks for the HNS specified transmit filters can be overlaid on the displayed frequency response plot. To edit the displayed filter mask curves, see the description of procedure **TX_BPF** for instructions.

Parameters Used

- **RX path gain RF level (- 30 dBm optimum) (dBm)**

Pass/Fail Limits Used

- **RX path gain (RGA) (dB)**

TEST_22 - RX Path Insertion Loss

This test checks the frequency response of the receive signal path from the receiver of the combiner network to the cell site hatchplate, and also checks the insertion loss.

NOTE: The dynamic range of the spectrum analyzer is approximately 60 to 70 dB for this sweep test. Therefore, the insertion loss of the filter may be better than it appears in the out of band areas.

- Run TEST_22.
- Enter the desired start frequency and stop frequency.
- Press k5 (**`Begin Tst`**).
- Make connections shown on the display, and press k2 (**`Continue`**).
- The frequency response will be plotted on the display.

Filter masks for the HNS specified transmit filters can be overlaid on the displayed frequency response plot. To edit the displayed filter mask curves, see the description of procedure **TX_BPF** for instructions.

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

There are no pass/fail limits used in this test.

Parameter Descriptions

Parameters are used to define the conditions under which a test will run. You may edit the parameters to change the default values, to meet your specific testing needs and conditions. Parameters may be used in one or more tests.

For information on editing parameters, **see "Customizing Testing," in chapter 3, on page 42**.

The list of parameters is arranged alphabetically. The first few letters in the title of each parameter indicate what the parameter refers to:

GN - General

RT - Receiver/Transmitter

RX - Receiver

TX - Transmitter

ZZ - Test/demo mode selection

GN draw graticules on plots [0=no 1=yes]

This parameter turns on and off graticules (grid lines) when results are plotted.

GN return loss & cable loss RF level (dBm)

Enter the value for the return loss and cable loss tests' RF level. Interference may be caused by the a signal so it is best to keep this level low if you are doing a swept test or a cable fault test.

RT audio test frequency (Hz)

Enter the audio test frequency to be used in RX and TX tests (**TEST_11 - TX Voice Deviation/Audio Level**, **TEST_18 - RX Sensitivity/SINAD**, **TEST_19 - RX Deviation/Audio Level**, and **TEST_20 - RX RSSI**).

RX deviation high test level (kHz)

Enter the high test level to be used in **TEST_19 - RX Deviation/Audio Level**.

RX deviation low test level (kHz)

Enter the low test level to be used in **TEST_19 - RX Deviation/Audio Level**.

RX deviation/audio RF level for test (dBm)

Enter the RF level to be used in **TEST_19 - RX Deviation/Audio Level**.

RX path gain RF level (– 30 dBm optimum) (dBm)

Enter the RF level to be used in **TEST_21 - RX Path Gain**. 30 dBm is the optimum level.

RX RSSI high detection level (dBm)

Enter the high detection level to be used in **TEST_20 - RX RSSI**.

RX RSSI low detection level (dBm)

Enter the low detection level to be used in **TEST_20 - RX RSSI**.

RX SAT & ST RF level for test (dBm)

This parameter is not used by the current version of software code.

RX Sensitivity modulation deviation (kHz)

Enter the modulation deviation to be used in **TEST_18 - RX Sensitivity/SINAD**.

RX Sensitivity nominal RF level (dBm)

Enter the nominal RF level to be used in **TEST_18 - RX Sensitivity/SINAD**.

RX Sensitivity threshold RF level (dBm)

Enter the threshold RF level to be used in **TEST_18 - RX Sensitivity/SINAD**.

TX audio high test level (dBm)

Enter the high audio level to be used in **TEST_11 - TX Voice Deviation/Audio Level** and **TEST_12 - TX SAT Frequency and Deviation**.

TX audio low test level (dBm)

Enter the high audio level to be used in **TEST_11 - TX Voice Deviation/Audio Level**.

TX Min/Max power difference for SCA-I (dB)

Enter the power difference (maximum – minimum) for SCA-I, to be used in **TEST_09 - TX Output Power**.

TX Min/Max power difference for SCA-II (dB)

Enter the power difference (maximum – minimum) for SCA-II, to be used in **TEST_09 - TX Output Power**.

TX pow at ANT use Watt Meter [0=no 1=yes]

This parameter is experimental in the current version of software code. If set to 1=**yes**, it enables power measurements to be made with an external power meter, rather than the power meter internal to the Test Set. Note: the connection diagram for this test set up is not included in this manual.

TX power units for measure [0=W 1=dBm]

Enter the units you would like power measurements to be displayed in:

- 0=Watts
- 1=dBm

ZZ test mode [0=normal 1=demo]

This parameter is used to set up a demo mode.

When this parameter is to the 1=**demo**, the software will bypass most communication with the base station, allowing the program to be demonstrated without the delay caused by base station response time. This mode is useful if you are working in a training or practice situation without a base station connected to the Test Set.

Pass/Fail Limit (Specification) Descriptions

Pass/Fail Limits define the values a measurement's result is compared against to determine if the UUT meets its specified standards. The default values used in this software program were based on values listed in the Hughes Network Systems *GMH 2000 Base Transceiver Station Commissioning Test Procedure Handbook, revision 1.5*.

For information on how to edit Pass/Fail Limits, **see "Customizing Testing," in chapter 3, on page 42**.

All pass/fail limits have lower and upper limits that can be entered. The column labeled **`Check`** on the **`Pass/Fail Limits`** (or **`Edit Spec`**) screen specifies whether the lower limit, the upper limit, or both of the limits are used when compared with measurements. Some of the default pass/fail limits provided in the software have only one of the limits chosen. If you enter the other limit, be sure to change the **`Check`** column to **`Both`**.

Pass/Fail Limits remain in battery-backed-up memory until you select a procedure to run. If you wish to prevent them from being lost when a new procedure is selected you will have to save them in a procedure. **See "Saving a Test Procedure," in chapter 3, on page 53**. To print the list of Pass/Fail Limits, **see "To print TESTS screens:," in chapter 6, on page 166**.

Pass/fail limits can be secured. **See "Saving a Procedure," in chapter 6, on page 172**.

The list of pass/fail limits is arranged alphabetically. The first few capital letters in the title of each pass/fail limit indicate what the pass/fail limit refers to:

GN=General

RX=Receiver

TX=Transmitter

GN return loss (dB)

Enter the minimum return loss that is acceptable for swept return loss and discrete channel return loss.

RX audio level at high deviation (dBm)

This pass/fail limit sets the maximum and minimum RX audio level at high deviation for **TEST_19 - RX Deviation/Audio Level**.

RX audio level at low deviation (dBm)

This pass/fail limit sets the maximum and minimum RX audio level at low deviation for **TEST_19 - RX Deviation/Audio Level**.

RX path gain (RGA) (dB)

This pass/fail limit sets the maximum and minimum RX path gain for **TEST_21 - RX Path Gain**.

RX RSSI RF high level error (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to the cut channel of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF high level error on chan 333 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to channel 333 (mid-band A frequency) of the receiver. It is used in **TEST_20 - RX RSSI** .

RX RSSI RF high level error on chan 334 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to channel 334 (low-band B frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF high level error on chan 566 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to channel 566 (mid-band B frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF high level error on chan 716 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to channel 716 (high-band A frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF high level error on chan 799 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to channel 799 (high-band B frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF high level error on chan 991 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to channel 991 (low-band A frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF low level error (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI high detection level (dBm)** (default=–75 dBm) is applied to the cut channel of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF low level error on chan 333 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI low detection level (dBm)** (default=–90 dBm) is applied to channel 333 (mid-band A frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF low level error on chan 334 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI low detection level (dBm)** (default=–90 dBm) is applied to channel 334 (low-band B frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF low level error on chan 566 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI low detection level (dBm)** (default=–90 dBm) is applied to channel 566 (mid-band B frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF low level error on chan 716 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI low detection level (dBm)** (default=–90 dBm) is applied to channel 716 (high-band A frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF low level error on chan 799 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI low detection level (dBm)** (default=–90 dBm) is applied to channel 799 (high-band B frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX RSSI RF low level error on chan 991 (dBm)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator, when the level specified by parameter **RX RSSI low detection level (dBm)** (default=–90 dBm) is applied to channel 991 (low-band A frequency) of the receiver. It is used in **TEST_20 - RX RSSI**.

RX sensitivity at nominal RF level (dB)

This pass/fail limit sets the acceptable limits for the base station receiver's RX sensitivity at the nominal RF input level . It is used in **TEST_18 - RX Sensitivity/ SINAD**.

RX sensitivity at threshold RF level (dB)

This pass/fail limit sets the acceptable limits for the base station receiver's RX sensitivity at the threshold RF input level. It is used in **TEST_18 - RX Sensitivity/ SINAD**.

TX audio distortion (%)

This pass/fail limit sets the acceptable limits for the base station transmitter's audio distortion. It is used in **TEST_11 - TX Voice Deviation/Audio Level**.

TX audio frequency (Hz)

This pass/fail limit sets the acceptable limits for the base station transmitter's audio frequency. It is used in **TEST_11 - TX Voice Deviation/Audio Level**.

TX frequency deviation high (kHz)

This pass/fail limit sets the acceptable limits for the base station transmitter's voice high deviation. It is used in **TEST_11 - TX Voice Deviation/Audio Level**.

TX frequency deviation low (kHz)

This pass/fail limit sets the acceptable limits for the base station transmitter's voice low deviation. It is used in **TEST_11 - TX Voice Deviation/Audio Level**.

TX frequency error (Hz)

This pass/fail limit sets the acceptable limits for the base station transmitter's carrier frequency error. It is used in **TEST_10 - TX Frequency**.

TX maximum deviation with SAT (kHz)

This pass/fail limit sets the acceptable limits for the base station transmitter's maximum deviation with SAT. It is used in **TEST_13 - TX Maximum Voice Deviation**.

TX maximum deviation without SAT (kHz)

This pass/fail limit sets the acceptable limits for the base station transmitter's maximum deviation without SAT. It is used in **TEST_13 - TX Maximum Voice Deviation**.

TX Output power error (dB)

This pass/fail limit sets the acceptable limits for the base station transmitter's output power error. It is used in **TEST_09 - TX Output Power**.

TX path insertion loss (dB)

This pass/fail limit sets the acceptable limits for the base station transmitter's path insertion loss. It is used in **TEST_15 - TX Path Insertion Loss (for NGA)**.

TX SAT deviation (kHz)

This pass/fail limit sets the acceptable limits for the base station transmitter's SAT deviation. It is used in **TEST_12 - TX SAT Frequency and Deviation**.

TX SAT frequency error (Hz)

This pass/fail limit sets the acceptable limits for the base station transmitter's SAT frequency error. It is used in **TEST_12 - TX SAT Frequency and Deviation**.

TX SCA frequency response flatness (dB)

This pass/fail limit sets the acceptable limits for the base station transmitter's SCA frequency response flatness. It is used in **TEST_16 - SCA Frequency Response & MIN/MAX** and **TEST_17 - SCA Freq Resp, MIN/MAX & RX tests**.

TX SCA freq resp or MIN/MAX high power (dBm)

This pass/fail limit sets the acceptable limits for the base station transmitter's SCA frequency response. It is used in **TEST_09 - TX Output Power**.

TX SCA MIN/MAX SCA-I power error (dB)

This pass/fail limit sets the acceptable limits for the base station transmitter's SCA-I power error. It is used in **TEST_09 - TX Output Power**.

TX SCA MIN/MAX SCA-II power error (dB)

This pass/fail limit sets the acceptable limits for the base station transmitter's SCA-II power error. It is used in **TEST_09 - TX Output Power**.

6

Reference (Alphabetical)

This chapter provides detailed descriptions of the features and functions of the HP 11807B software. Topics are arranged alphabetically for quick, easy reference.

Conventions Used

Special presentations of text in this manual reflect the appearance of the item being referred to.

Examples of these special presentations are:

TESTS

A key on the Test Set.

Procedure:

Characters displayed on the CRT display.

k1 (**Run Test**)

A USER key, in the key column next to the CRT. **Run Test** *is displayed on the CRT.*

0.000000

A field on the CRT where entries can be made.

Titles of documentation are printed in italics.

The term Test Set refers to the HP 8921A,D or HP 8921A, Option 500. In the steps in this manual the following words are used to describe cursor and entry actions:

- **select** refers to pressing the knob after positioning the cursor in front of the appropriate field (**inverse video** area).
- **choose** means to position the cursor in front of an item in the **Choices:** or **To Screen** menu in the lower right corner of the CRT display, and then press the knob.
- **enter** means to use the numeric keypad, and the ENTER key or measurement units keys to make entries to fields. In some procedures, **enter** is used to describe the action of entering characters into a field.

Data Collection (Saving and Retrieving Test Results)

The software has the capability to save test results to an SRAM memory card, or to a PC or printer via the serial port. Each time the test procedure is run, a Data Entry screen will appear on the display. Scroll the cursor to **`Data collection`** (the first entry under **`Begin test`**). Selecting this entry will present the following options: off, card, serial.

- **`Off`** turns off the data collection function, and test results will not be saved.
- **`Card`** saves test results to an initialized SRAM card inserted in the Test Set.
- **`Serial`** saves test results via the serial port to a printer or PC.

Scroll to and select your desired choice. If you select either **`card`** or **`serial`**, you must also scroll to the bottom of the list and select **`More Cell Site Information`**. A new screen will be displayed, and you will need to select **`Data coll file type`** (DOS, ASCII, BDAT) and **`Data coll rec size`**. Procedures use 12-16 records each. Many of the other fields on the Data Entry Screen are descriptors and may be used for data collection record keeping.

See the description of **"TEST_06 - GN Data Collection File Transfer" in chapter 5, on page 109** for information on retrieving data.

Collection to a PC

Test results can be output through the serial port. A variety of devices can receive the data. An HP Palmtop computer, PC, laptop, or terminal can be used. A terminal emulator can log the test results to a file. Examples of terminal emulator programs are HP AdvanceLink and ProComm, a product of DataStorm Technologies, Inc.

For example: Configuring an IBM-Compatible PC with HP AdvanceLink for DOS

1. Load and run HP AdvanceLink on your PC.
2. Use the following tables to set the *Global Configuration*, *Terminal Configuration*, and *Remote Configuration* settings.

Table 5 Global Configuration Settings

FIELD	SETTING	FIELD	SETTING
Keyboard	USASCII	Memory Size	32K
Personality	HP	Plotter I/F	None
Language	English	HP Mode	Yes
Terminal Mode	Alphanumeric	Video Type	*Select your display type*
Remote to	*enter PC's serial port #*	Forms Path	*Enter path if used*
Printer I/F	None	Screen Size	*Enter the size*

Table 6 Terminal Configuration Settings

FIELD	SETTING	FIELD	SETTING
Terminal ID	2392A	Esc Xfer(N)	YES
Local Echo	OFF	ASCII 8 Bits	YES
CapsLock	OFF	FldSeparator	US
Start Col	01	BlkTerminator	RS
Bell	ON	ReturnDef	CR
XmitFnctn(A)	NO	Copy	Fields
SPOW(B)	NO	Type Ahead	NO
InhEolWrp(C)	NO	ROW Size	80
Line/Page(D)	LINE	Host Prmpt Char	D1
InhHndShk(G)	NO	Horiz. Scroll. Incr.	08
Inh DC2(H)	NO	Large [+] Key	+

Table 7 Remote Configuration Settings

FIELD	SETTING	FIELD	SETTING
Baud Rate	4800	SR(CH)	LO
Parity/Data Bits	None/8	Recv Pace	None
Eng Ack	No	Xmit Pace	None
Asterisk	OFF	CS(CB)Xmit	NO
Chk Parity	NO		

Exiting and Resuming a Program

Do not press RX or TX to exit the program. Selecting the RX TEST or TX TEST screen causes signal paths internal to the Test Set to be modified. If you exit the program to a screen other than RX TEST or TX TEST, the settings necessary to resume testing will be retained.

After you have made the manual settings you want, press the DUPLEX key as a last step before continuing the software. This will cause the Test Set to be properly set up.

Another way to safely exit is to:

1. Press CANCEL.
2. Press DUPLEX.
3. Press SHIFT SAVE.
4. Using list of characters in the **`Choices`** menu, enter a register name or number.
5. Select **`Done`**.
6. Operate the Test Set manually.
7. Press RECALL.
8. Choose the name of the saved setup.
9. Press TESTS.
10. Press k2 (**`Continue`**).

HP-IB Control Annunciators

The words, letters, and symbols at the top right corner of the CRT display indicate these conditions:

- **R** indicates remote operation from an external controller or IBASIC program in the Test Set. This letter will be displayed while the software is running.
- **L** indicates that the Test Set is listening, and is ready to receive a manual or remote command.
- **T** indicates that the Test Set is talking to another HP-IB device.
- **S** indicates that a service request has been generated.
- **C** indicates that the Test Set is currently an active controller. Control mode is set on the I/O CONFIGURE screen. The Test Set must be a controller if HP-IB peripherals are to be controlled.
- ***** indicates that an IBASIC program is running, or that the IBASIC controller is executing a command.
- **?** indicates that an IBASIC program is waiting for a user response.
- **-** indicates that the IBASIC program is paused.
- **SHIFT** indicates that the SHIFT key was pressed, and that the next key entry will be shifted. (Press SHIFT again to clear).

Memory Cards

Memory cards are inserted into the slot on the Test Set's front panel. The memory card is powered by the Test Set while it is inserted. Arrows printed on the memory card and the Test Set's front panel indicate the direction and orientation of card insertion.

Memory cards are used to store or retrieve the following:

- Software code
- An HP-supplied Procedure, containing:
  - A default TEST sequence
  - Default test parameter values
  - Default pass/fail limit values
- A Library file
- Procedures you make, optimized for your application
- Data collection files
- Channel Information
- Save registers

Two types of memory cards are available:

- Static Random Access Memory (SRAM)
- One-Time Programmable (OTP)

SRAM cards have read and write capability. Once programmed, OTP cards have read-only capability.

The software memory card can be removed after the program is loaded into the Test Set memory. The program will remain in memory after a power-down/ power-up cycle, until a new program is loaded. Loading a new program will replace the existing program.

SRAM Memory Cards

A Static Random Access Memory (SRAM) Card can be used to store test results and procedures you make. The following parts can be used.

Table 8 SRAM Memory Card Products for HP 8921A,D

Memory	Product
32 kilobytes	HP 85700A
128 kilobytes	HP 85702A
256 kilobytes	HP 85704A
512 kilobytes	HP 85705A

SRAM memory cards use a lithium battery (part number CR 2016 or HP part number 1420-0383. Programs and data will be retained for over one year if the memory card is stored at 25° C. The memory card is powered by the Test Set while it is inserted. Replace the battery while the memory card is inserted into a powered-up test set. To retain data and programs, it should be replaced annually. See the *Test Set User's Guide*. The write-protect switch on an SRAM memory card will write protect the card when it is set toward the outside of the card.

Memory Card Storage Space

Procedures use 12-16 records each. A Library uses 20-35 records. A single library must be included on the card. A record is 256 bytes. Approximately 11 kilobytes of overhead is required on each card.

Use the following formula to estimate the storage space needed:

Storage Space(in kilobytes) = (Number of Procedures × 4.1) + 20

For example, if you want to save ten different procedures, you will need 61 kilobytes of memory. The 64 kilobyte or 128 kilobyte card is sufficient.

The storage space you need for data collection depends on the number of test results that are saved. You will need approximately 4 kilobytes per page of test results that you save. A page of test results is about 57 lines of CRT or printer output.

The storage space of smaller SRAM cards can be quickly used. If you are collecting large quantities of data, data collection using a PC or printer may be preferable.

Initializing a Memory Card

See the description of **"TEST_05 - GN Memory Card Initialization" in chapter 5, on page 108**.

Parameters

Parameters are values you enter that optimize your use of the test software. Many of the parameters are determined by examining your test needs.

Default values are set into the software. Some of these values are derived from standard methods of measurement and some are derived from the industry standard requirements. Load a Procedure and select the **`Test Parameters`** screen from the **`CUSTOMIZE TEST PROCEDURE`** list, to see the default values.

You should verify that parameters are properly set after you select the tests to be placed in your procedure.

Parameters remain in battery-backed-up memory until you select a procedure to run. If you wish to prevent them from being lost when a new procedure is selected, you will have to save them in a procedure. See **"Saving a Procedure" on page 172**.

To print the parameters list, see **"To print TESTS screens:" on page 166**.

To edit a parameter value:

1. Press TESTS.
2. Select **`Test Parameters`** from the **`CUSTOMIZE TEST PROCEDURE`** list (or **`Edit Parm`** from the **`Test Function`** field).
3. Position the cursor to the **`Parm#`** field and select it.
4. Rotate the knob to the desired parameter number and select it.
5. Position the cursor to the **`Value`** field and select it.
6. Enter the desired value using the DATA keypad and press ENTER.
   a. Use the ⇐ key to backspace.
   b. Press CANCEL to cancel entries and retain the old value.
7. Press k5 (**`Main Menu`**) (or TESTS) to return to the TESTS screen.

Pass/Fail Limits (specifications)

Pass/Fail Limits are values you enter that set passing limits for tests. Default values are available in the test software. They have been derived from standard methods of measurement.

Pass/Fail Limits do not have to be changed when you select a test or change the tests in your procedure. Each test has pass/fail limits that apply to it.

You should verify that pass/fail limits are properly set after you select the tests to be placed in your procedure. Lists of the pass/fail limits used by each of the tests are contained in the test descriptions in **chapter 5, "Test, Procedure, Parameter, and Pass/Fail Limit Descriptions"** of this manual. A lock is provided to prevent access to the pass/fail limits. See **"Securing a Procedure" on page 175**. Pass/fail limits remain in the Test Set's battery-backed-up memory until you select a procedure to run. If you wish to prevent pass/fail limits from being lost when a new procedure is selected, you will have to save them in a procedure. See **"Saving a Procedure" on page 172**.

To print the pass/fail limits list, see **"To print TESTS screens:" on page 166**.

To edit a pass/fail limit value:

1. Press TESTS.
2. Select **`Pass/Fail Limits`** from the **`CUSTOMIZE TEST SET`** list (or **`Edit Spec`** from the **`Test Function`** field).
3. Position the cursor to the **`Spec#`** field and select it.
4. Rotate the knob to the desired pass/fail limit number and select it.
5. Position the cursor to the **`Lower Limit`** or the **`Upper Limit`** field and select it.
6. Enter desired value using the DATA keypad and press ENTER.
   a. Use the ⇐ key to backspace.
   b. Press CANCEL to cancel entries and retain the old value.
7. Position the cursor to the **`Check`** field and select it.
8. From the **`Choices`** menu, select the combination of upper and lower limits to be checked.

Pausing or Stopping a TEST

To pause the program, press CANCEL.

To stop the program, press SHIFT then CANCEL. This performs an IBASIC RESET operation.

NOTE:

Changing Settings while Paused and then Continuing

If you make changes to instrument settings while the program is paused, subsequent operation may be unpredictable. Error messages may or may not be displayed. See **"Exiting and Resuming a Program" on page 152**.

To continue a paused program:

1. Press TESTS.
2. Press k1 (**`Continue`**). The test time is displayed when the test is completed. This time includes the time that the program is paused and the time that it is waiting for connection and inputs to be made. If you are testing through midnight, the test time will not display properly.

Printing

You can print any of the following:

- Test results
- TESTS screens
  - ”External Devices” (Edit Cnfg)
  - ”Order of Tests” (Edit Seqn)
  - ”Channel Information” (Edit Freq)
  - ”Pass/Fail Limits” (Edit Spec)
  - ”Test Parameters” (Edit Parm)

How to Print (task list)

There are five basic steps to printing listed below. A detailed description of each of these steps is at the end of this section.

1. Check to see if your printer is supported by the Test Set (see **"Supported Printers" on page 160**).
2. Determine if your printer requires serial, parallel, or HP-IB connection. Connect the printer to the appropriate port on the Test Set (see **"Printer Connection" on page 161**).
3. Configure the Test Set for your printer and its interface (see **"Configuring the Test Set for Printing" on page 163**).
4. Instruct the Test Set what to print (see **"To print test results:" on page 164**).

Supported Printers

- HP ThinkJet
- HP QuietJet
- HP PaintJet
- HP DeskJet
- HP LaserJet
- Epson FX-80
- Epson LQ-850

If you do not have one of these printers, consult your printer’s manual for the correct printer settings to emulate one of the supported printers.

Printer Connection

HP-IB Connection

An HP-IB printer can be connected to the Test Set's rear-panel HP-IB connector with an HP-IB cable.

Serial Connection

A serial printer can be attached to the serial port. See **figure 10**. Use the following RJ-11 pins for this connection. This connection can be made with the serial cable, part number HP 08921-61038 and is included with your software.

- RJ-11 Pin 2 - Test Set Receive Data
- RJ-11 Pin 4 - Ground
- RJ-11 Pin 5 - Test Set Transmit Data

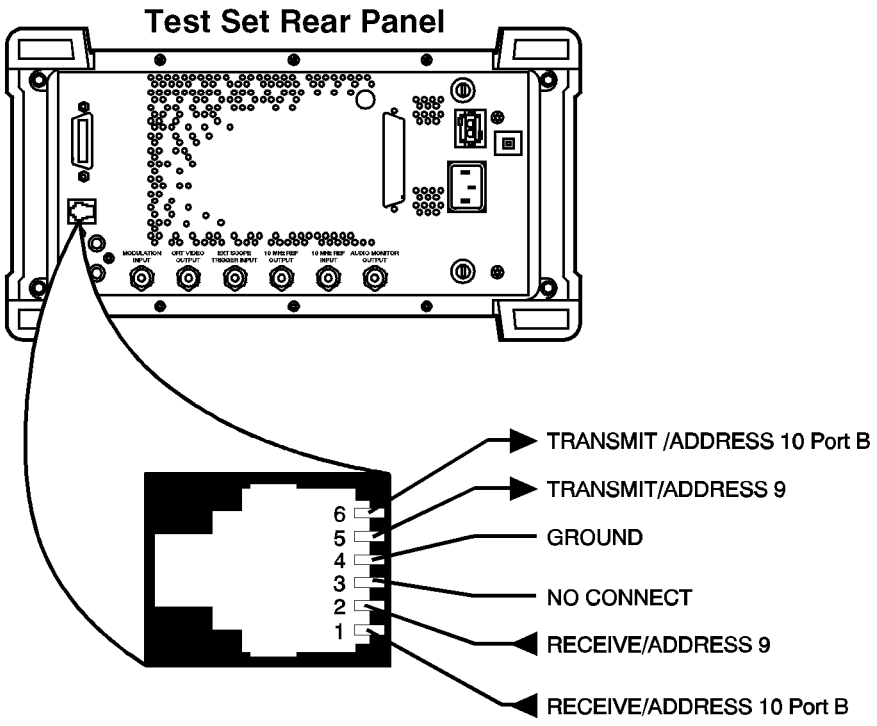


Figure 10 **Test Set RJ-11 Serial Port Connections**

Parallel Connection

A parallel printer can be attached to the parallel port. Use the following **figure 11** for pin information. You may order this cable from Hewlett- Packard using part number HP 24542D.

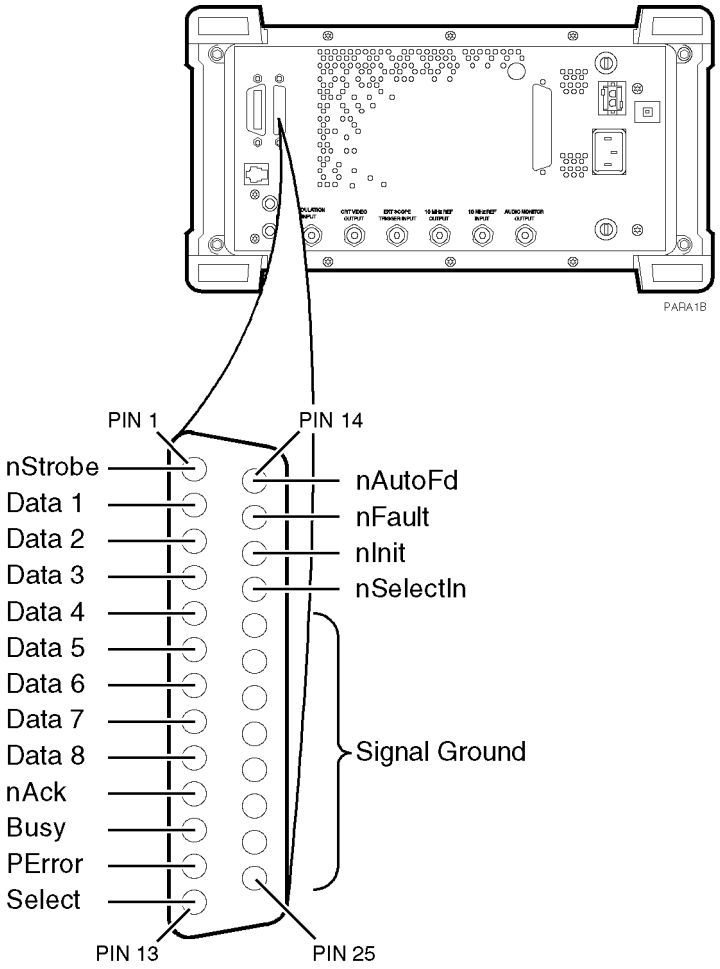


Figure 11 **Test Set Parallel Port Connections**

Configuring the Test Set for Printing

If using a serial printer, you cannot use the serial port for other connections at the same time, such as Data Collection (saving test results). Serial port connections are shown earlier in this section.

NOTE:

Printer Setup Differences

The HP 8921A had several firmware enhancements. The following **`Setup Printer`** section applies to users with:

- HP 8921A test sets with firmware above revision A.14.00.

The Test Set's firmware revision is displayed on the top right corner of the CONFIGURATION screen.

- Press SHIFT CONFIG to display the CONFIGURATION screen and read the firmware revision.

If you have an HP 8921A with firmware revision below A.14.00, refer to the next section, titled **"To Setup Printer Using HP 8921A FW Below Rev A.14.00" on page 167**. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired.

To Setup Printer Using HP 8921A FW Above Rev A.14.00

1. Press TESTS
2. Select **`Printer Setup`** from the **`SET UP TEST SET`** list.
3. Position the cursor to **`Model`** and select the desired printer.
4. Position the cursor to **`Print Port`** and select the desired port.
5. (If HP-IB only) Position the cursor to **`Printer Adrs`** and enter the HP-IB address for your printer (0-30).
6. Set the following options if desired:
   a. Lines/Page (controls the number of lines, 20-120, printed on a page before a form feed is sent to the printer)
   b. FF at Start (to cause a form feed at the start of a test sequence)
   c. FF at End (to cause a form feed at the end of a test sequence)
7. From the **`To Screen`** menu, select **`More`**.

8. From the **Choices** menu, select **IO CONFIG**.
   a. For Serial Printing, set the **Serial Baud** field and other serial communications fields listed under it to correspond to your printer's configuration.
   b. For HP-IB Printing, set the **Mode** field to **Control**.
9. Press TESTS to return to the TESTS (Main Menu) screen.

To print test results:

1. Press TESTS
2. Select **Printer Setup** from the **SET UP TEST SET** list.
3. Position the cursor to **Output Results To** and select **Printer**.
4. Position the cursor to **Output Results For** and select **All** if you want all results printed, or **Failures** if you want failures only printed.
5. (Optional) Position the cursor to **Output Heading** and enter your desired heading.

To send Escape Sequences to the printer

The Test Set may be used to send escape sequences to control printer options such as pitch, margins, paper size, and so forth. The software comes with some pre-defined escape sequences compatible with HP printers, listed below, or you have the option to enter others which are compatible with your printer (use your printer's user's manual for the available print features and corresponding escape sequences).

The software already has an implied escape character for the first sequence, you need only to enter the escape sequence following the escape character. However, if you are linking two or more sequences together, you must use the **~** to indicate the escape character between each sequence. If the sequence exceeds the space allotted in the options field, you may continue with additional escape sequences in the next available **Options** field. You must however, still enter **Escape Seq** in the **Calling Name** field and the appropriate address in the **Addr** field for all subsequent entries.

How to send an Escape Sequence:

1. Press TESTS.
2. Select **External Devices** from the **SET UP TEST SET** list.
3. Position the cursor to the **Inst#** field and select it.
4. Rotate the knob until an empty **Calling Name** field appears, and select it.
5. Position the cursor to the **Calling Name** field and select it.
6. Select **Escape Seq** from the **Choices** menu.
7. Position the cursor to the **Addr** (address) field and select it.
8. Using the DATA keypad, enter **9** for serial printers, **15** for parallel printers, or **70X** for HP-IB printers, then press ENTER. .
9. Position the cursor to the **Options** field (directly under **Calling Name**) and select it.
10. Select the desired escape sequence from the **Choices** menu if applicable, or enter an appropriate sequence using the list of characters below the choices.

Table 9 Escape Sequence Definitions for HP Printers

Escape Sequence	Print Feature
&l66P	Sets page length to 66 lines
&l72P	Sets page length to 72 lines
&l6D	Sets lines per inch to 6 lines
&l8D	Sets lines to inch to 8 lines
(s12h12v6T	Selects 12 characters per inch 12/72 inch character height gothic typeface
&a9L~&l6E	Sets left margin to 9 characters top margin to 6 lines
(s12h12v6T~&a9L~&l6E	Selects 12 characters per inch 12/72 inch character height gothic typeface left margin to 9 characters top margin to 6 lines
&l8d88P	Selects 8 lines per inch 88 lines per page
&l8d96P	Selects 8 lines per inch 96 lines per page
(s16.67h12V~&a17L~&l6E	Selects 16.67 characters per inch 12/72 inch character height left margin to 17 characters top margin to 6 lines

To print TESTS screens:

TESTS screens include:

- ”External Devices”
- ”Order of Tests”
- ”Channel Information”
- ”Pass/Fail Limits”
- ”Test Parameters”

The same general process is used to print the information for all of the above TESTS screens.

1. Make sure that your printer is properly connected and configured as explained earlier in this section.
2. Press TESTS.
3. Select the **CUSTOMIZE TEST PROCEDURE** screen of your choice.
4. Press k3 (**Print All**) and select it.
5. Press TESTS to return to the TESTS (Main Menu) screen.

To print exactly what appears on a test screen, press SHIFT then PRINT.

To Setup Printer Using HP 8921A FW Below Rev A.14.00

1. Press TESTS
2. Select **Edit Cnfg** from the **Test Function** field.
3. Position the cursor to the **Inst#** field and select it.
4. Rotate the knob until an empty **Calling Name** field appears, and select it.
5. Position the cursor to the **Calling Name** field and select it.
6. Using the list of characters in the **Choices** menu, enter the word **Printer**. Select **Done** when complete.
7. Position the cursor to the **Model** field and select it (optional).
8. Using the DATA keypad, enter the Model # and press ENTER.
9. Position the cursor to the **Addr** (address) field and select it.
10. Using the DATA keypad, enter **9** for serial printers, **15** for parallel printers, or **70X** for HP-IB printers, then press ENTER. .
11. Position the cursor to the **Options** field (directly under **Calling Name**) and select it.
12. Using the list of characters from the **Choices** menu, the following commands may be entered. Separate the commands with commas (example; **LN=60,START,END**)
    a. **LN** equals the number of printed lines per page.
    b. **START** causes a form feed at the start of each printout.
    c. **END** causes a form feed at the end of each printout.
13. From the **To Screen** menu, select **More**.
14. From the **Choices** menu, select **IO CONFIG**.

15. For Serial Printers:

- **a.** Set the **Serial Baud** field and other serial communications fields listed under it to correspond to your printer's configuration.

16. For HP-IB Printers:

- **a.** Position the cursor to the **Mode** field and select it.
- **b.** From the **Choices** menu, select **Control**.
- **c.** Position the cursor to the **Print Adrs** field and select it.
- **d.** Rotate the knob and select the HP-IB address of your printer.
- **e.** Position the cursor to the **Print To** field. Pressing knob will toggle the underlined selection. Select to underline **HP-IB**.

17. Press TESTS to return to the TESTS screen.

To print test results

1. Make sure that your printer is properly connected and configured as explained earlier in this section.
2. Press TESTS.
3. Position the cursor to the **Output Results To:** field (or the **Output Destination** field). Pressing knob will toggle the underlined selection. Select to underline **Printer**.
4. Position the cursor to the **Output Heading** field and select it.
5. Using the list of characters in the **Choices** menu, enter a printout heading (optional). Select **Done** when the heading is complete.

To send Escape Sequences to the printer

The Test Set may be used to send escape sequences to control printer options such as pitch, margins, paper size, and so forth.You may enter sequences which are compatible with your printer (use your printer's user's manual for the available print features and corresponding escape sequences).

The software already has an implied escape character for the first sequence, you need only to enter the escape sequence following the escape character. However, if you are linking two or more sequences together, you must use the **~** to indicate the escape character between each sequence. If the sequence exceeds the space allotted in the options field, you may continue with additional escape sequences in the next available **Options** field. You must however, still enter **Escape Seq** in the **Calling Name** field and the appropriate address in the **Addr** field for all subsequent entries.

How to send an Escape Sequence:

1. Press TESTS.
2. Select **Edit Cnfg** from the **Test Function** field.
3. Position the cursor to the **Inst#** field and select it.
4. Rotate the knob until an empty **Calling Name** field appears, and select it.
5. Position the cursor to the **Calling Name** field and select it.
6. Enter **ESCAPE SEQ** using the characters in the **Choices** menu. Select **Done** when you are finished.
7. Position the cursor to the **Addr** (address) field and select it.
8. Using the DATA keypad, enter **9** for serial printers, **15** for parallel printers, or **70X** for HP-IB printers, then press ENTER. .
9. Position the cursor to the **Options** field (directly under **Calling Name**) and select it.
10. Select the desired sequence using the list of characters below the choices.

Table 10 Examples of Common Escape Sequences

Escape Sequence	Print Feature
&l66P	Sets page length to 66 lines
&l72P	Sets page length to 72 lines
&l6D	Sets lines per inch to 6 lines
&l8D	Sets lines to inch to 8 lines
(s12h12v6T	Selects 12 characters per inch 12/72 inch character height gothic typeface
&a9L~&l6E	Sets left margin to 9 characters top margin to 6 lines
(s12h12v6T~&a9L~&l6E	Selects 12 characters per inch 12/72 inch character height gothic typeface left margin to 9 characters top margin to 6 lines
&l8d88P	Selects 8 lines per inch 88 lines per page
&l8d96P	Selects 8 lines per inch 96 lines per page
(s16.67h12V~&a17L~&l6E	Selects 16.67 characters per inch 12/72 inch character height left margin to 17 characters top margin to 6 lines

To print TESTS screens

TESTS screens include:

- ”Edit Cnfg”
- ”Edit Seqn”
- ”Edit Freq”
- ”Edit Spec”
- ”Edit Parm”

The same general process is used to print the information for all of the above TESTS screens.

1. Make sure that your printer is properly connected and configured as explained earlier in this section.
2. Press TESTS.
3. Select the TESTS screen you desire.
4. Press k3 (**`Print All`**) and select it.
5. Press TESTS to return to the TESTS screen.

To print exactly what appears on a test screen, press SHIFT then PRINT.

Procedures

A procedure is a collection of test parameters, pass/fail limits and a testing order, saved in a file that customizes the test software to a specific application. You may save the file on a memory card.

You do not have to save a test sequence in a procedure. Each test can be stand-alone if desired. After you choose a procedure, you can choose which of the tests you want to run.

When you save a procedure you will only be saving test parameters, pass/fail limits and a testing order. The memory card or disk must also contain a library file. A library file contains the names of all of the test parameters, pass/fail limits and tests that are in the test software. The library you use will be the library that is supplied with your software. When you save your procedure, the library will be automatically saved on the same card or disk.

The procedure(s) supplied with your software will be listed in the **`Choices:`** column when you select the **`Select Procedure Filename:`** (or **`Procedure`**) field. Procedures will be displayed if your software memory card is plugged in.

Saving a Procedure

After you have set up the test software you can save the setup to an SRAM memory card, disk, or internal RAM memory by doing the following.

The memory card or disk you use must be initialized before its first use. See **"Initializing a Memory Card" on page 156** or **"Initializing RAM Disks" on page 178**. If you are using a disk drive, you may have to enter the **`External Disk Specification`** into the TESTS **`External Devices`** screen (or **`Edit Cnfg`** screen). It will be used when the **`Select Procedure Location:`** field on the TESTS screen is **`Disk`**.

To save a procedure:

1. Press TESTS.
2. Select **Save/Delete Procedure** from the **CUSTOMIZE TEST PROCEDURE** list (or **Proc Mngr** from the **Test Function** field).
3. Position the cursor to the **Select Procedure Location** (or **Location**) field and select it.
4. From the **Choices** menu, select the desired location. The media must be initialized before a file can be saved. To initialize an SRAM card (HP 8921A,D firmware above revision A.14.00 only, otherwise see **"Initializing a Memory Card" on page 156**):
   a. Insert card in the slot on the Test Set's front panel.
   b. Press k3 (**Init Card**)
   c. Press **Yes**. Note: this will delete any procedures or programs from memory.

   To initialize a RAM disk, see "Memory Cards/Mass Storage" in the *HP 8920 Programmer's Guide* .
5. Position the cursor to the **Enter Procedure Filename** (or **Procedure**) field and select it.
6. From the list of characters in the **Choices** menu, enter a filename. Filename must be nine characters or less. When filename is complete, position cursor to **Done** and select it. Procedure filenames that already exist on the card will appear at the top of the list of characters.
7. If you selected **Card**, insert an initialized memory card into the slot on the Test Set's front-panel.
8. Verify that the card or other media is not write-protected. See **"Memory Cards" on page 154**.
9. Position the cursor to the **Enter Description for New Procedure** (or **Comment for new procedure**) field and select it. From the list of characters in the **Choices** menu, enter comments. When the comments are complete, position the cursor to **Done** and select it.
10. Position the cursor to the **Procedure Library** (or **Library for new procedure**) field and select **Current** (Current underlined). The name of the Library is displayed on the TESTS screen.
11. Position the cursor to the **Code Location** (or **Program location for new procedure**) field and select it.

    From the **Choices** menu, choose memory **Card**, **ROM**, **RAM** or **Disk**. When a procedure is run, the test system will look in this location for a code file if it is not resident in the Test Set's battery-backed-up memory. This location will usually be the software memory card.
12. Press k1 (**Save Proc**) (or position the cursor to the **Action** field and select **Make Procedure**). A procedure will be saved at the location you chose.

Loading a Procedure

A procedure can be loaded from storage media into the Test Set's battery-backed-up memory by doing the following.

To load a procedure:

1. Press TESTS.
2. Position the cursor to the **`Select Procedure Location`** (or **`Location`**) field and select it.
3. From the **`Choices`** menu, choose the desired location where the procedure is stored and select: **`Card`**, **`ROM`**, **`RAM`** or **`Disk`**.
4. Position the cursor to the **`Select Procedure Filename`** (or **`Procedure`**) field and select it.
5. From the **`Choices`** menu, choose the procedure file that you want to load.
6. Read the **`Description`** (or **`Comment`**) field to ensure that the loaded procedure file is the one you want.

Deleting a Procedure

Procedures can be removed from an SRAM memory card, disk or RAM by doing the following.

To delete a Procedure:

1. Press TESTS.
2. Select **`Save/Delete Procedure`** from the **`CUSTOMIZE TEST PROCEDURE`** list (or **`Proc Mngr`** from the **`Test Function`** field).
3. Position the cursor to the **`Select Procedure Location`** (or **`Location`**) field and select it.
4. From the **`Choices`** menu, select the desired location.
5. Position the cursor to the **`Enter Procedure Filename`** (or **`Procedure`**) field and select it.
6. From the **`Choices`** menu, select the name of the procedure you wish to delete.
7. Press k2 (**`Del Proc`**) (or position the cursor to the **`Action`** field and select **`Delete Procedure`**).
8. Press Yes if you wish to continue.

Securing a Procedure

After you have set up your test software with a testing order, channel information, test parameters, and pass/fail limits, you may wish to secure it. This operation will prevent the viewing and changing of those functions. You can select the items you wish to secure or un-secure. An IBASIC ROM program is stored in the Test Set's firmware to do this.

You can secure the procedure that is supplied with the test software. It is shipped un-secured.

After you make a procedure, you can secure it.

To secure a Procedure:

1. Press TESTS.
2. Position the cursor to the **`Select Procedure Location`** (or **`Location`**) field and select it.
3. From the **`Choices`** menu, select **`ROM`**.
4. Position the cursor to the **`Select Procedure Filename`** (or **`Procedure`**) field and select it.
5. From the **`Choices`** menu, select **`IB_UTIL`** (or **`SECURE_IT`**).
6. Press k1 (**`Run Test`**).
7. Select the location of the procedure you want to secure: k1 memory (**`Card`**) or k2 (**`RAM`**).

NOTE: RAM refers to the RAM Disk memory within the Test Set. Before selecting RAM, you must initialize the RAM as a disk. See **"Initializing RAM Disks" on page 178**.

8. Proceed with the on-line instructions. You may wish to secure only one of the items, such as pass/fail limits.
9. When you are prompted to enter the **`pass number`**, enter any sequence of numerals 0 through 9 using the DATA keypad. Enter 9 digits or less.

To un-secure a procedure:

To un-secure a procedure, you must know the **pass number**.

1. Press TESTS.
2. Position the cursor to the **Select Procedure Location** (or **Location**) field and select it.
3. From the **Choices** menu, select **ROM**.
4. Position the cursor to the **Select Procedure Filename** (or **Procedure**) field and select it.
5. From the **Choices** menu, select **IB_UTIL** (or **SECURE_IT**).
6. Press k1 (**Run Test**).
7. Select the location of the procedure you want to un-secure: k1 memory (**Card**) or k2 (**RAM**).
8. Enter the name of the procedure you wish to un-secure.
9. If the procedure has any item secured, you will be asked for the **pass number**.
10. Proceed with the on-line instructions. Select the items you wish to un-secure.
11. When you are prompted, enter the **pass number** using the DATA keypad.

RAM

RAM disk is a section of internal memory that acts much like a flexible disk. Programs can be stored, re-stored, erased, and retrieved.

The RAM disk is partitioned into four separate volumes; 0-3. Each volume is treated as a separate ‘disk’. You can also specify the size of each disk in 256-byte increments.

The four RAM disk volumes are designated **`:MEMORY,0,0`** to **`:MEMORY,0,3`**. For example, to catalogue the contents of RAM disk volume ‘0’ from the IBASIC Cntrl screen, enter

```
CAT ":MEMORY,0,0"
```

Volume 0’s contents can be viewed and loaded from the three screens mentioned at the beginning of this section. Volumes 1, 2, and 3 can *only* be accessed from the IBASIC Controller.

NOTE:

RAM Disk Erasure

Any existing programs or formatting on RAM is erased if you use the **`RAM_MNG`** or **`COPY_PL`** ROM programs, or the SERVICE screen’s **`RAM Initialize`** function.

Therefore, you should only use RAM disks for short-term storage of files.

Initializing RAM Disks

Each RAM disk volume must be initialized before it can be used. Volume 0 can be initialized using the RAM_MNG procedure stored on the internal ROM's **IB_UTIL** menu. Volumes 1, 2, and 3 must be initialized from the IBASIC Cntrl screen.

The optional 'volume size' in the following procedure lets you specify the memory area set aside for each disk in 256 byte blocks.

Follow these steps to initialize volumes 1, 2, or 3:

1. Press TESTS.
2. Select **IBASIC Cntrl** from the **SET UP TEST SET** list.
3. Position the cursor to the data entry field and select it.
4. Using the list of characters from the **Choices** menu, enter the following command:

```
INITIALIZE ":MEMORY,0,<volume number 1-3>",<volume size>
   or
INITIALIZE ":MEMORY,0,1",50
```

Saving Tests Results

See **"Data Collection (Saving and Retrieving Test Results)" on page 149**.

Serial Port

This 6-pin, RJ-11 serial port is used to input and output serial data. Serial data is used for entering programs, printing, and for sending test results to a connected controller, disk drive, or terminal.

Operating Considerations

The serial communications settings are defined on the I/O CONFIGURE screen. Ground is used with both IBASIC and all other serial connections. Transmit B and Receive B are exclusively used with IBASIC programs. Transmit and Receive are used with all other serial connections (see **figure 12**).

The IBASIC Controller sends data to and receives data from the serial ports using address **`9`** for the primary port, and address **`10`** for Port B.

Use an RJ-11/25-pin RS-232 adapter (HP P/N 98642-66508) and RJ-11 cable (HP P/N 98642-66505) to connect the HP 8921A,D to a serial printer or terminal/ computer.

NOTE: **RJ-11 Connectors**

RJ-11 cables and adapters can be wired several ways. If you buy a cable or adapter other than the HP parts listed, verify the connections for the pins indicated in the following **table 11** before connecting cables to the instruments.

The following **table 11** lists connections for Transmit, Receive, and Ground pins (address 9).

Table 11 Connections for Transmit, Receive, and Ground Pins

HP 8921A,D RJ-11 Serial Port		Terminal/PC 25-PinRS-232		Terminal/PC 9-Pin RS-232
Pin 2 (RX)	to	pin 2 (TX)	or	pin 3 (TX)
Pin 5 (TX)	to	pin 3 (RX)	or	pin 2 (RX)
Pin 4 (GND)	to	pin 7 (GND)	or	pin 5 (GND)

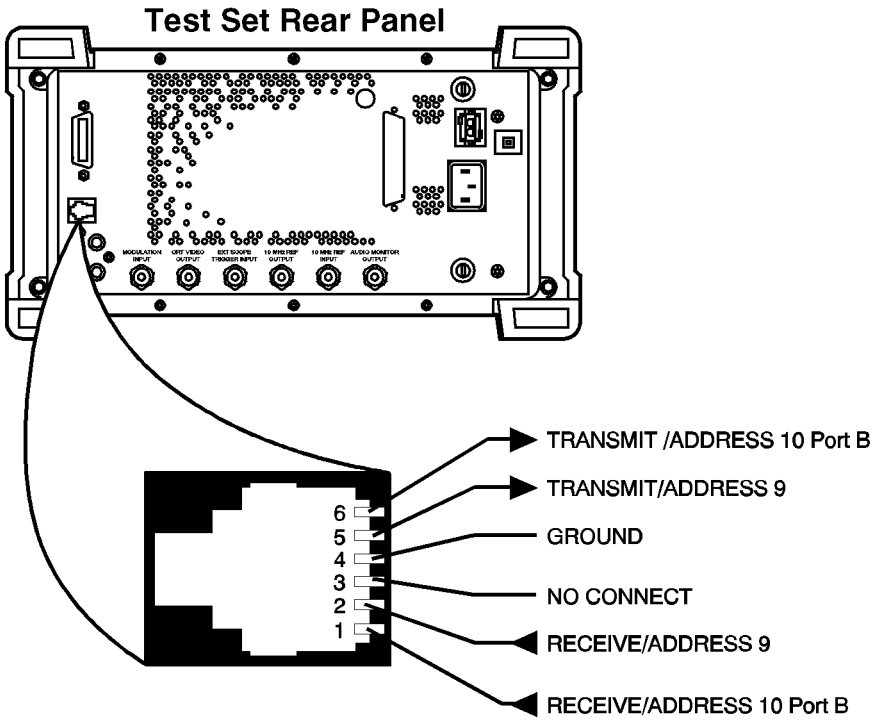


Figure 12 **Test Set RJ-11 Serial Port Connections**

Test Execution Conditions

In some situations, you may wish to change the way the software works when a test result is obtained. **Test Execution Conditions** allow you to do this.

Test Execution Conditions are accessed from the **SET UP TEST SET** list on the TESTS (Main Menu) screen. Press TESTS, then select **Execution Cond** to display them. (They are displayed directly on the main TESTS screen in firmware below revision A.14.00).

Test Execution Conditions are not retained after a power-down/power-up cycle.

The following **Test Execution Conditions** can be set as needed:

Output Results To: (Output Destination)

You can select either: **Crt** or **Printer** Default:**Crt**

You can specify where test results are to be placed. If you select **Crt**, results will be displayed on the Test Set's CRT. If you select **Printer**, test results will be sent to the CRT and to a printer. You must connect and configure a printer if you select **Printer**. See **"Printing" on page 160**.

Output Results For: (Output Results)

You can select either: **All** or **Failures** Default:**All**

You can specify if you want only the failed results to be displayed or printed. This will be useful if you generally do not print test results, and want to ensure that failed results are displayed or printed.

Output Heading

You can use this field to enter a heading that will be printed or displayed.

Select the **Output Heading** field. Use the knob to choose and enter the characters that you want to appear in the heading.

Choose **Done** when you are finished.

If Unit-Under-Test Fails (If UUT Fails)

You can select either: **`Continue`** or **`Stop`** Default:**`Continue`**

If you set this to **`Stop`**, and a pass/fail result is **`F`**, the program will stop. You may continue from the paused state by pressing k2 (**`Continue`**), or repeat the measurement by pressing k3 (**`Repeat`**).

Test Procedure Run Mode (Run Mode)

You can select either: **`Continuous`** or **`Single Step`** Default:**`Continuous`**

You can make tests pause at certain times. If you set this to **`Single Step`**, the program will pause after a comparison is made between a test determination and the expected result. For example, tests will pause after the program compares the results to a specification. You can continue from the paused state by pressing k2 (**`Continue`**), or repeat the measurement by pressing k3 (**`Repeat`**).

Autostart Test Procedure on Power-Up

You can select either: **`On`** or **`Off`** Default: **`Off`**

You can set up the Test Set so that if the procedure was previously loaded, the procedure will be immediately executed when the test set is powered on.

USER Keys

When you are using the Test Set, you will see the following USER keys assigned appear at times in the top right corner of the display. These keys are assigned to the hard keys k1 through k5. In many cases, these keys can be used as “shortcuts” instead of positioning the cursor and selecting. USER keys are sometimes referred to as softkeys.

`Clr Scr` clears the Test Set’s CRT display.

`Continue` continues the program after it has been paused.

`Delet Stp` is used to the edit items in a test sequence. When you press this key, the test in the displayed sequence that has its **`Step #`** highlighted (inverse video) will be deleted. The tests that follow in the sequence will be scrolled up by one step.

`Del Proc` is used to delete the selected procedure. When you press this key, you will be prompted to verify the command by pressing Yes.

Press **`Done`** when you want to exit a test or have completed a task. The program will continue if there is a next test in the sequence or if there are additional program steps in the test being run.

`Help` provides information on how to use the current TEST screen.

`Init Card` is used to initialize a memory card. Before you press this key, verify that the card is inserted correctly and not in the write-protected position.

`Insrt Stp` is used to enter items into a test sequence. When you press this key, the test in the displayed sequence that has its **`Step #`** highlighted (inverse video) will be copied into a new sequence location, immediately after the highlighted one. The tests that follow in the sequence will be scrolled down by one step. This key does nothing if there are no items in the sequence. Choose a test before using this key to insert another.

`Main Menu` is used to return to the main TESTS screen. The same result is achieved by pressing TESTS.

`Page Up`**`Page Down`** are used to quickly display items in the list when some of the items won’t fit on the screen.

`Repeat` is used to repeat the previous measurement after the program has been paused. See **"Test Execution Conditions" on page 182**.

`Run` starts an IBASIC program that has been loaded into the Test Set’s memory.

Run Test loads and runs the program that is called from the procedure that has been entered into the TESTS screen **Select Procedure Filename:** entry. If the program is already loaded into the Test Set's memory, it will be started.

Save Proc is used to save the specified procedure.

Sngl Step steps the IBASIC program one line at a time. This is different from **Continuous/Single Step** run mode. See **"Test Execution Conditions" on page 182**.

Stop Test pauses the test software.

Yes\No are pressed when answering questions displayed on the Test Set's CRT display.

7

Problem Solving

This chapter contains problem modules and error messages. Problem modules alphabetically list the location of the problem with a brief symptom (for example, Test Set Doesn’t Power Up). Each problem module describes possible causes and corrections. The error messages section is located at the end of the chapter and provides a brief description of the message as well as possible corrective actions.

If a problem persists, call the HP Factory Hotline from anywhere in the USA (1-800-922-8920, 8:30 am - 5:00 PM Pacific time; in the USA and Canada only).

NOTE: If the Test Set displays an error that states “One or more self-tests failed”, you have a hardware problem. In this case, refer to the Test Set’s *Assembly Level Repair* manual.

Memory Space Problems

The program uses a substantial amount of the Test Set RAM space. If you see a message that indicates a memory problem, check the memory space that has been used.

To determine the memory space used:

1. Load the program, if it is not already loaded, by pressing USER (**`Run Test`**) and waiting for the program display to appear.
2. Press SHIFT CANCEL to stop the program.
3. Press DUPLEX to exit the TESTS screen.
4. Press SHIFT SAVE.
5. Read the number in front of **`free memory`**.

If this number is a few percent or less, you may get an error message after saving additional set-ups to SAVE registers.

If you do not have sufficient memory space available, you may need to delete unnecessary save registers.

To delete save_recall registers:

1. Press DUPLEX.
2. Press RECALL.
3. Scroll among saved registers; select one to delete.
4. Press ON/OFF to clear register.
5. Press the ON/OFF button again to answer **YES**.

Printing Problems

- ❒ Check that the printer is turned on.
- ❒ Check that the HP-IB, parallel, or serial cable from the Test Set to the printer is connected.

  If have firmware below revision A.14.00

  1. Press TESTS.
  2. Check that **`Printer`** was selected as the **`Output Destination`** in the **`Test Execution Conditions`**.
  3. Check that the Test Set is correctly configured for HP-IB, parallel, or serial printing:

     For a HP-IB printer:

     a. Check that the printer's **`Calling Name`** is "PRINTER" and its address is correctly set up in the **`External Devices`** (or **`Edit Cnfg`**) screen.

     b. Check that the I/O CONFIGURE screen has been set up correctly:

     i. Mode=Control

     ii. Print To=HP-IB

     iii. Print Adrs=address of your printer

     For a parallel printer:

     a. Check that the printer's **`Calling Name`** is **`PRINTER`** and its address is set to **`15`** in the **`External Devices`** (or **`Edit Cnfg`**) screen.

     For a serial printer:

     a. Check that the printer's **`Calling Name`** is **`PRINTER`** and its address is set to **`9`** in the **`External Devices`** (or **`Edit Cnfg`**) screen.

     b. Check that the I/O CONFIGURE screen has been set up correctly for the printer's baud rate, parity, and so forth.

     Refer to the Test Set's *User's Guide* for details about configuring the printer.

If you have an HP 8921A or HP 8921D with firmware above revision A.14.00

1. Press TESTS.
2. Select **`Printer Setup`** from the **`SET UP TEST SET`** list.
3. Check that **`Printer`** was selected in the **`Output Results To:`**.
4. Check that the Test Set is correctly configured for HP-IB or serial printing:
   a. Select **`Model`** and choose the most compatible printer model from the **`Choices`** menu.
   b. Select **`Printer Port`** and choose which printer port you are using.
   c. If the HP-IB port was selected, check that the correct **`Printer Adrs`** was entered.
   d. If the Serial port was selected, check that the I/O CONFIGURE screen has been set up correctly for the printer's baud rate, parity, and so forth.

   Refer to the Test Set's *User's Guide* for details about configuring the printer.

Test Results are Unexpected

If one or more tests fail unexpectedly, or you believe there is a problem with the way tests are running:

- Verify that the T1 Test Set is connected correctly and working properly.
- Verify that the LMT revision 1.6 is connected correctly and working properly.
- Check the HP 8921A settings that are used for the tests.

1. Press TESTS.
2. Select **`Execution Cond`** from the **`SET UP TEST SET`** list (HP 8921A,D fw above rev A.14.00 only).
3. Position the cursor to the **`Run Mode`** field (in Test Execution Conditions) and select **`Single Step`**.
   a. Run the test.
   b. When the message **`Press continue when ready`** is displayed in the top line of the IBASIC controller tests screen, press CANCEL to pause the IBASIC program.
4. From the **`To Screen`** menu, position the cursor to the desired instrument screen and select it.
5. After viewing the instrument settings, press PREV to return to the TESTS screen.

NOTE: Do not alter the instrument settings. The IBASIC program will not re-configure the settings when continue is executed. You can alter settings to experiment with the measurement, but they must be returned to their initial settings before leaving the instrument screen.

6. Press k2 (**`Continue`**) to return to the IBASIC controller.
7. Press k2 (**`Continue`**) to continue the program.

Test Set Doesn’t Power Up

Check the AC or DC power connection and the setting of the AC/DC switch on the rear panel. See the Test Set’s *User’s Guide*.

Error Messages

Many error messages are coded into the Test Set's firmware and test software. If the problem is related to Test Set operation, access the MESSAGE screen to see any messages that have occurred since the instrument was turned on. To do this, press the SHIFT then RX.

Many of the error messages are listed on the following pages, alphabetically, with a description of the problem and possible corrections. If you see a message that is not described here, press CANCEL, and then the MSSG key. Other related error messages may be displayed.

For a listing of additional error messages, see the:

- *Test Set's User's Guide*, part number 08921-90022
- *Programmer's Guide*, part number 08921-90031
- *Assembly Repair Manual*, part number 08921-90168

If you see an error message that contains a program line number, and it is not listed in this section, please write down the message with the line number and call the factory at 1-800-922-8920 (in the USA and Canada only).

Error Message Reference

Duplicate file. Over-write old file?

A file name can only be used once. The entered file name has the same name as one that is already stored on the storage media. If you answer **`Yes`** to Over-write old file?, the old file will

Error occurred at line_____

This message is displayed at the start of the testing sequence if a communication occurred between the base station and the Test Set.

- In some cases the software will try to recover from this error. If this is the case, you will be prompted to turn off the base station and press the USER (**`Continue`**) key
- Check the control cables between the Test Set Serial Port and the base station DATA jack. Then try to run the test again.
- Turn the base station off, then run the test again.
- If the problem persists, there may be a problem with the software, the base station, or the Test Set. If you suspect a software or Test Set problem, call the HP factory at 1-800-922-8920.

Error 80 during Procedure catalog. Catalog aborted.

This message is displayed when the Test Set is unable to load a procedure from a memory card.

- Check that the card is properly inserted and has procedures saved on it.

ERROR 80 in (line number). Medium changed or not in drive Re-try?

This message is displayed when the Test Set is unable to access valid files from a memory card.

- Check that the card is properly inserted and has procedures saved on it.

Printer address cannot be set to 10.

The second Test Set serial port, Serial B, has an address of 10. The serial port, having an address of 9, can be used for printing. If you are using an HP-IB printer, you need to enter all three digits of the printer address. **See "Printing," in chapter 6, on page 160**.

The Test Set must be configured in Control Mode. No other controllers may be on the HP-IB bus. Do you want to put the Test Set in Control Mode? Select desired softkey.

The Test Set can be set to operate in the HP-IB **`Control`** mode or can be set to operate in the **`Talk&Lstn`** mode. This selection is made on the Test Set's I/O CONFIGURE screen. If the TESTS ‘‘(Edit Configuration)" screen has entries that require the Test Set to operate as a controller, the software will verify that the Test Set is configured properly. Answer the question **`Yes`** if you wish to have the entry on the I/O CONFIGURE screen changed.

Timeout error from an external instrument.

This message will be displayed if the Test Set tries to control a device on the HP-IB bus and is unable to do so for 5 seconds.

- Check cables
- Verify that the HP-IB address and other setup conditions of your device are set properly.
- Verify entries made to the ‘‘External Devices" (or ‘‘Edit Configuration") screen

Timeout from printer at address (printer address). Retry?

- Check the cable and the connections

Glossary

AMPS Advanced Mobile Phone Service - The cellular system in use on the North American continent and on other continents.

BPF Band Pass Filter. A filter that increasingly rejects signals as their frequency increases and decreases outside of certain cutoff frequencies. In the test set, audio band pass filters are used to reduce the level of out-of-band signals during certain measurements.

CANCEL A key used to pause (stop) the IBASIC program running in the test set.

card Refers to the memory card containing the procedures for testing the base station.

`Choices` Refers to a field in the lower right of the test set screen that displays several possible functions for selection.

`Continue` Proceed with the IBASIC software program if it has been stopped (paused).

cursor Refers to the brightened region of the test set screen used to indicate the field/function currently being accessed.

`Del Step` A function to delete a step in the procedure.

`Edit Cnfg` (configuration) Title of an test set screen that allows you to set up (configure) printers, PCs, disks…

`Edit Freq` (frequency) Function which allows you to edit the values of the test frequencies.

`Edit Parm` (parameters) Function which allows you to edit the values of the test parameters. See also “parameters”.

`Edit Seqn` (sequence) Function which allows you to select a single test and run it or to create your own sequence of tests.

`Edit Spec` (specifications) Function which allows you to edit the limits of the test specifications. See also “specifications”.

ESD ElectroStatic Discharge - A transfer of electric charge from one place to another. Devices can be damaged by the energy transferred during the discharge.

field An area on the CRT with an inverse video display (**`example`**) where entries can be made.

function Refers to a particular field, feature, or operation of the test set.

GN Abbreviation for General. GN appears in some titles in the software and indicates that it relates to the general system, as opposed to a transmitter (TX) or receiver (RX).

`Help` A feature providing specific information about how to use the current screen in the TESTS environment. This feature is accessed by pressing k4 (**`Help`**) from any TEST screen. Note: this feature is only available in the HP 8921A,D firmware above revision A.14.00.

HELP A feature providing additional test set information accessed by pressing SHIFT, then TX (HELP) keys.

highlight Refers to the brightened region (cursor) of the test set screen used to indicate the field/function currently being accessed.

HPF High Pass Filter. A filter that increasingly passes signals as their frequency increases towards, and then is greater than, a certain cutoff frequency. In the test set, audio high pass filters are used to reduce the level of low frequency signals during certain measurements.

IBASIC Instrument BASIC is the computer language (code or software) used by the Test Sets' built-in controller. The IBASIC software is downloaded from the CARD into the Test Sets' RAM.

initialize The process of formatting a card or disk prior to storing data.

key (USER keys) Keys refer to any of the push buttons on the front panel . The USER keys are a specific grouping of keys labeled k1 to k5 which perform the associated numbered function in the action field located in the upper right or the screen. The USER keys are user programmable.

knob The large tuning dial for cursor control located in the center of the Test Sets' front panel. This knob is rotated to position the cursor on the screen and then pressed to select the particular field or function.

library A collection of the names of all of the parameters, specifications, and tests in the test software. The test software and the Test Set's firmware use the library, test software program code file, and a procedure to run a customized application program. A library is stored as a file on a memory card or other mass storage with its associated procedure files.

Location Where to retrieve or save a particular testing procedure for example, disk, CARD, RAM, PC, etc.

LPF Low Pass Filter. A filter that increasingly rejects signals as their frequency increases towards, and then is greater than, a certain cutoff frequency. In the test set, audio low pass filters are used to reduce the level of high frequency signals during certain measurements.

measurement A series of calculations on data measured by the test set. These calculations provide a value to be compared against pass/fail values that verify the performance of the unit-under-test.

Main Menu The screen accessed by pressing the TESTS key, or k5 (**`Main Menu`**). It is used to customize and execute (run) automated testing.

Also referred to as the "TESTS" screen.

menu The test set screen displays various tasks to be selected with the cursor control knob or the USER keys ; this display is the menu.

message The upper portion of the test set screen is reserved for messages and prompts. Messages give an indication of the status of the test set, for example, **System initialization**.

OTP One Time Programmable (OTP) refers to a memory card on which code or data may only be stored once; similar to ROM.

parameters Entries you make for calibration data, base station characteristics, or test customization. They give you flexibility in the way you use the software. Default values for parameters are entered into the software.

pass/fail limits Pass/fail limits are the names of criteria verifying the performance of the unit-under-test. Usually, the associated measurement value must fall within the HI/LO limits of pass/fail values to verify performance of the unit-under-test. Default values in the test software have been derived from standard methods of measurement or from the unit-under-test requirements.

pause Using the CANCEL key pauses the running of IBASIC software and allows access to the keyboard functions. CONTINUE allows the software to proceed.

peak+/- max A detector in the test set that measures and computes the maximum of the absolute value of the positive and negative excursions of the measurement. For example, when an FM waveform with a +10 kHz and -9 kHz deviation is applied, 10 kHz will be displayed.

PRESET Sets the test set to its initial power-up state.

procedure A shortened label for test procedure. A procedure is a collection of channels, parameters, pass/fail limits, and testing order, saved in a file, that customizes the test software to a specific application. Procedures are made by editing existing channels, parameters, pass/fail limits, and testing order, and saving the resulting files to a memory card, disk or internal test set RAM.

prompts The upper portion of the test set (inverse video field) is reserved for prompts and messages. The prompt directs the user to take some action. Messages give an indication of the status of the test set.

RAM Random Access Memory - The memory in the test set that is used to store program code and data. The test set RAM is battery-backed-up, retaining data and program code when the power is turned off.

ROM Read Only Memory

RSSI Received Signal Strength Indicator - A level in a receiver that is related to the signal strength of the incoming signal.

`Run Test` Directs the test set to load the program from the current procedure and begin testing (may take up to two minutes).

SAT Supervisory Audio Tone - A 5970 Hz, 6000 Hz, or 6030 Hz sine-wave signal that frequency modulates an AMPS cell site voice channel transmitter. The signal is transponded by the base station and is used to help determine RF path integrity.

screen Refers to the video display of the test set.

select To choose a particular field or function. Rotate the CURSOR CONTROL knob and position the highlighted cursor on the chosen field or function, then press the knob. An alternative method is to press the numbered USER key having the same number as displayed alongside the desired function.

sequence The method used in the test set to run one or more TESTs in a desired order. A sequence is entered using the TESTS **`(Edit Sequence)`** screen.

SINAD Signal plus Noise And Distortion divided by noise and distortion. A measurement result that determines the quality of an audio tone in the presence of noise and distortion. A 12 dB SINAD value is often used when measuring the receiver sensitivity.

softkey The name of the set of keys next to the CRT display that can be assigned to certain special actions or fields. The keys are also called USER keys.

specifications Specifications are the names of criteria verifying the performance of the base station (used in fw below rev A.14.00. See also pass/fail limits). The specification value may be changed by using the **`Edit Spec`** function. Usually the associated measurement value must fall within the HI/LO limits of specification values to verify performance of the base station. Default values in the test software have been derived from standard methods of measurements.

SRAM Static Random Access Memory - A data storage device. SRAM memory cards can be used with the test set to save programs and test results.

Step# Orders the sequence of tests, for example, Step #1 may be Test_5, and Step #2 may be Test_26, etc.

`Test Function` Used only in fw below Rev A.14.00. A field, in the lower left corner of the tests screen that provides access to the editing features: **`Edit_Seqn`**, **`Edit_Freq`**, **`Edit_Parm`**, **`Edit_Cnfg`**, **`Proc_Mgr`**, and **`IBASIC`**.

tests Tests are a collection of measurements (or a series of other tests) which verify a particular specification value or operation of the UUT. A sequence of tests are contained in a test procedure.

TESTS screen The screen accessed by pressing the TESTS key. It is used to customize and execute (run) all automated testing. Also referred to as the “Main Menu”.

USER keys A group of keys located immediately to the right of the test set screen that allow the user to more rapidly select certain functions without rotating and pressing the knob. These key assignments are displayed in the upper right portion of the test set screen. The number on the left of the function corresponds to the number on the user key k1 to k5.

values The scaler quantities or numbers entered in the inverse video fields of the specifications or parameters. Units of measure (dB, inches, volts, watts, etc.) are contained in the pass/fail limits and test parameters.

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