Nortel (Northern Telecom) TRU/DRU Cell Site Test Software

HP 11807B Option 044,
Test Software User's Guide

Software Revision B.02.00 and above

HP Part No. 11807-90150
Printed in U. S. A.
June 1999

Rev E

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1

Getting Started with Firmware Above Revision A.15.00

What You Will Test

NOTE: Firmware revision A.15.00 in the HP 8921A Test Set has several enhancements. This chapter applies to users with:

- **HP 8921A Test Sets with firmware revision above A.15.00**

The Test Set 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.

Getting Started will quickly acquaint you with the operation of the HP 8921A Test Set or the HP 8921 Option 500, 503 Test Systems and the HP 11807B Option 044 Test Software. This guide will instruct you to load and run the test plan that comes programmed on your card, which will:

- Measure and store test cable loss
- Prompt you to enter frequency and slot information
- Draw a cabling diagram
- Read and Store TRU settings
- Perform RX Quick Tests
- Perform TX Quick Tests
- Perform TXD Standard Tests
- Perform LED Alarm and TRU Display Test

After becoming acquainted with the Test Set and Test Software, you might wish to customize the Test Software with the appropriate parameters, pass/fail limits, and test sequence. This is explained in **chapter 4, "Using the Test Software with FW Above Revision A.15.00"**.

What Equipment is Required

Completing the testing in Getting Started will required the following items. Additional cabling is required for other tests, as described in **chapter 3, "Making Connections"**.

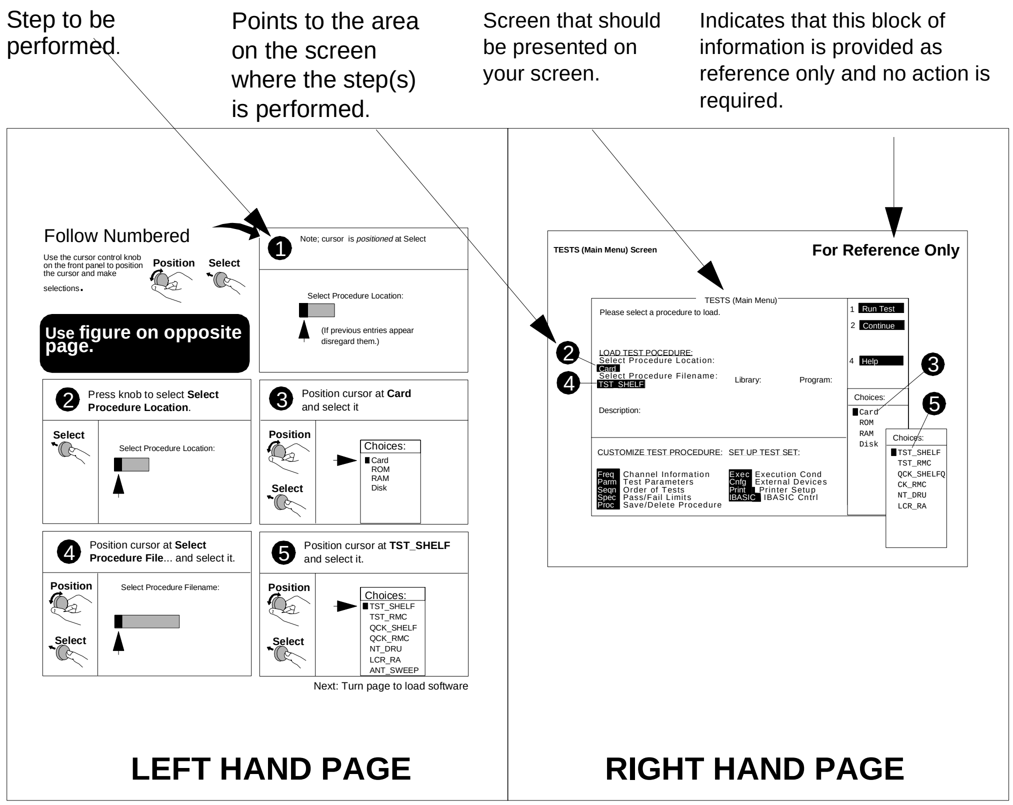
- HP 11807B Option 044 TRU/DRU Test Software card
- One of the following:
  - HP 8921A, Cell Site Test Set (firmware revision above A.15.00 is required)
  - HP 8921, Option 500, TDMA Dual-Mode Cell Site Test System (HP 83204A)
  - HP 8921, Option 503, TDMA/CDPD MDBS Cell Site Test System (HP 83204A)
- A Northern Telecom TRU/DRU Base Station
- Type N(m) to N(m) cable (10 ft)
- BNC (m) to BNC (m) cable (10 ft)
- RJ11(m) to RJ11(m) 6-wire cable
- RJ11 (f) to DB25 (m) adapter
- DB25 to RJ45 adapter
- RJ45 to RJ45 8-wire cable

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

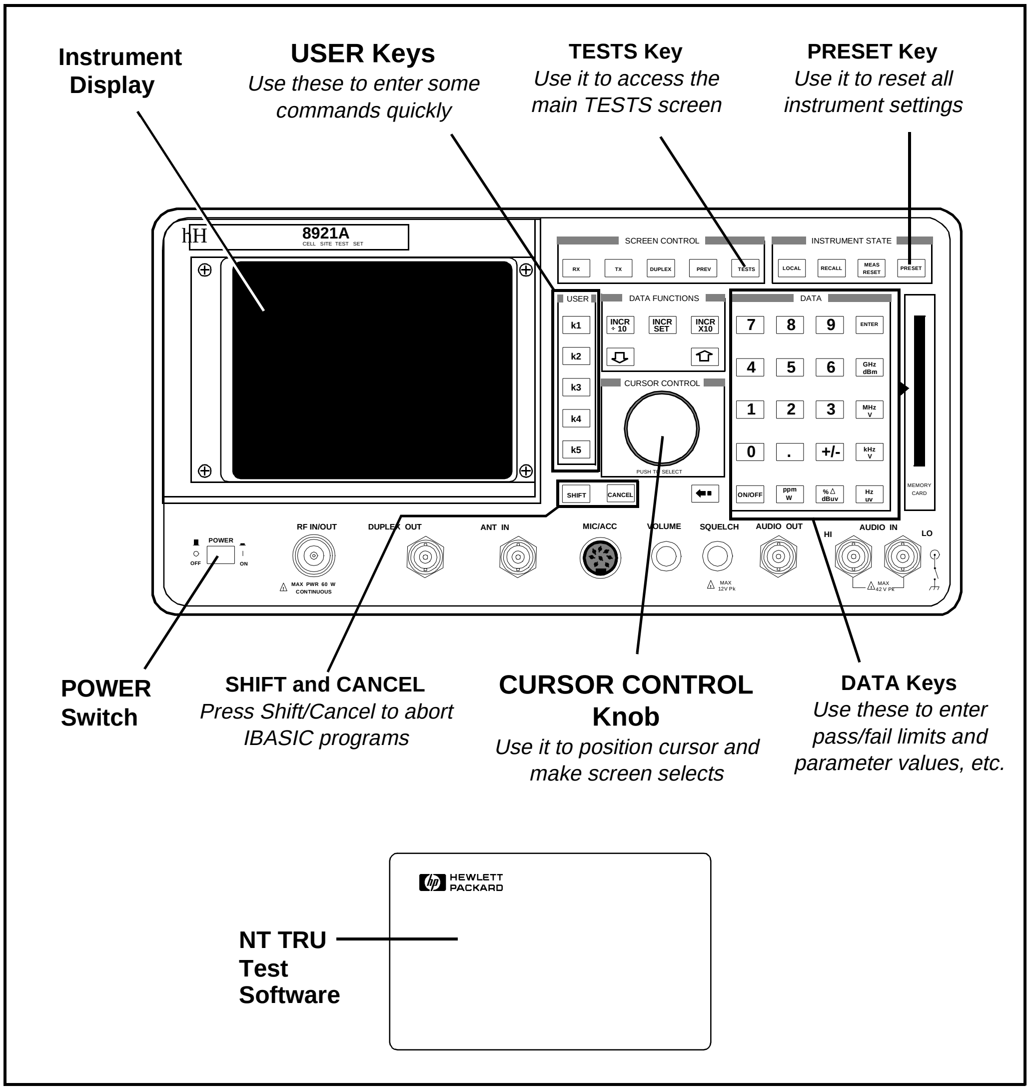
- HP 8921A, Cell Site Test Set (firmware revision above A.15.00 is required)
- HP 8921A, Option 500, TDMA Dual-Mode Cell Site Test System (HP 83204A)
- HP 8921A, Option 503, TDMA/CDPD MDBS Cell Site Test System (HP 83204A)

How to Use This Getting Started Guide

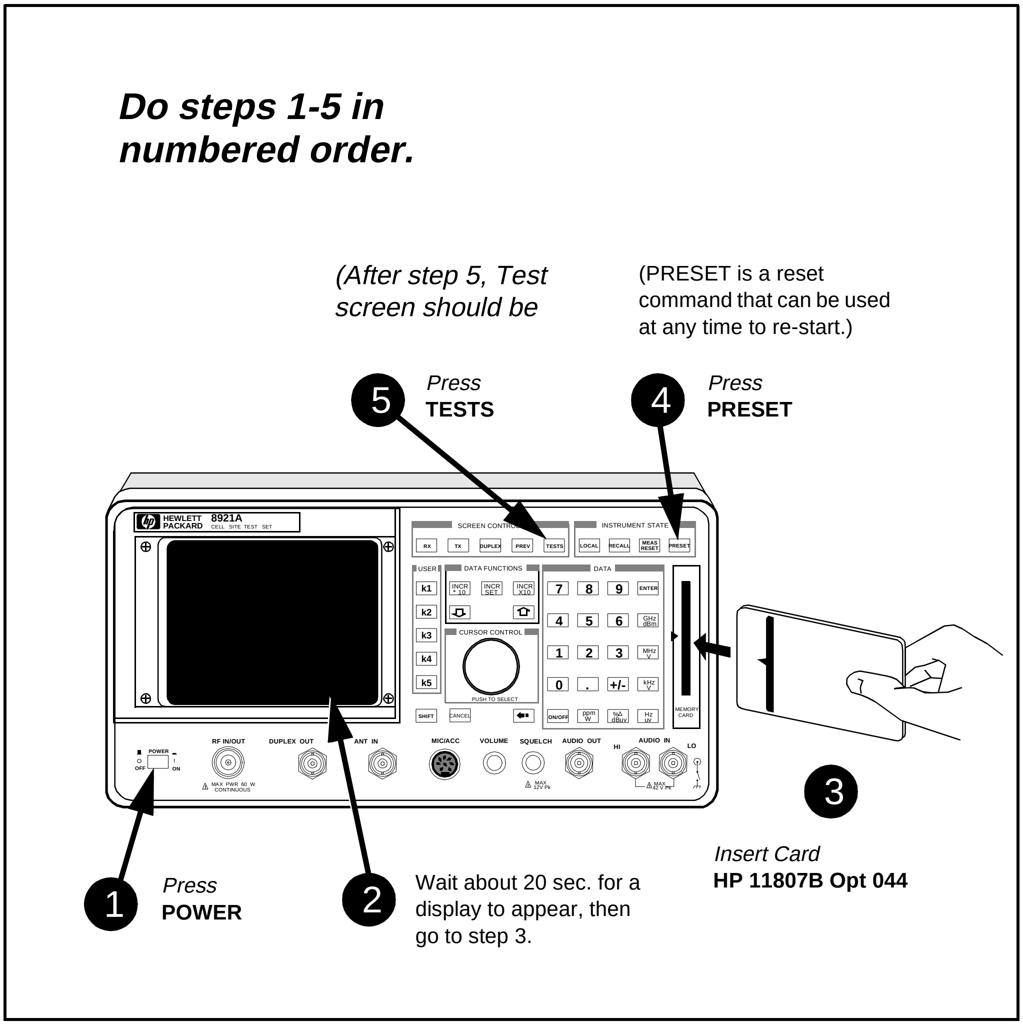
Most of the instructions in this manual are presented as two page task modules. These are designed so that a logical sequence of steps can be performed without turning the page. On many of the modules, you need perform only the steps on the left hand page and use the right for reference. In these cases, the instruction block will be marked **FOR REFERENCE ONLY**. Some modules do require that you perform the steps on both pages.



Test Set Overview

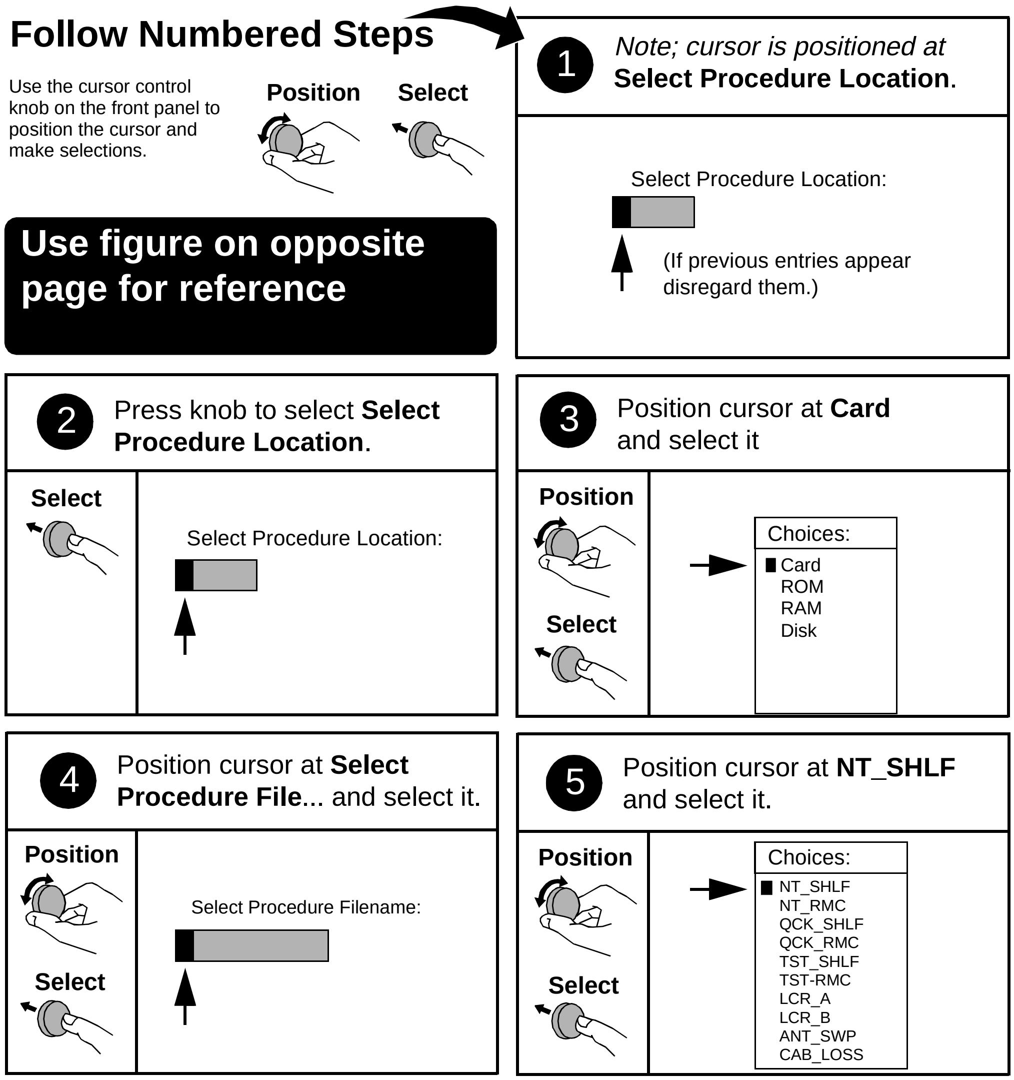


Load the Test Software

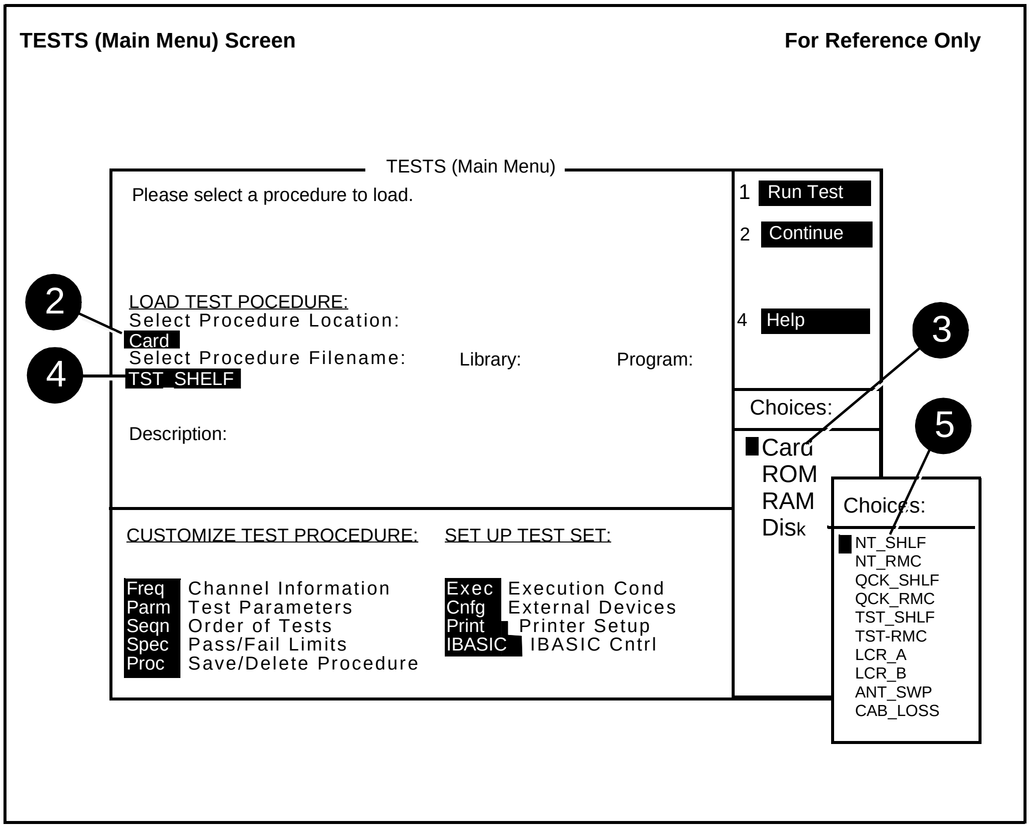


Next: Turn page to select a procedure

Selecting a Procedure

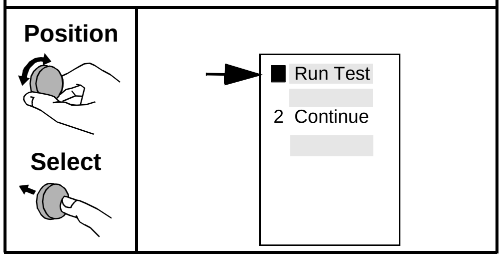


Next: Turn page to load Test Software


TESTS (Main Menu) Screen
For Reference Only
TESTS (Main Menu)
Please select a procedure to load.
LOAD TEST POCEDURE:
Select Procedure Location:
Card
Select Procedure Filename:
TST_SHELF
Library:
Program:
Description:
1 Run Test
2 Continue
4 Help
Choices:
Card
ROM
RAM
Disk
Choices:
NT_SHLF
NT_RMC
QCK_SHLF
QCK_RMC
TST_SHLF
TST-RMC
LCR_A
LCR_B
ANT_SWP
CAB_LOSS
CUSTOMIZE TEST PROCEDURE:
Freq Channel Information
Parm Test Parameters
Seqn Order of Tests
Spec Pass/Fail Limits
Proc Save/Delete Procedure
SET UP TEST SET:
Exec Execution Cond
Cnfg External Devices
Print Printer Setup
IBASIC IBASIC Cntrl
2
3
4
5

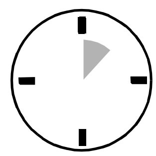
Measuring and Storing Cable Loss

1 Position cursor at **Run Test** and select it.

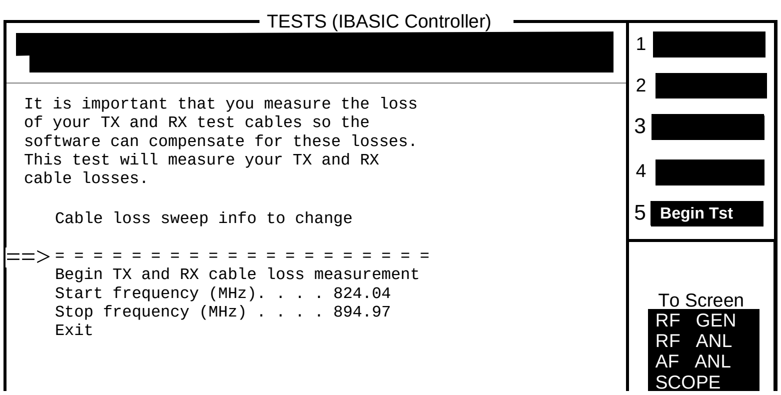


2 Wait for Test Software to load, then begin set-up at step 3.

NT TRU *software takes 3 min. to load.*



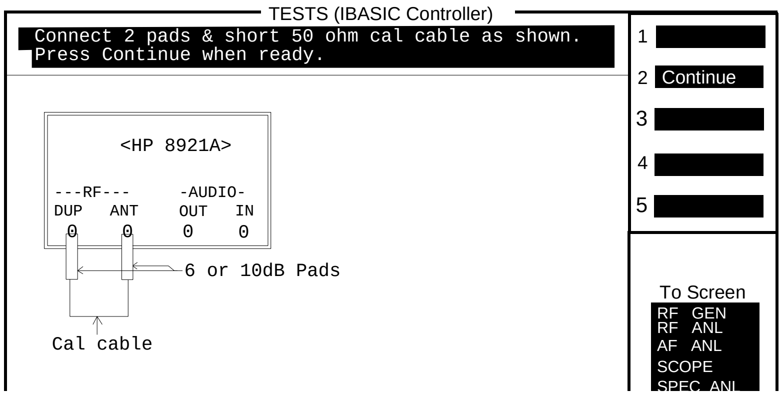
3 **a)** When the cable loss screen appears, read the displayed information.
b) Press the **Begin Tsts** user key (k5).



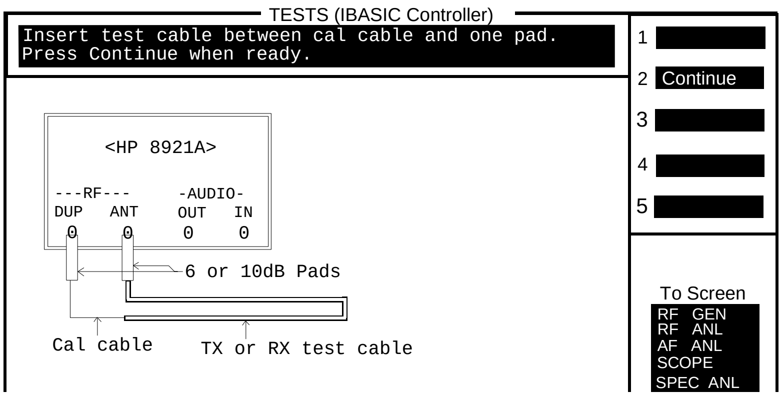
For more information regarding cable loss test screens, see Cable Loss Test Section on Chapter 5.

Next: Turn page to continue set up

4 **a)** Follow the instructions displayed on the screen.
b) Press the **Continue** user key (k2).



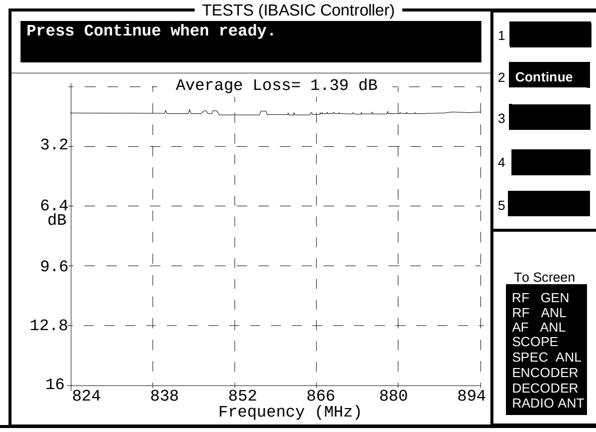
5 **a)** Connect a TX cable as shown on the screen.
b) Press the **Continue** user key (k2).



Next: Turn page to continue set up

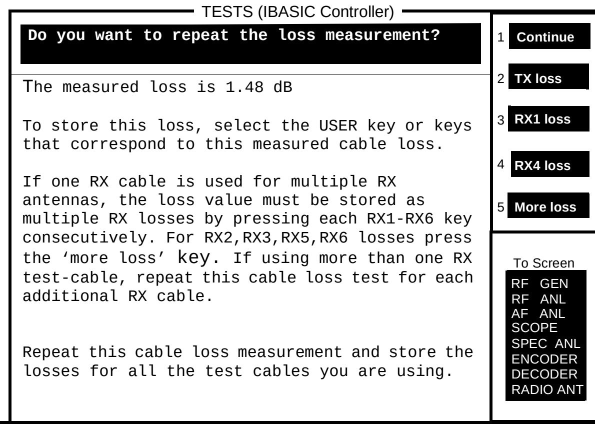
6

a) Check average cable loss.
b) Press the **Continue** user key (k2).



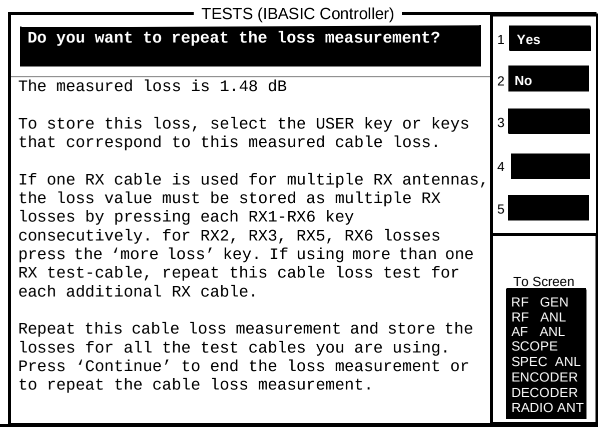
7

a) Read the instructions displayed on the screen.
b) Press the **TX loss** user key (k2).
c) Press the **Continue** user key (k1).

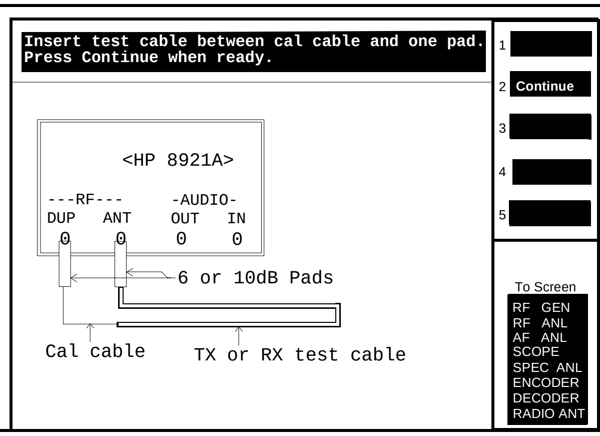


Next: Turn page to continue set up

8 To measure RX cable loss, press the **Yes** user key (k1).



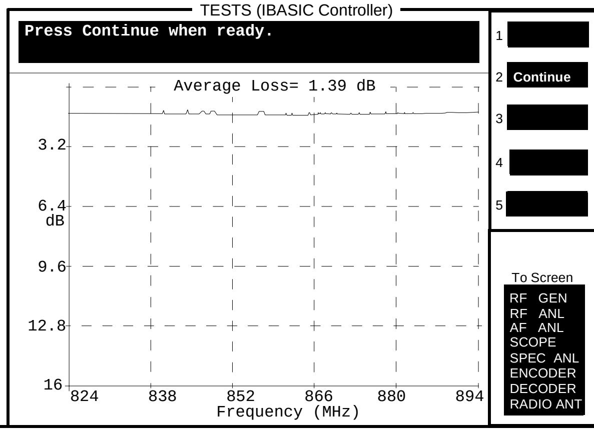
9 **a)** Connect a RX cable as shown on the screen.
b) Press the **Continue** user key (k2).



Next: Turn page to continue set up

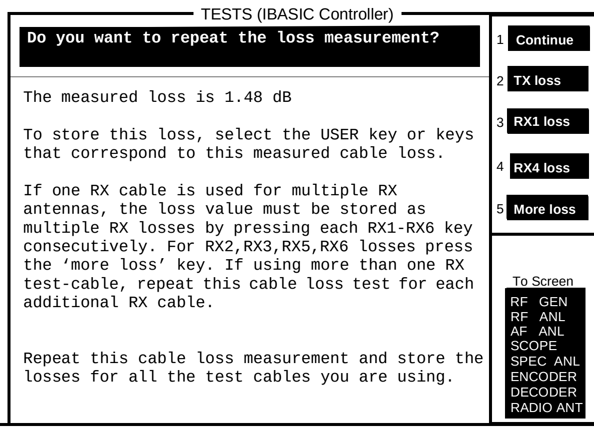
10

a) Check average cable loss.
b) Press the **Continue** user key (k2).



11

a) Press the **RX1** loss user key (k3).
b) Press the **RX4** loss user key (k4).
c) Press the **Continue** user key (k1).
d) Press the **No** user key (k2).

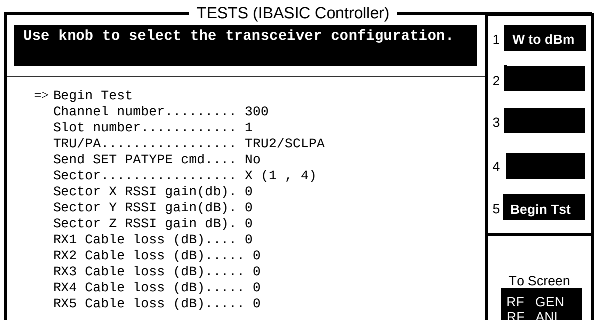


Next: Turn page to continue set up

Begin Testing

1

a) Enter the appropriate information in the **Channel number**, **Slot number**, **Base Station radio**, and **Sector** fields.
b) Press the **Begin Tst** user key (k5).

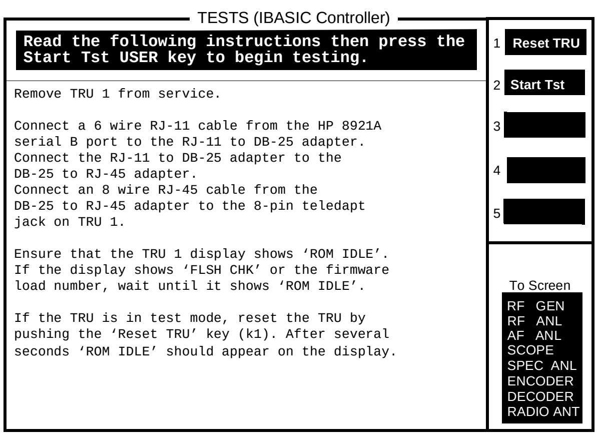


For more information regarding cable loss test screens, see Cable Loss Test Section on Chapter 4.

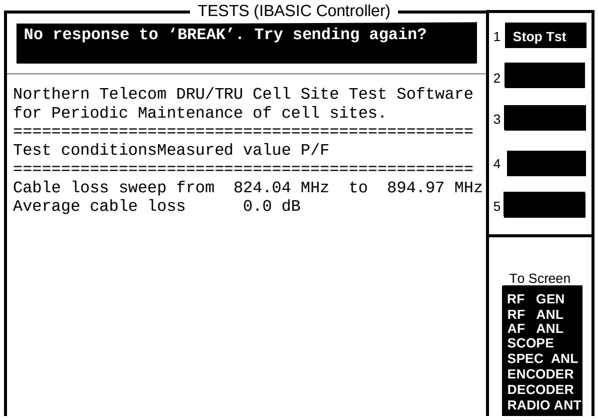
2

a) Follow the instructions displayed on the screen
b) Press the **Start Tst** user key (k5).

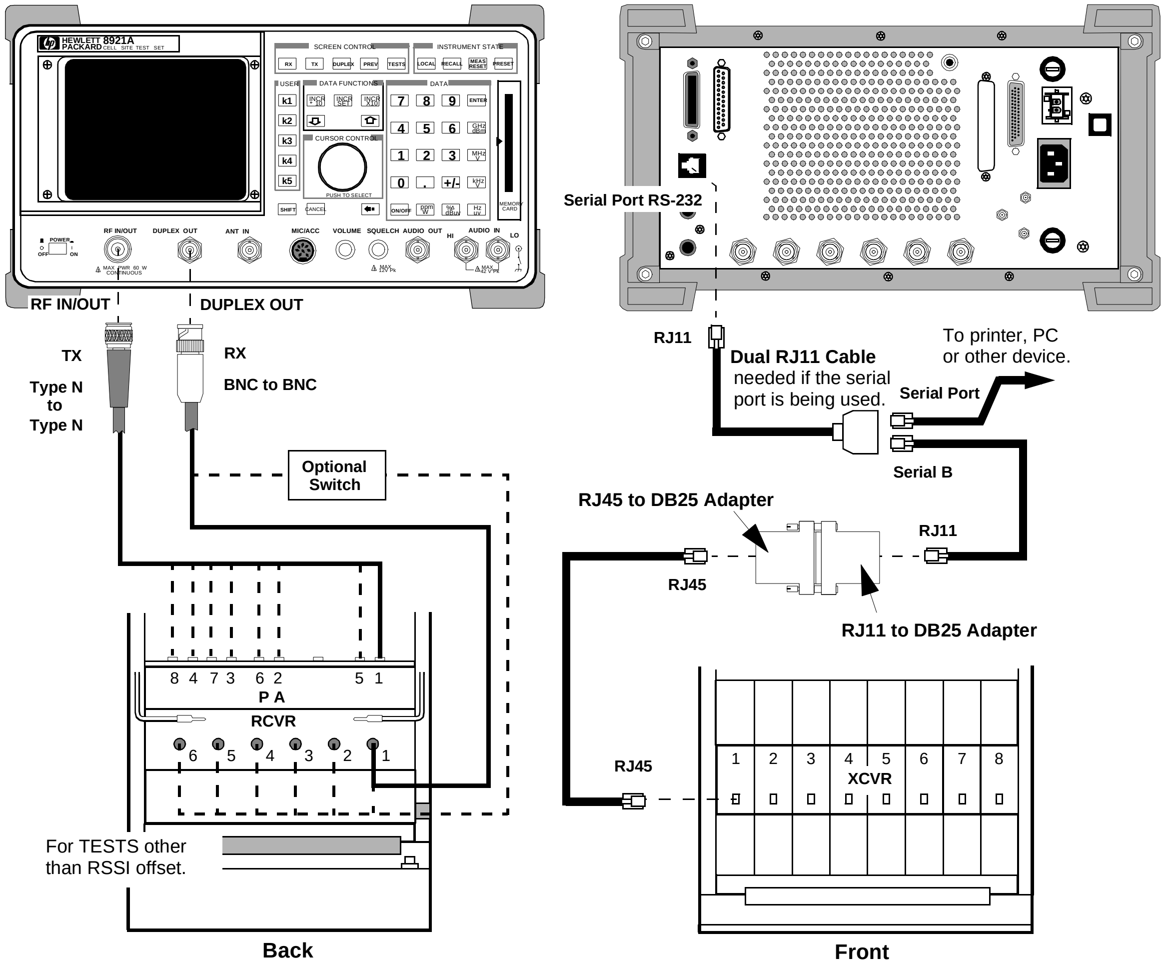
(See diagram on next page.)



3 Set-up is complete. The tests in the test procedure will now run consecutively.



Make Connections



Test Results

The tests in the test procedure will now run consecutively. Results from these tests will scroll down the Test Set screen. Each test will display the test condition, measured value, and a pass/fail indication. Some of the test results might indicate failures (which are not necessarily correct) for this trial run if the Test Software was not customized for your Base Station. Refer to **chapter 2, "Product Description"** for information on what is contained in this package, what is required, how to use this manual, and where to get additional help.

2

Product Description

Chapter 2
Product Description

HP 11807B Test Software

The HP 11807B Test Software performs fast, accurate, automated tests that determine RF and audio performance of Cellular Base Stations.

HP 11807B Option 044 TRU/DRU Test Software card can be used for the installation, maintenance, and/or repair of:

- Northern Telecom Transmit Receive Units (TRU)
- Northern Telecom Dual-Mode Radio Units (DRU)

NOTE: The DRU tests include a version for testing with the latest switch load for the Base Stations, MTX08.

Items Supplied in the Test Software Package

The HP 11807B Option 044 Test Software Package contains four PC cards: one for TRU/DRU testing, one for P-Series testing, one for RF Tools, an SRAM card, plus other items. The package contains the following:

- HP 11807B Option 044 TRU/DRU Test Software card
  Part Number: HP 11807-10017.
- HP 11807B Option 044 TRU/DRU Test Software User's Guide
  Part Number: HP 11807-90150.
- HP 11807B Option 044 P-Series Test Software card
  Part Number: HP 11807-10302.
- HP 11807B Option 044 P-Series Test Software User's Guide
  Part Number: HP 11807-90151.
- HP 11807A Option 100 RF Tools card
  Part Number: HP 11807-10100.
- HP 11807A Option 100 RF Tools User's Guide
  Part Number: HP 11807-90141.
- 128-kilobyte SRAM card for storing customized test programs and results. This card must be initialized, **see "Memory Cards," in chapter 6, on page 259** for the initialization procedure.
  Part Number: HP 85702A
- Software licensing agreement.

Equipment Required

- HP Test Set, consisting of one of the following:
  - HP 8921A, Option 500, TDMA Dual-Mode Cell Site Test System (HP 83204A)
  - HP 8921A, Option 503, TDMA/CDPD MDBS Cell Site Test System (HP 83204A)
- HP 8921A Test Set firmware revision A.15.00 or above.
- Accessories:
  - HP 83202A Option 044 Base Station Connection Kit
  - or, other switch and interconnect arrangements
- *Optional:*
  - Printer and printer connection cable for documenting test results.
  - PC or HP Palmtop computer and appropriate connection cable for storing test results.
  - Radio Interface Board (Option 020).

Test Set and Test System Description

- The HP 8921A, Option 500, TDMA Dual-Mode Cell Site Test System consists of:
  - HP 8921A Cell Site Test Set
  - HP 83204A, Option 001, TDMA Cellular Adapter
- The HP 8921A, Option 503, TDMA/CDPD MDBS Cell Site Test System consists of:
  - HP 8921A Cell Site Test Set
  - HP 83204A, Option 003, TDMA/CDPD Cellular Adapter

Northern Telecom TRU/DRU Test Software Functions:

Using the HP 11807B Option 044 TRU/DRU Test Software you can test:

- RXA and RXB SINAD Sensitivity
- RXA and RXB SAT Detection
- RXA and RXB ST Detection
- RXA and RXB RSSI Linearity
- RXA and RXB RSSI Offset
- RTA and RTB Audio Level
- TX Frequency Error
- TX Maximum Power and Power Level
- TX SAT Frequency and Deviation
- TX Residual AM
- TX Residual FM
- TX Wideband Data Deviation
- TXD TDMA Uncalibrated Power
- TXD TDMA Calibrated Power
- TXD TDMA Adjacent Channel Power
- TXD TDMA Modulation Accuracy
- PA LED Alarm and TRU Display
- Swept Return Loss
- Cable Loss

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

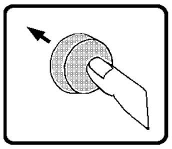
Test Software Features

The following features simplify testing:

- TRU control commands are automatically sent from the Test Set via the RS-232 interface. Responses from the TRU are received and used by the Test Software.
- System interconnects are graphically shown on the Test Set screen.
- Results of tests and pass/fail indications are displayed on the Test Set screen, and can be printed, or collected in an HP Palmtop computer, PC or terminal, or memory card.
- Switches that change the external RF signal path can be controlled automatically by the Test Software.
- The Test Software allows the operator to change the TEST sequence, channels, specifications, parameters, and equipment configurations.
- RF path losses can be determined and corrected.
- Demo mode may be used to observe the test environment without connecting to a Base Station (set parameter ZZZZ Demo to 1).
- User has the option to repeat a test on failure (as many times as desired), or continue testing.
- User may exit to laptop mode from the test environment.
- Tests may be run to measure cable fault, cable loss, and VSWR.

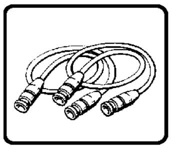
Finding Information

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



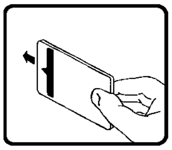
GETTING STARTED-CHAPTER 1

- Fast paced, hands on tutorial.
- Basic test set/software operation.
- First time or occasional users.



CONNECTIONS-CHAPTER 3

- Instructions for cabling test set.



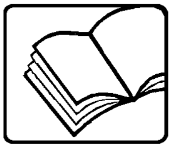
USING THE SOFTWARE-CHAPTER 4

- 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

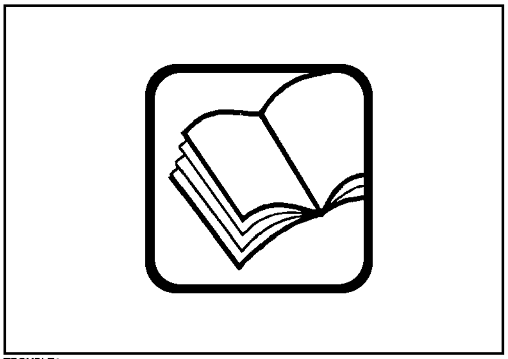
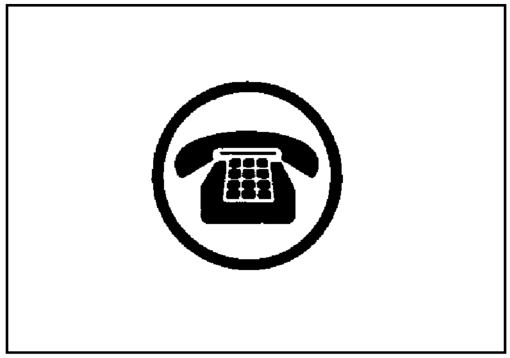
- Alphabetically listed
- Detailed descriptions of all the features and functions of the HP 11807B software.
- For the advanced level user.

PROBLEM SOLVING-CHAPTER 7

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

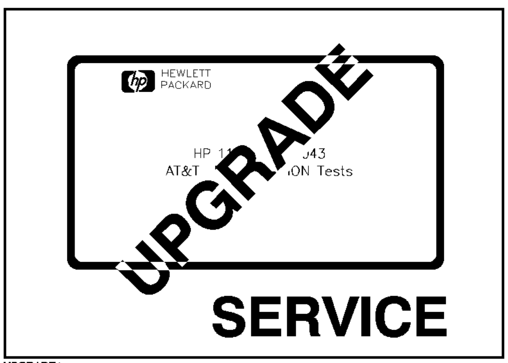
MANUAL1

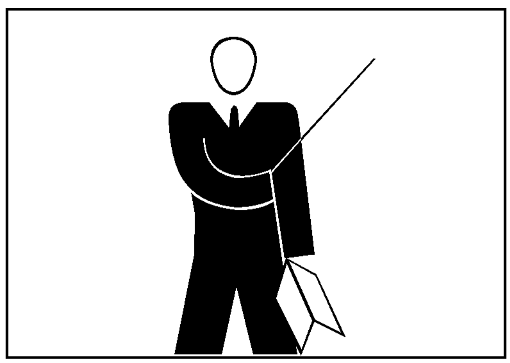
Additional Services Available

TROUBLE1

Consult the Test Set *User's Guide*, contact your sales representative, or call the Test Set Hotline 1-800-922-8920 (USA and Canada only) and give your Test 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.

3

Making Connections

This chapter describes how to:

- make connections to the TRU/DRU radio.
- calibrate test cables.

Equipment Required

The following equipment is required for testing:

- Northern Telecom TRU/DRU to test
- One of the following:
  - HP 8921A, Option 500, TDMA Dual-Mode Cell Site Test System (HP 83204A)
  - HP 8921A, Option 503, TDMA/CDPD MDBS Cell Site Test System (HP 83204A)
- Cables and Connectors (described below)

Test Set Firmware

The HP 8921A Test Set firmware revision number must be A.15.00 or higher. Determine the revision of the firmware by pressing SHIFT, CONFIG on the Test Set front panel. The revision number will be displayed in the CONFIGURE screen.

Cables and Connectors Included in Accessory Kit

The following cables and connectors may be purchased together in the Northern Telecom Accessory Kit (Part Number: HP 83202A Opt 044) or separately through a local vendor.

CAUTION: 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, switch settings, and power-on conditions must be chosen carefully to reduce the risk of damage to the equipment.

Table 1 Cables/Adapters Contained in Accessory Kit

Description	Purpose	Qty	P/N
Coaxial Attenuator, 6 dB (1W)	Used for cable loss test and return loss tests	2	0955-0698
BNC(f) to BNC(f) Adapter	Used for cable loss test	1	1250-0080
BNC to Single Banana Adapter	Connects AUDIO IN HI/LO to Dual banana adapter	2	1250-2164
Dual Banana to BNC Adapter	Connecting Test Set AUDIO IN HI/LO to balanced line input	1	1251-2277
Coaxial Cable Assembly (50 Ohms, 1 ft)	Used for cable loss test	1	8120-1838
RJ45 to RJ45 8-wire cable	Provides control capability for Northern Telecom TRU/DRU radios	1	8120-6343
Type N(m) to N(m) Cable, 10 ft	RF IN to TX output connector	1	08921-61010
BNC(m) to BNC(m) Cable, 10 ft	Duplex out to RX input cable	1	08921-61011
Cable Assembly flex coaxial BNC(m) to Molex 20 ft cable	To GE RCU rear panel TEST 1 and HP 8921A AUDIO OUT	1	08921-61012
RJ11(m) to RJ11(m) 6-wire cable,25 ft	Connects to dual port splitter and to RJ11 to DB25adapter	1	08921-61015
RJ11(f) to DB25(m) Adapter	Provides control capability for Northern Telecom P-Series and TRU/DRU radios	1	08921-61018
BNC to Bantam 309 cable, 10 ft	Audio connections (reverse & forward audio) for Northern Telecom P-Series radios	2	08921-61024
DB25 to RJ45 Adapter	Provides control capability for Northern Telecom TRU/DRU radios	1	08921-61027
RJ11(m) to RJ11(f) Dual-Port, 6-wire splitter	Provides interface to both rear panel serial ports on Test Set	1	08921-61031
DB25 to Bantam 309 cable	Provides control capability for Northern Telecom P-Series radios	1	08921-61034
DB9 to RJ11 Cable	Interface to PC for data collection	1	08921-61038
DB25 to RJ11 Cable	Interface to printer for data collection	1	08921-61039
Cable Assembly flex coaxial BNC(m) to AMP 20 ft cable	To GE CRCU rear panel TEST BUS IN and HP 8921AAUDIO OUT	1	08921-61045
RJ11(f) to DB9(m) Adapter	Provides control capability for GE CRCU radios	1	08921-61046

Additional Cables and Connectors Required

The following cables are required for VSWR (return loss), cable fault, and cable loss tests. These parts are NOT included in the Accessory Kit.

Table 2 Additional Cables/Adapters Required

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
50 Ohm termination connector type as required	Termination for cable-under-test	1	None
Resistive Power Splitter 1 GHz, BNC(f), 3 dB	For cable fault location	1	HP 0955-0733

1. Eagle, P.O. Box 4010, Sedona, AZ 86340, (Tel: 520-204-2597)(Fax: 520-204-2568)

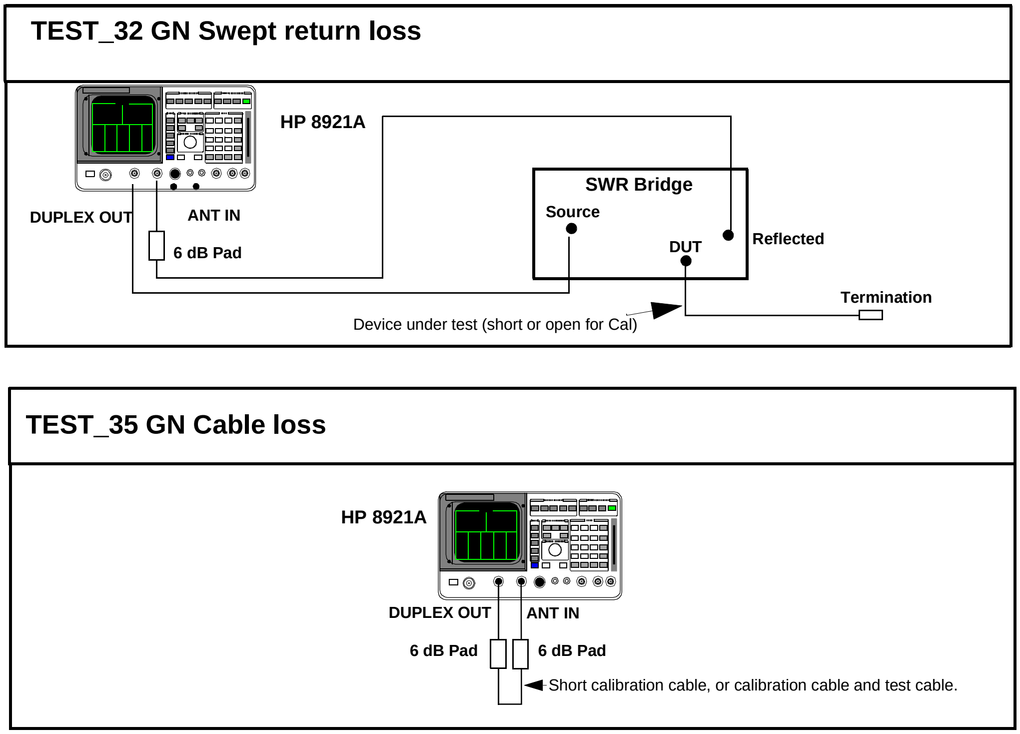


Figure 1 **VSRW and Cable Loss Measurement Connections**

TRU/DRU Equipment Connections

Many arrangements of test equipment and TRU/DRU equipment are possible. In this manual, two of these possibilities are presented:

- Performing Transmitter tests at the PA shelf and Receiver tests at the Receiver shelf.
  - This method will affect service at that shelf only.
- Performing Transmitter tests at the Duplexer or Combiner and Receiver tests at the Receive Multicoupler Output.
  - This method will affect the whole cell site

Radio Interface Board control of the Switch Matrix is described in this section. Also, refer to **Appendix A, "Using the HP 3488A Switch Matrix," on page 325**, if you are using an HP 3488A Switch Matrix.

Figure 2 is an overall system block diagram.

After you set up your system, you must calibrate some system components. Tests should be run with the equipment connected in the same way as when it was calibrated.

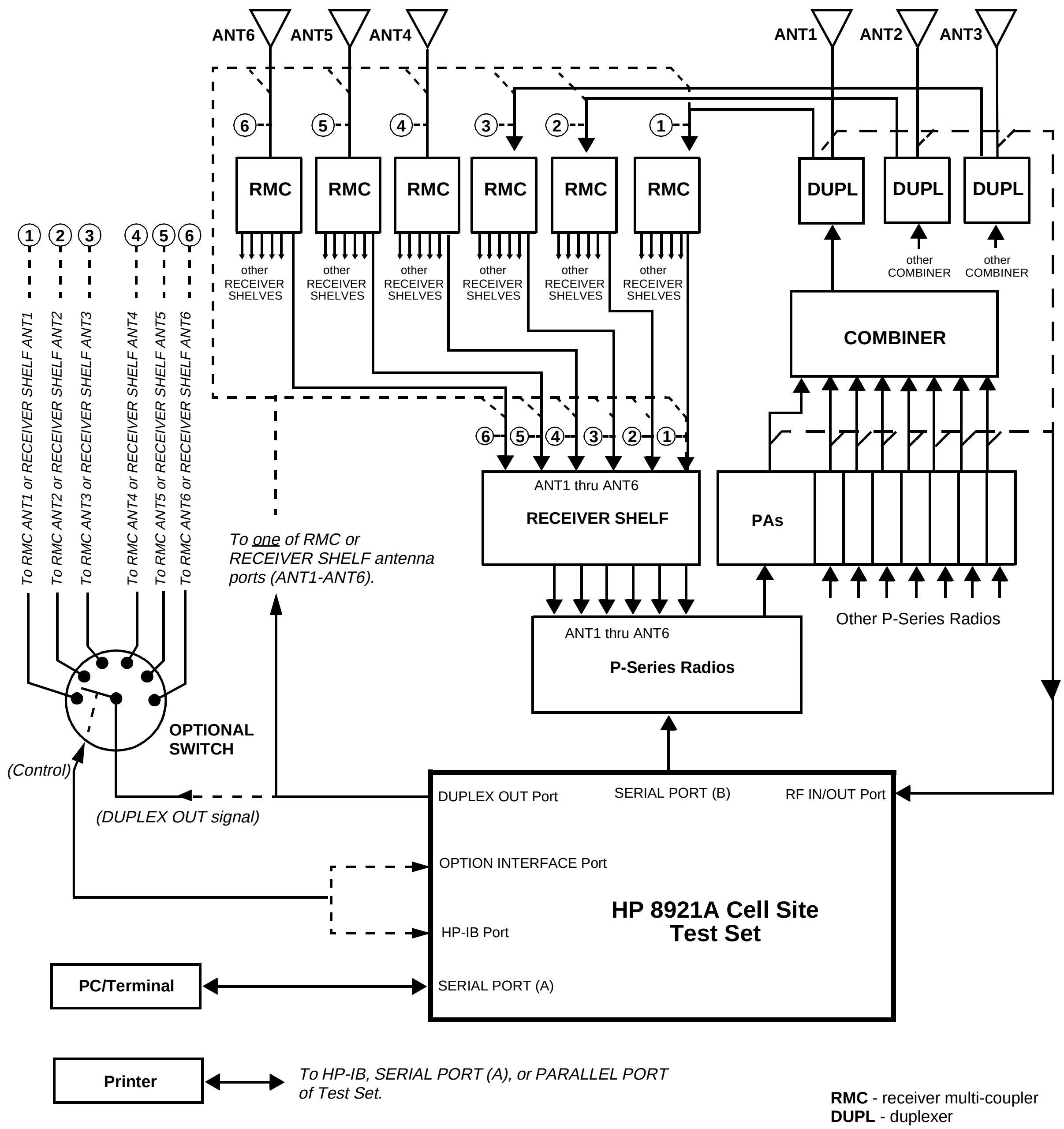


Figure 2 **Test System Block Diagram**

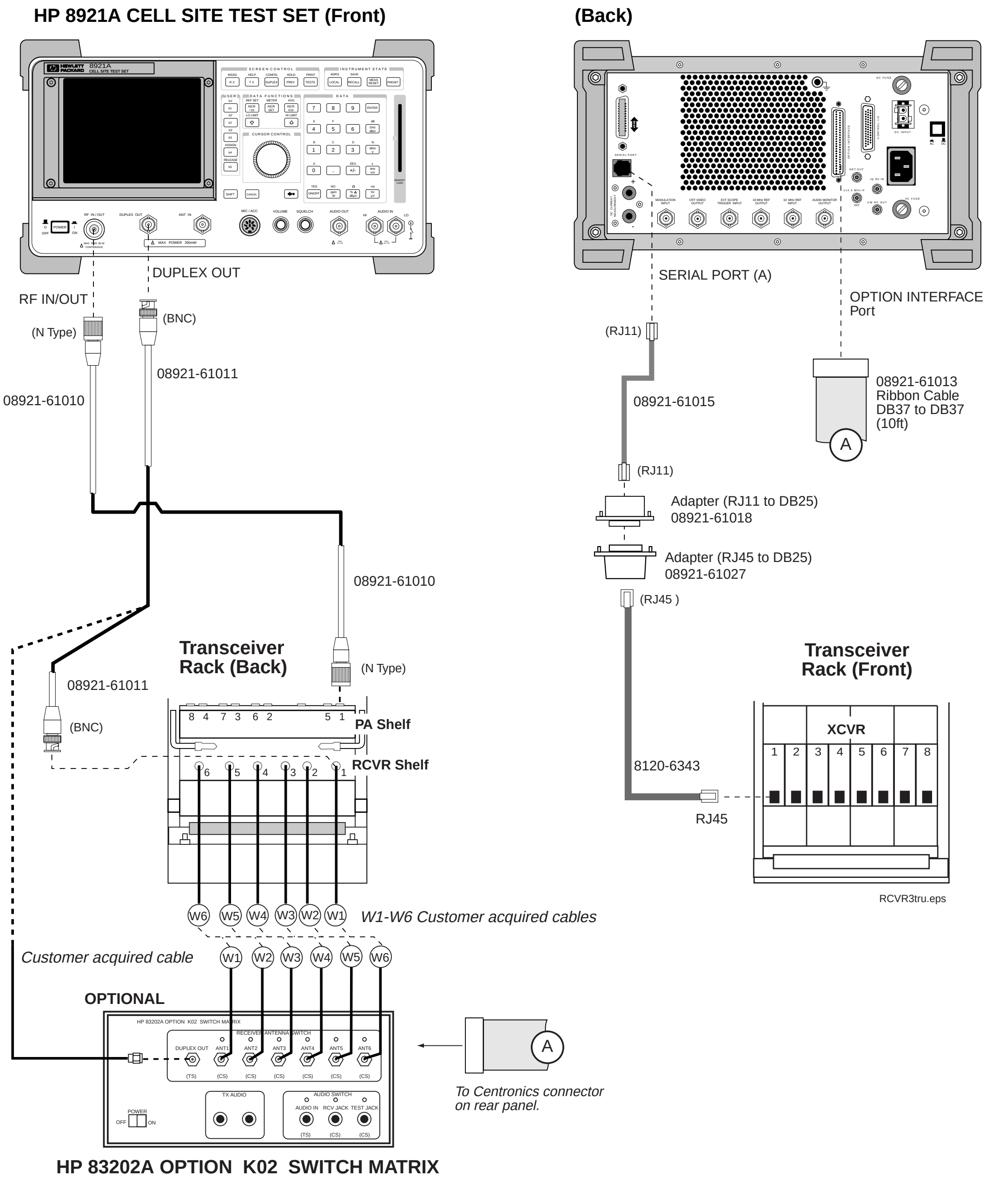


Figure 3 **Connecting the Test Set to the Macrocell Receiver Shelf and PA Shelf**

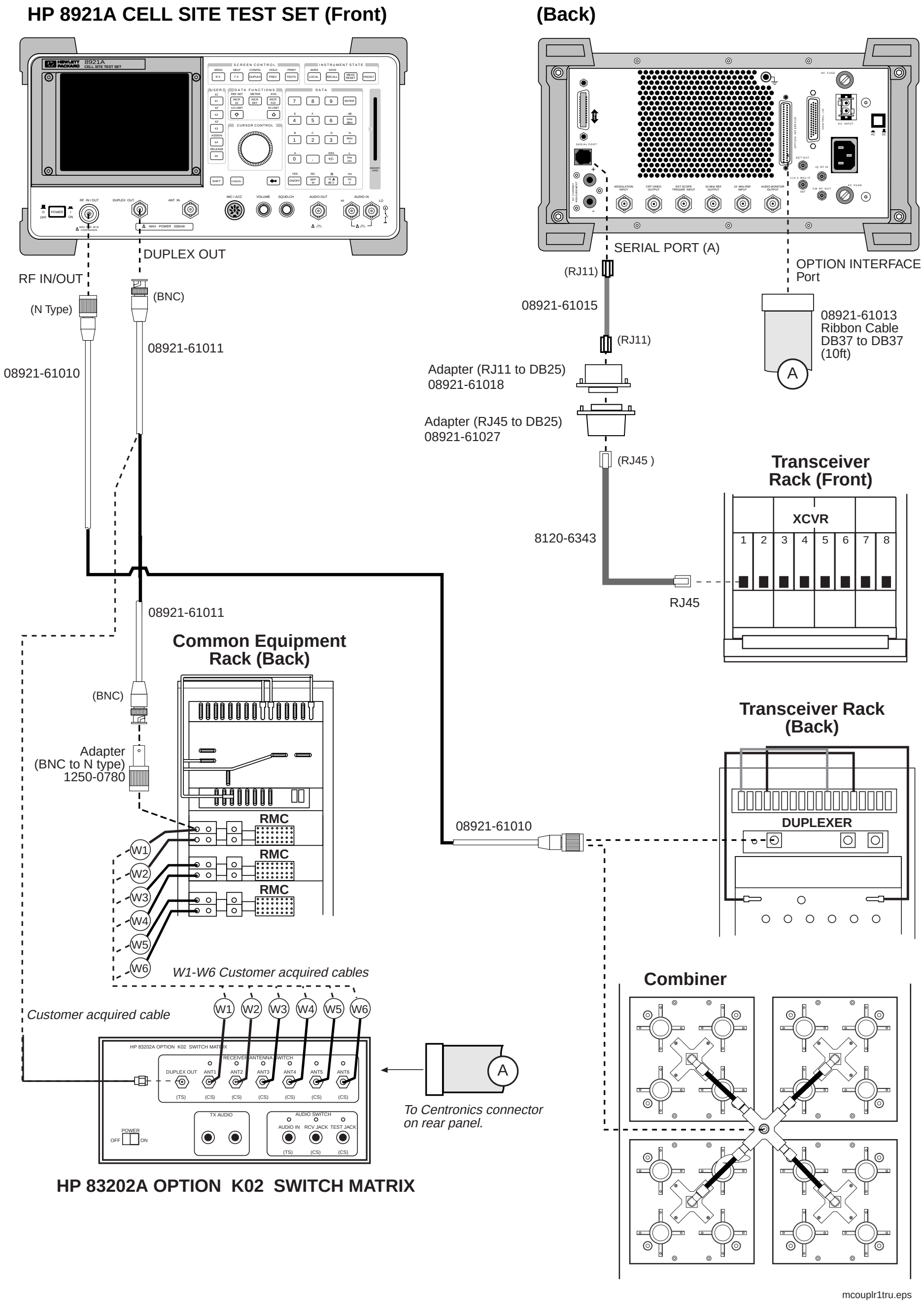


Figure 4 **Connecting the Test Set to the Macrocell Receive Multicoupler Input and Duplexer Output**

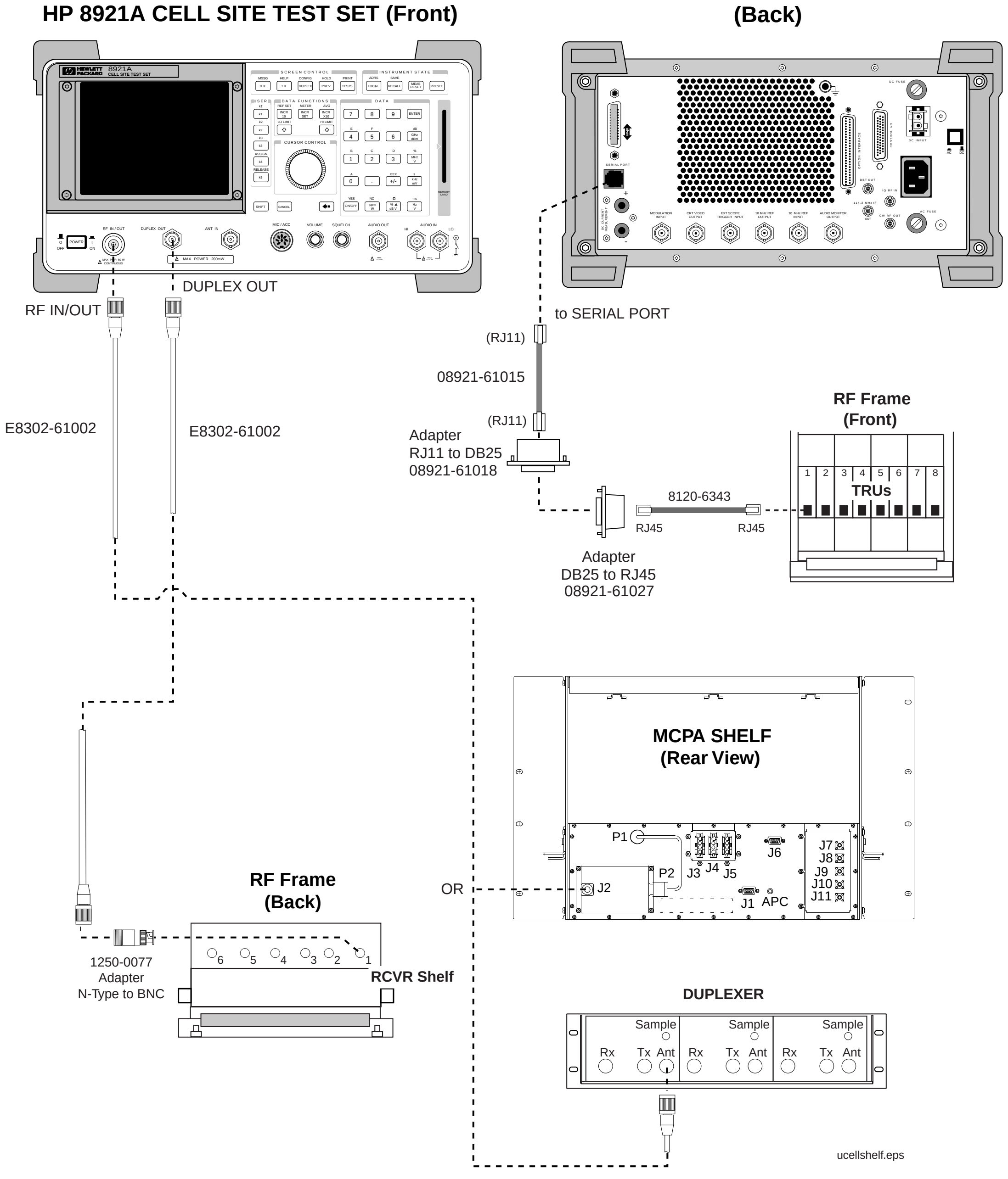


Figure 5 Connecting the Test Set to the Urbancell Receiver Shelf and MCPA Output or Duplexer Antenna Output

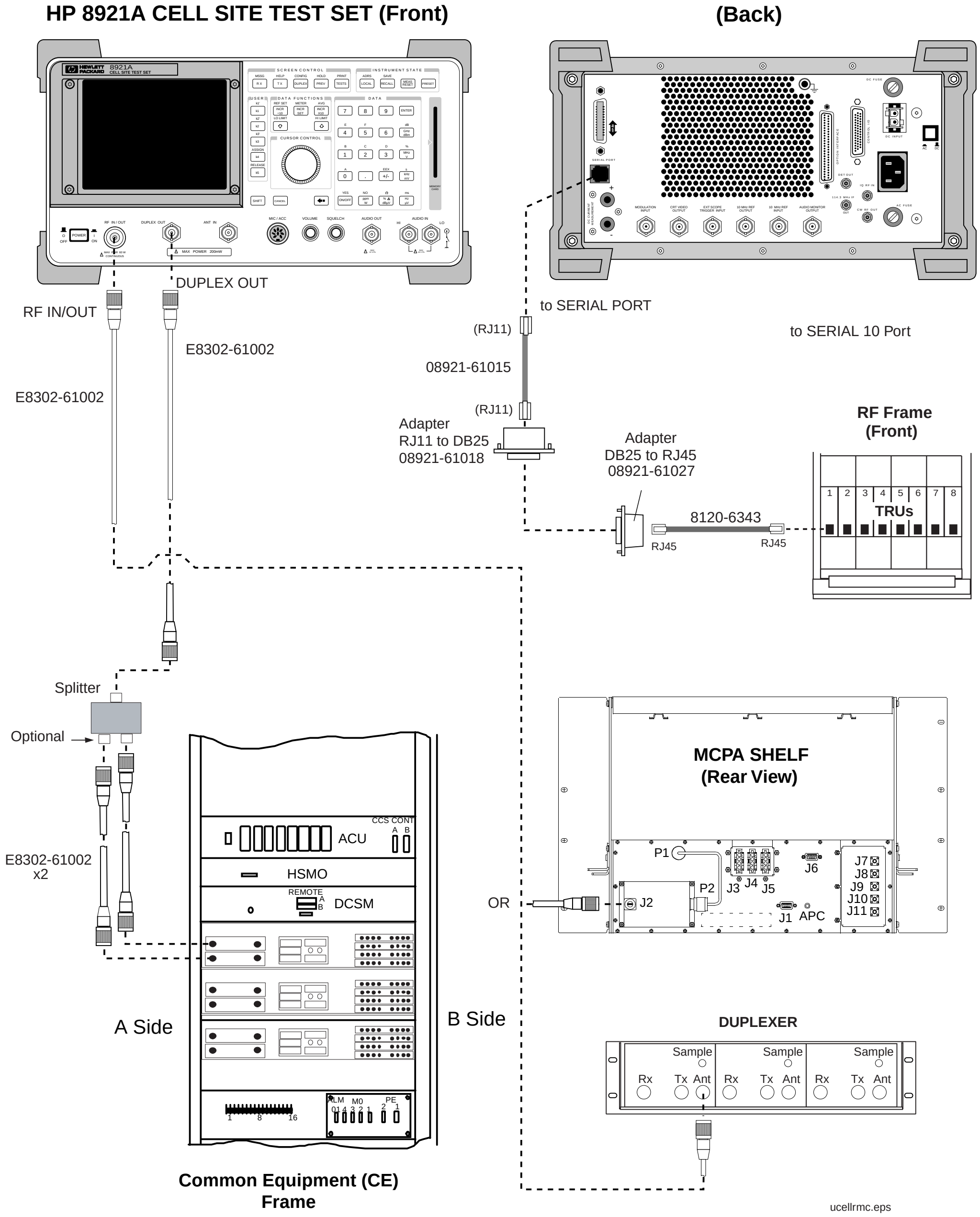


Figure 6 **Connecting the Test Set to the Urbancell Receive Multicoupler Input and MCPA Output or Duplexer Antenna Output Using an Optional Splitter on the Receive Path**

Receiver RF Connections

See **figure 3**, **figure 4**, **figure 5**, and **figure 6** for depictions of these connections. An RF cable is used to connect the RX shelf connector or RMC or Duplexer input to the Test Set DUPLEX OUT connector. The Test Software will prompt you when the connection must be changed.

You may use a Switch Matrix to automatically switch the Test Set DUPLEX OUT to the antenna inputs.

See **"Automatic Selection Using a Switch Matrix" on page 67** for information on using the Switch Matrix. See **"Radio Interface Board Connections" on page 67** for details of the connecting the Radio Interface Board to the Switch Matrix. See **"Configuration" on page 241** for information on how to make the Test Software control the Switch Matrix.

CAUTION: The application of RF power greater than 200 mW (+23 dBm) can damage the Test Set DUPLEX OUT port. Make 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.

Transmitter RF Connections

See **figure 3**, **figure 4**, **figure 5**, and **figure 6** for depictions of these connections.

The PA shelf outputs or Combiner/Duplexer output (or the MCPA output/ Duplexer output in the case of an Urbancell) are connected to the Test Set RF IN/ OUT connector. Use low loss cable with Type N connectors. Type RG-214 cable may be used. The Test Software will prompt you when a connection must change.

The PA connections may be switched using an 8-way Switch Matrix and a Radio Interface Board to control it. See **"Radio Interface Board Connections" on page 67** later in this chapter for details of connections between the Switch Matrix and the Radio Interface Board. See **"Configuration" on page 241** for the required entries to the `Edit Configure` screen.

No Audio Connections

There are no audio connections from the TRU/DRU to the Test Set.

Connection for RS-232 Control of the TRU/DRU

The HP 11807B Option 044 Test Software automatically controls the TRU/DRU through the TRU/DRU RJ-45 front panel connector. The connector used on the TRU/DRU is also called an 8-pin Teledapt. Other connections to the TRU/DRU are not supported.

The Test Set has a rear-panel RJ-11 connector for serial communication (see **figure 7**). The connector include two serial ports, Serial A port and Serial B port. The Serial B port is used for TRU/DRU control and messaging.

Connections to the TRU/DRU RJ-45 adapter are shown in **figure 8**. The view in the figure is from the outside of the connector in the adapter. Make certain that the RJ-45 cables and wiring result in the connections shown in the figures. Table 2-1 shows the wiring between the test serial RJ-11 connector to a DB25 connector to the TRU/DRU RJ45 connector.

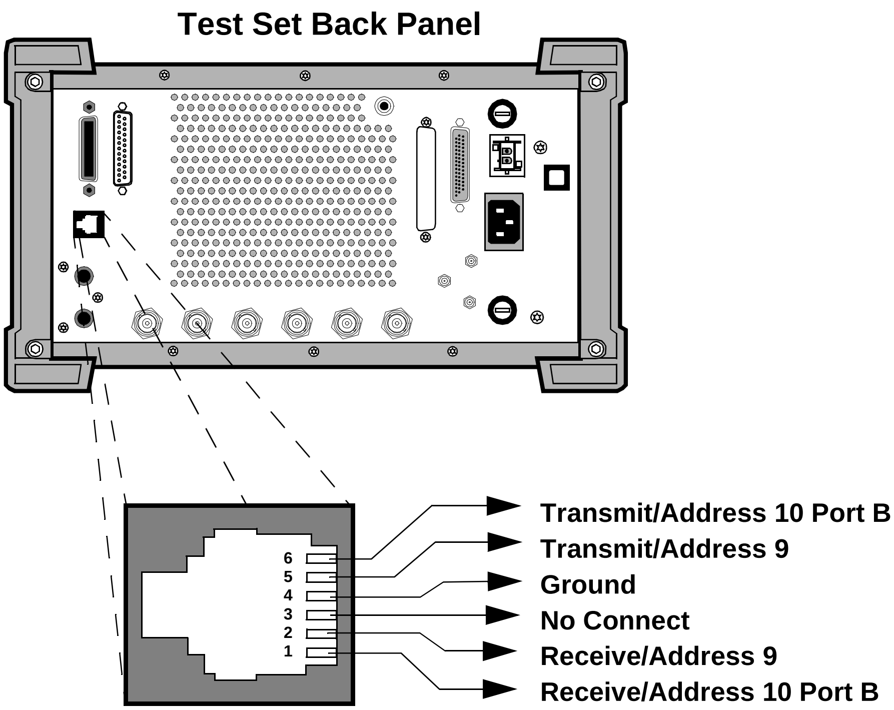


Figure 7 **Test Set RJ-11 Serial Port Connections**

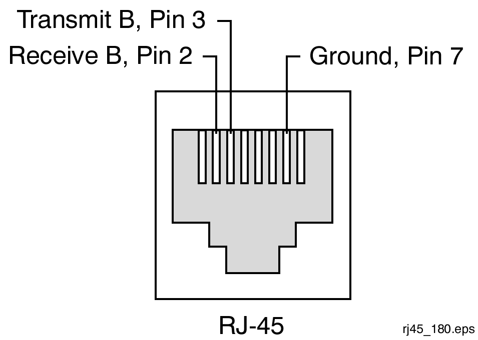


Figure 8 **RJ-45 Adapter Connections for TRU1**

NOTE: RJ-11 cable and adapters may be wired in several ways. Verify the end to end connections between the Test Set RJ-11 connector and the RJ-45 TRU/DRU connector.

The connections between the Test Set RJ-11 connector and the RJ-45 connector are described in the following table:

Table 3 **Connections for TRU/DRU Control**

Item	Test Set	DB-25	TRU/DRU RJ-45
Test Set Receive B data	RJ-11 Pin 1	DB-25 pin 3	RJ-45 pin 2
Ground	RJ-11 Pin 4	DB-25 pin 7	RJ-45 pin 7
Test Set Transmit B data	RJ-11 Pin 6	DB-25 pin 2	RJ-45 pin 3

The transmit data line (RJ-11 pin 6) for the Serial B port is the uppermost pin on the RJ-11 connector on the rear panel of the Test Set.

Depending on the adapters you use, you may have to insert three supplied pins with attached wires into the DB-25 connectors. See **table 3 on page 64**, **figure 7 on page 63**and **figure 8**to determine which pins to insert. Cover the un-used pins with tape to preclude shorting.

Serial Port and Printer Connections

Serial Port Connections for Data Collection

The HP 11807B Option 044 Test Software has the capability to transfer test results to an external computer. One way to accomplish this is by running a terminal program on a laptop or other computer and using terminal logging to save information sent out the Test Set Serial port.

The following pins are used by the HP8921A Serial A port, address 9:

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

See **figure 7 on page 63**. The transmit data line (pin 5) for the Serial A port is just below the uppermost pin on the RJ-11 connector on the rear panel of the Test Set.

Printer Connection

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

A serial printer can be attached to the Serial A port, address 9. See **figure 7**. Use the following RJ-11 pins for this connection.

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

A parallel printer can be attached to the Parallel port. See **figure 9**for pin information.

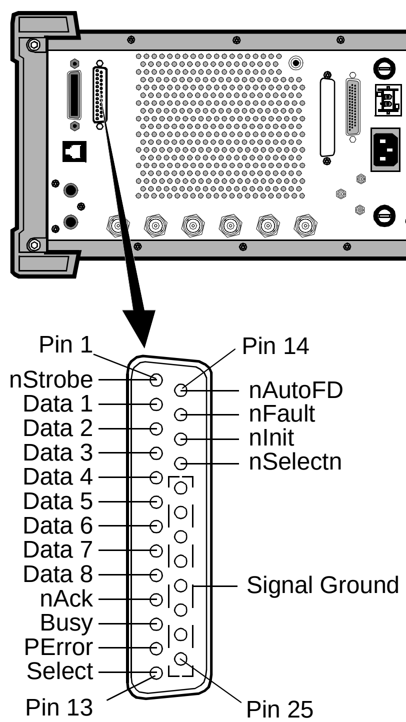


Figure 9 **Test Set Parallel Port Connections**

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

Radio Interface Board Connections

Automatic Selection Using a Switch Matrix

To speed up measurements and reduce test time, you may construct a switch arrangement, or you may use either an HP 3488 Switch Matrix or an HP 83202A Switch Matrix. If you wish to construct your own switch arrangement, use the information in this section to do so.

Using either the HP 3488 Switch Matrix or the HP 83202A Switch Matrix will allow you to connect to all six receiver antennas at once. The Test Software, controlling the Switch Matrix through the Radio Interface Board (Option 020), will automatically select the correct receiver path. See **table 4** and **table 5** for Radio Interface Board pinout information. Also see **"Configuration" on page 241** for information on configuring the Test Set to perform automatic switching. See **Appendix A, "Using the HP 3488A Switch Matrix," on page 325**.

CAUTION: Damage to the Test Set can result if the Switch Matrix generates transients that are conducted into the Test Set via the Radio Interface Board. It may be necessary to install diodes on the Radio Interface Board control lines to suppress transients caused by the switches. Refer to the Switch Matrix manual for the proper interface to TTL or CMOS control lines.

The parallel lines of the Radio Interface Board may be used to control a Switch Matrix. The Test Software will use the entries made into the TESTS **`(Edit Configuration)`** screen to set state of the lines as active low or active high. If no entry is made, the lines will be set high when the switch position is selected. By using the **`LOW`** option the polarity of the lines can be inverted. Check the switch polarity and enter **`LOW`** if necessary. See **"Configuration" on page 241** for key word entries.

Also, the Switch Matrix may be controlled manually. See **TEST_35 - GN Manual Switch Control**.

The following pins on the Radio Interface Board DB-37 connector are used to control a Switch Matrix:

Table 4 **Pinouts for ANT Switch Control**

Pin #	Pin Description	Switch Setting
1	GND	
19	Parallel Data Out - D0	ANT1
20	Parallel Data Out - D1	ANT2
21	Parallel Data Out - D2	ANT3
22	Parallel Data Out - D3	ANT4
23	Parallel Data Out - D4	ANT5
24	Parallel Data Out - D5	ANT6

Table 5 **Pinouts for PA Switch Control**

Pin #	Pin Description	Switch Setting
1	GND	
25	Parallel Data Out - D6	PA1
26	Parallel Data Out - D7	PA2
27	Parallel Data Out - D8	PA3
28	Parallel Data Out - D9	PA4
29	Parallel Data Out - D10	PA5
30	Parallel Data Out - D11	PA6
31	Parallel Data Out - D12	PA7
32	Parallel Data Out - D13	PA8

There are Radio Interface Board pins used for other purposes that are not listed above. If you plan to connect to these lines, see “Connector, Key, and Knob Descriptions” in the Test Set *User’s Guide.*

A buffer may be required between the Switch Matrix and the Radio Interface Board.

The Radio Interface Board has the capability to use a 5.1 volt or user selectable high state logic output voltage.

The Parallel Data Out lines are open-collector outputs with 3.16 kilohm internal pull-up resistors. The resistors are connected between the collectors of the drive transistors and a logic voltage that can be determined by an externally applied voltage. If an external voltage is applied, the internal logic voltage is approximately 0.6 volt less than the voltage applied to pin 9 of the Radio Interface Board. This applied voltage can be between 5.1 volts and 20 volts. The maximum loading on the voltage is 145 ohms to ground. If no voltage is applied, an internal 5.1-volt source is used as the logic voltage.

The characteristics of the parallel lines are:

High state output: 3.16 kilohm pull-up to the logic voltage. See the previous paragraph.

Output sink current (low state, output voltage ≤ 1.5 volts): 6 mA minimum, 16 mA typical

Series chokes: 4.6 µH for RFI control on all lines.

Clamp diodes for ESD protection: The applied voltage must not exceed the logic voltage plus 0.6 volt, or be less than – 0.6 volt.

DC Power to the Switch Matrix

DC power must be supplied to the Switch Matrix from an external source. It cannot be supplied from the Radio Interface Board. Refer to the Switch Matrix documentation for power requirements.

Calibrating Test Cables

The accuracy of RF power measurements and receiver sensitivity measurements is affected by losses through the cables and Switch Matrix connecting the TRU/DRU and the Test Set. It is important therefore that the appropriate calibration factors be used. *TEST_40 GN Cable Loss* automatically runs each time the Test Set power is cycled so that you may measure and store the cable loss values.

After running this test, you must store the values as *RX1 cable loss* through *RX6 cable loss* and *TX cable loss*. These stored values appear on the Initialization screen, and may also be edited if necessary.

See the description of **TEST_40 - GN Cable Loss** in **chapter 5**.

NOTE: If you are not using a Switch Matrix, enter the same value for all six cable losses. If you are using a Switch Matrix, create a procedure that will run **TEST_35 - GN Manual Switch Control** to control the Switch Matrix, followed by **TEST_40 - GN Cable Loss** to measure cable loss. Repeat this sequence of these two tests for each switch position (see **chapter 4**). You must still store the measured values for each cable as *RX1 cable loss* through *RX6 cable loss* and *TX cable loss.*

4

Using the Test Software with FW Above Revision A.15.00

Firmware Enhancements

NOTE: Firmware revision A.15.00 in the HP 8921A,D Test Set has several enhancements. This chapter applies to users with:

- **HP 8921A Test Sets with firmware revision above A.15.00**

The Test Set 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.

The Test Software may be run with the factory default settings or customized to your specific requirements. This chapter provides detailed information on how to load, run, and customize the Test Software.

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

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

- HP 8921A, Cell Site Test Set (firmware revision above A.15.00 is required)
- HP 8921A, Option 500, TDMA Dual-Mode Cell Site Test System (HP 83204A)
- HP 8921A, Option 503, TDMA/CDPD MDBS Cell Site Test System (HP 83204A)

Testing Overview

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

Begin running tests:

- If the factory default settings are acceptable for your application

  or

- If the Test Software has already been customized and saved to an SRAM card

or

Customize the Test Software:

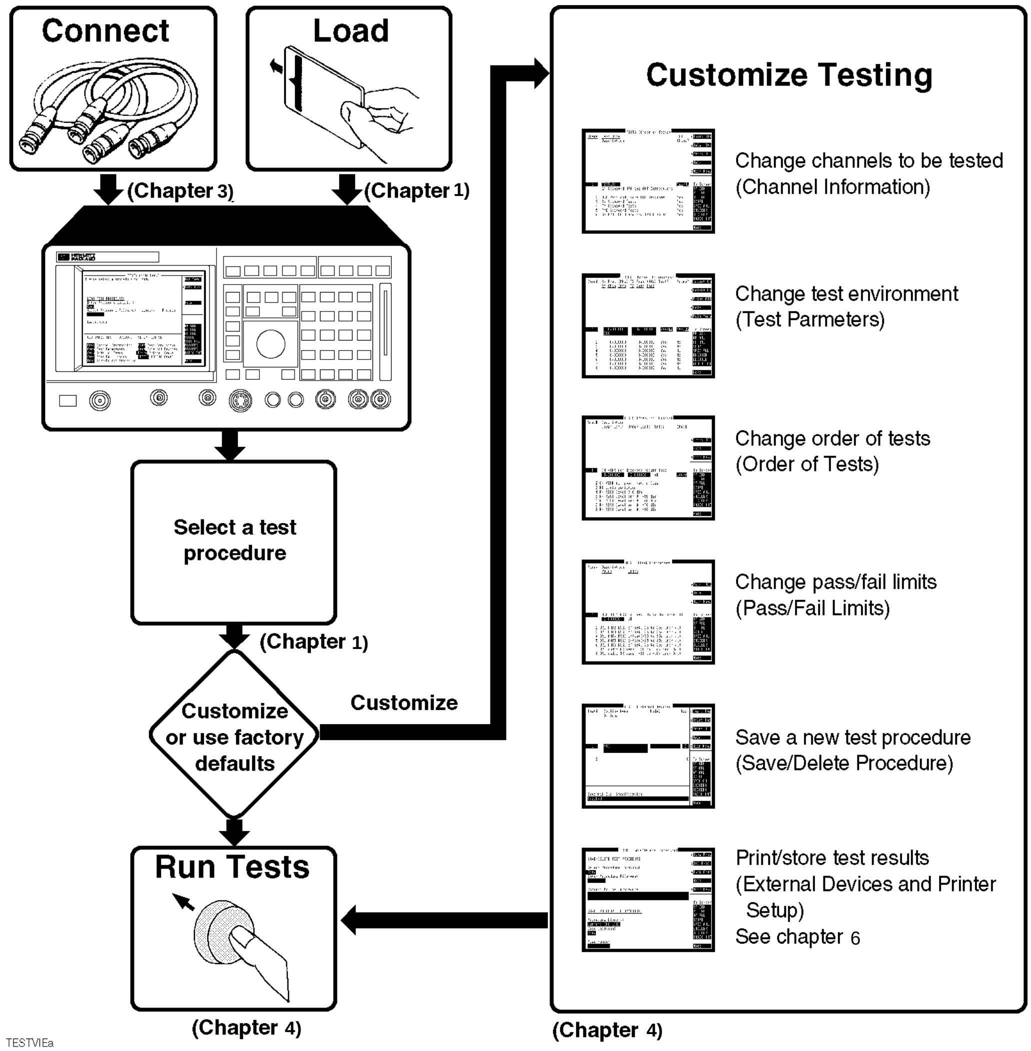
- Specify which channels to test, and enter frequency information (Channel Information)
  - You might wish to test one, some, or all of the radios on the shelf.
- Decide which tests you desire to run (Order of Tests)
  - You might wish to run all, some, or just one of the tests.
- Change the pass/fail limits for specific measurements (Pass/Fail Limits)
  - You might wish to use pass/fail limits with tighter or looser specifications than the default settings.
- Change the test environment and conditions (Test Parameters)
  - You might wish to change the output format.
  - You might wish to enter specific information about radio equipment and/or environment.
  - Save any or all of the above customized changes to an SRAM card (Save/Delete Procedure)

or

Set Up Test Set:

- You might wish to print test results or certain screens.
- You might wish to select when and where test results will be displayed (Test Execution Conditions/External Devices)

To Run Tests


Connect
Load
(Chapter 3)
(Chapter 1)
Select a test procedure
(Chapter 1)
Customize or use factory defaults
Customize
Run Tests
(Chapter 4)
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 4)
TESTVIEa

Running Tests

Before you load the Test Software and run tests, you should have made the appropriate hardware connections. See **chapter 3, "Making Connections"** if you have not done so already.

The HP 11807B Test Software may be run with the factory default settings, or it may be customized to your specific requirements (see **"Customizing Testing" on page 78**).

When testing starts, TESTs are executed in the order of entry into the Test Procedure.

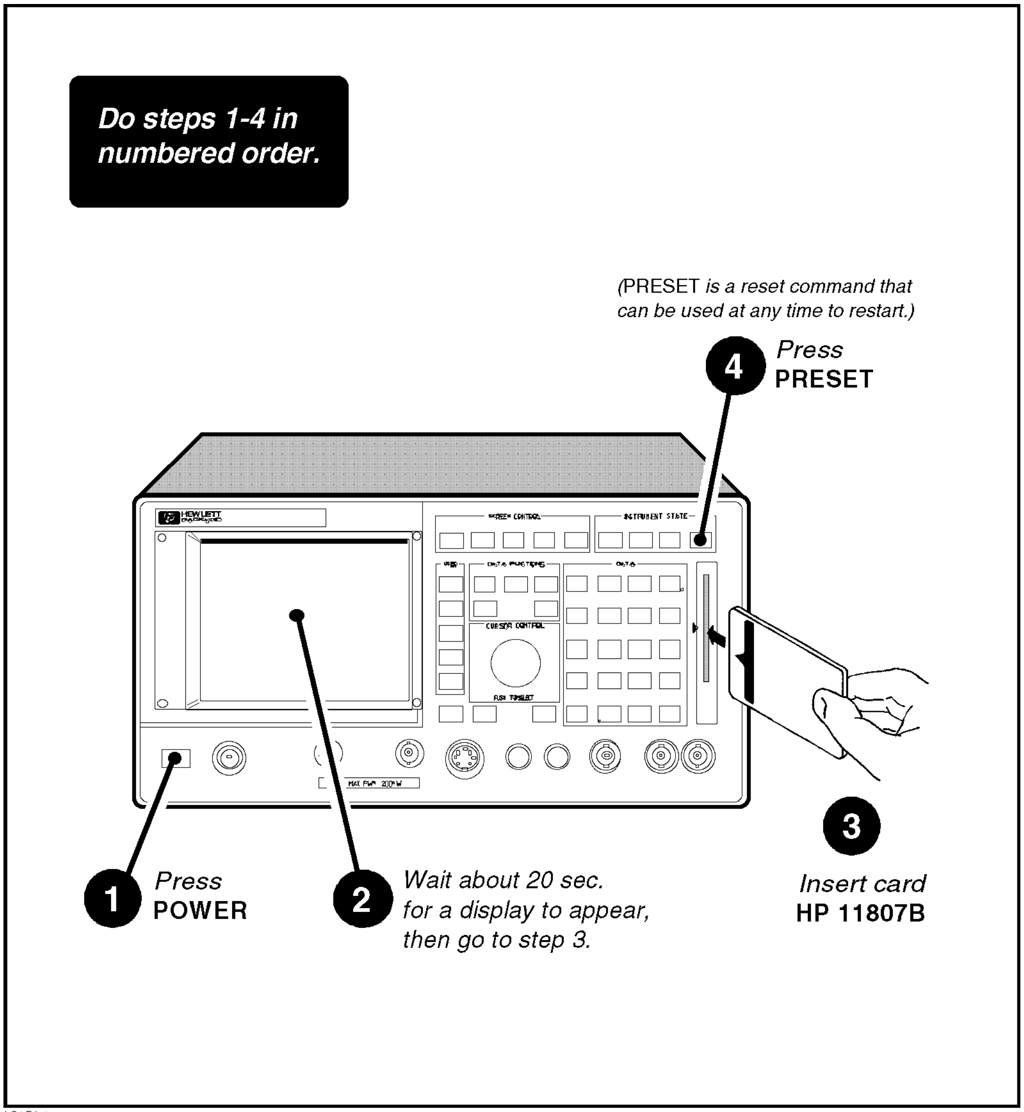
- Pressing CANCEL will pause the current test.
- Pressing k2 (**`Continue`**) will continue the test.

Loading the Test Software

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

The Test 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

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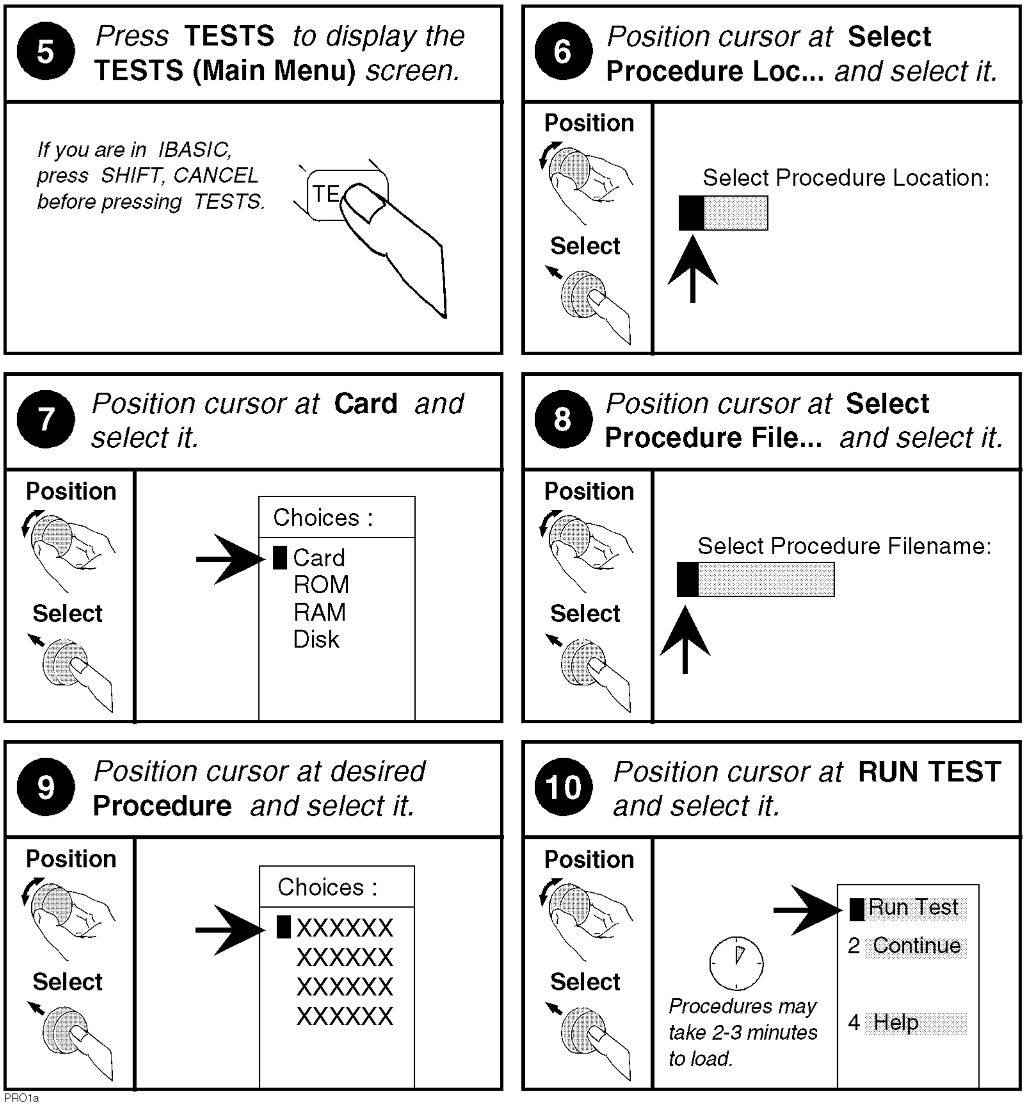

5
Press **TESTS** to display the **TESTS (Main Menu)** screen.
If you are in IBASIC, press SHIFT, CANCEL before pressing TESTS.
TE
6
Position cursor at **Select Procedure Loc...** and select it.
Position
Select
Select Procedure Location:
7
Position cursor at **Card** and select it.
Position
Select
Choices :
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 requirements, the Test Software has been designed so that changes may be easily made from the Test Set 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 91**.

Because your requirements may change, the Test Software allows changes to its default settings whenever you wish. For example, tests may be inserted or deleted, and later, after running the tests, you might change the pass/fail limits or elect 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 are explained later in this chapter.

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

The External Devices screen is used when setting up functions such as data collection or message logging. See **"Data Collection (Saving and Retrieving Test Results)" on page 247** and **"Logging" on page 258** in **chapter 6, "Reference (Alphabetical)"**.

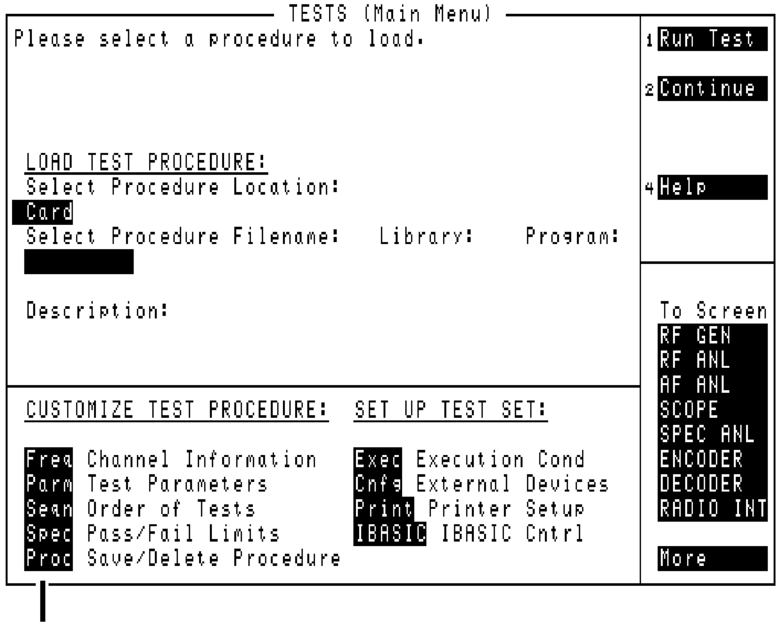
The Printer Setup screen is used to print the test results. **See "Printing," in chapter 6, on page 267**.

- The IBASIC Controller screen is used when writing your own programs and is not explained in this manual. If you wish to write your own IBASIC programs, you might wish to acquire the following manuals:
  - *HP Instrument BASIC User's Handbook*
    Part Number: HP E2083-90601
  - *HP 8921 Programming Manual*
    Part Number: HP 08921-90031

Beginning Test Software Customization

All Test Software customization begins by accessing the TESTS Main Menu screen first and then selecting the **`CUSTOMIZE TEST PROCEDURE`** filed of 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

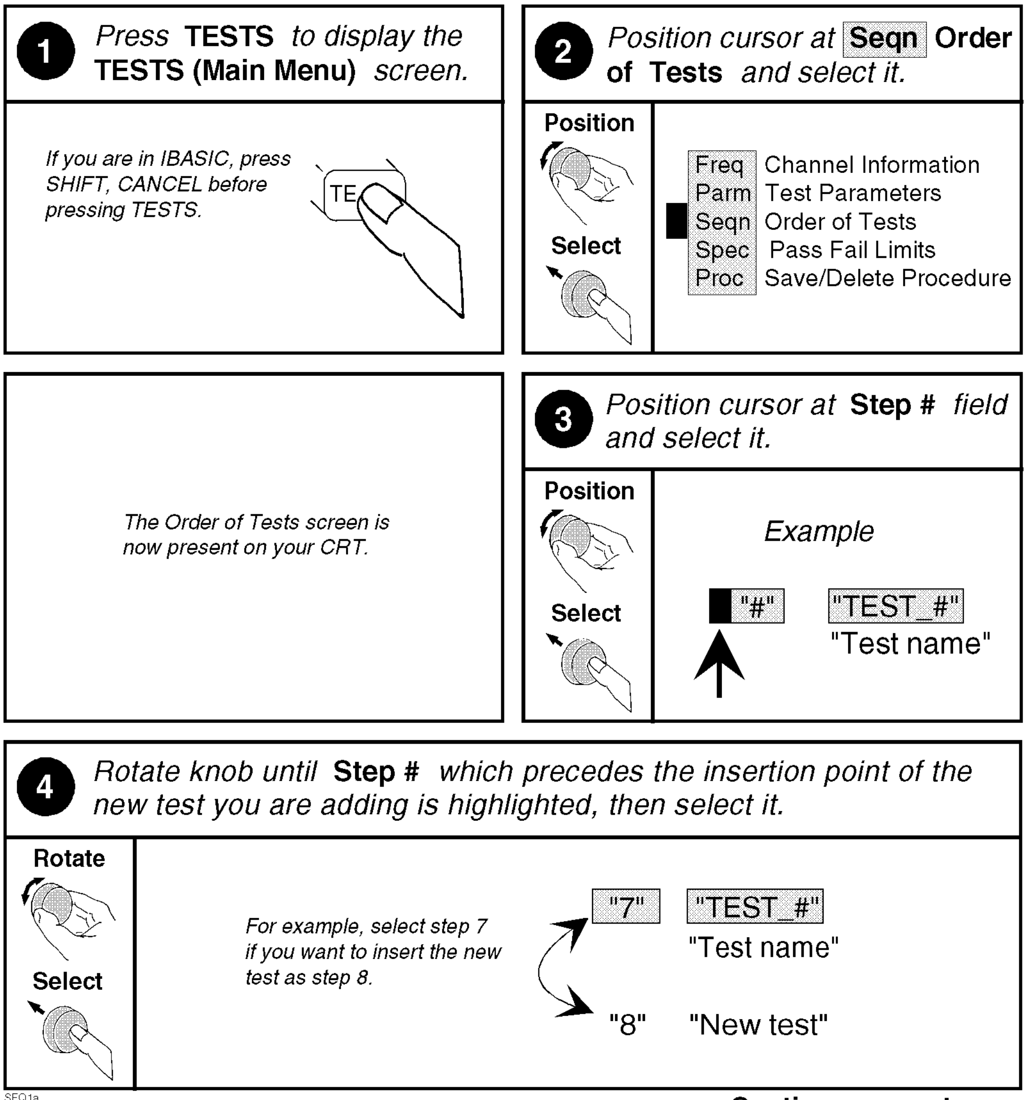
Changing the Order of Tests

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 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 91**.

Defining the order of tests is accomplished by inserting or deleting tests from the list of tests that come with the Test Software package. **See "Test Descriptions," in chapter 5, on page 127**, for descriptions of tests included in this package.

This section describes how to create a new test sequence. The `All Chans` field is not used by this Test Software package.

How to Change the Order of Tests



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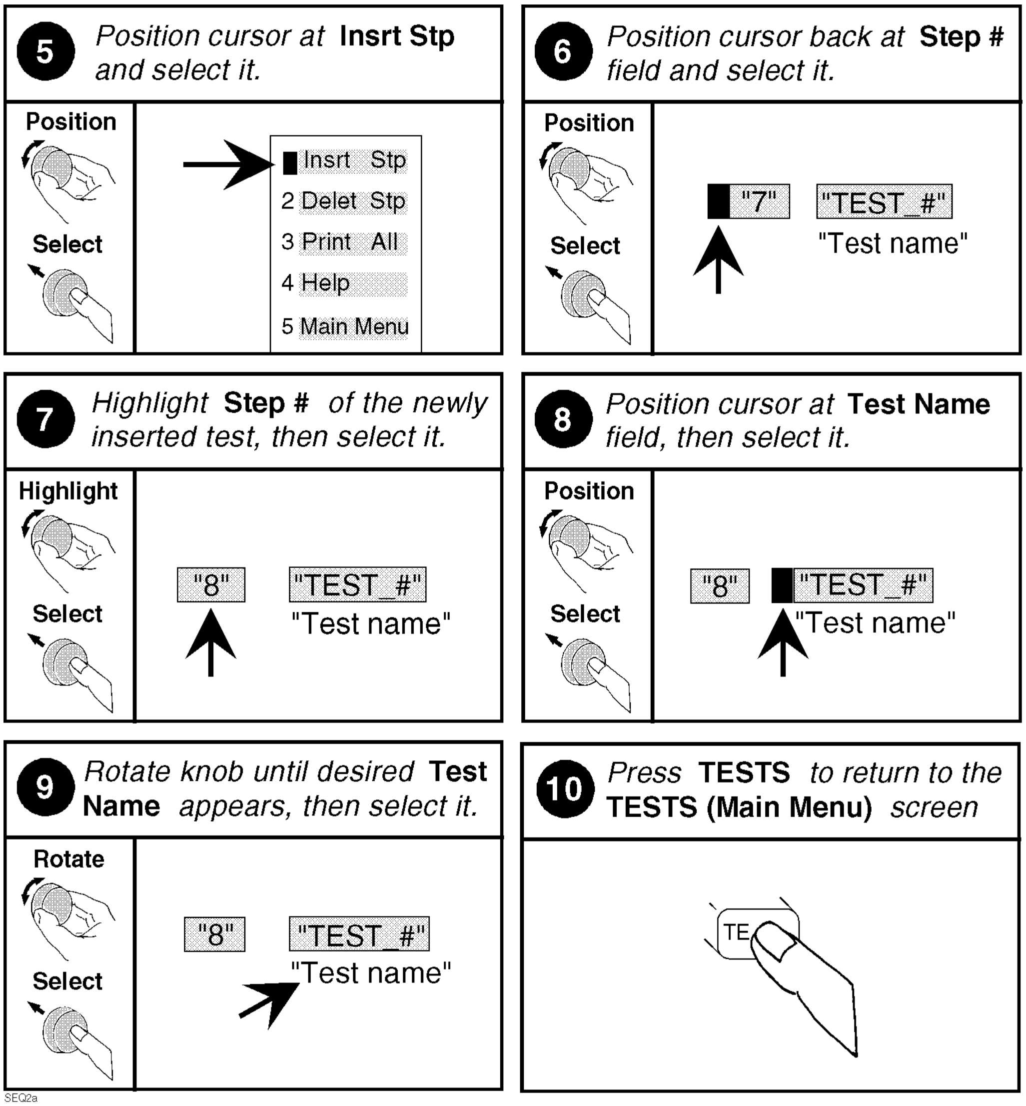

5 Position cursor at **Insrt Stp** and select it.
Position
Select
Insrt Stp
2 Delet Stp
3 Print All
4 Help
5 Main Menu
6 Position cursor back at **Step #** field and select it.
Position
Select
"7"
"TEST_#"
"Test name"
7 Highlight **Step #** of the newly inserted test, then select it.
Highlight
Select
"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

Specifying Channel Information (Edit Frequency)

There are three ways to enter channel information. The first is through the Channel Information screen. The second is by a field on the Initialization Screen at the start of each sequence of tests. The third is again using the Channel Information screen for LCR testing. The value in **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]** determines the method.

The edit frequency method is useful if you want to store all of the cell site frequencies on a card for later testing. The Channel Information screen is saved when a procedure is saved. This method also allows you to test all eight transceivers on a shelf as a unit. The prompt is useful if you do not wish to save the frequency information.

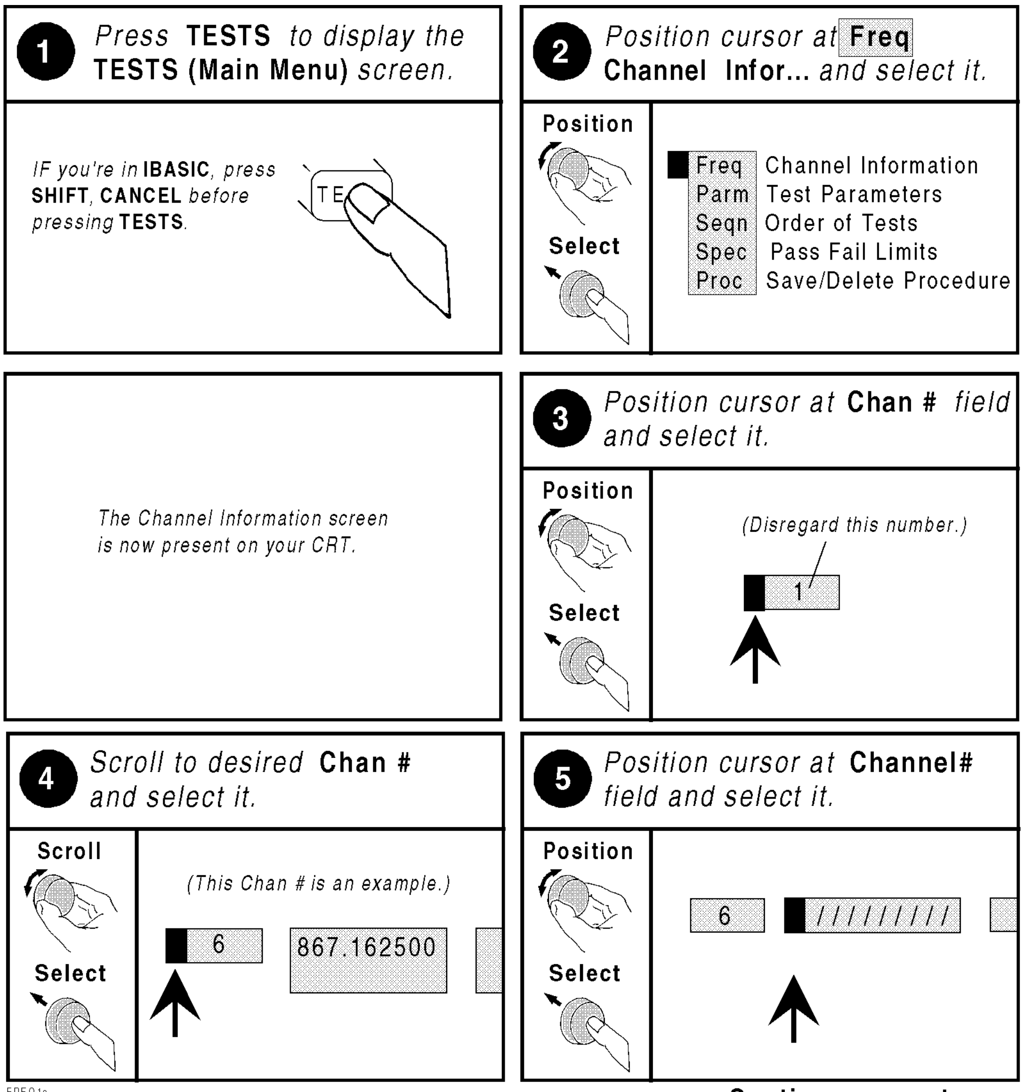
To Use the Channel Information Screen

For each channel that you wish to specify to be used in the tests that you run, you must enter the following information into the Channel Information screen:

- **`Channel#`**
  - Enter the channels that you wish to test into this field. Enter −1 as channel number to truncate channel testing.
- **`Slot# (1-8)`**
  - Enter the slot number into this field. This number is the location of the transceiver in the rack. The locations are 1 through 8 from left to right on a shelf.
- **`Test?`**
  - Select **`Yes`** or **`No`** to specify whether you want to test the UUT at this channel/frequency. If you select Yes, the channel will be tested. If you select No, channel/frequency will not be used, but the information may remain in the table for later use.

For information on saving the channel table, see **"Saving a Test Procedure" on page 91**.

How to Specify Channel Information



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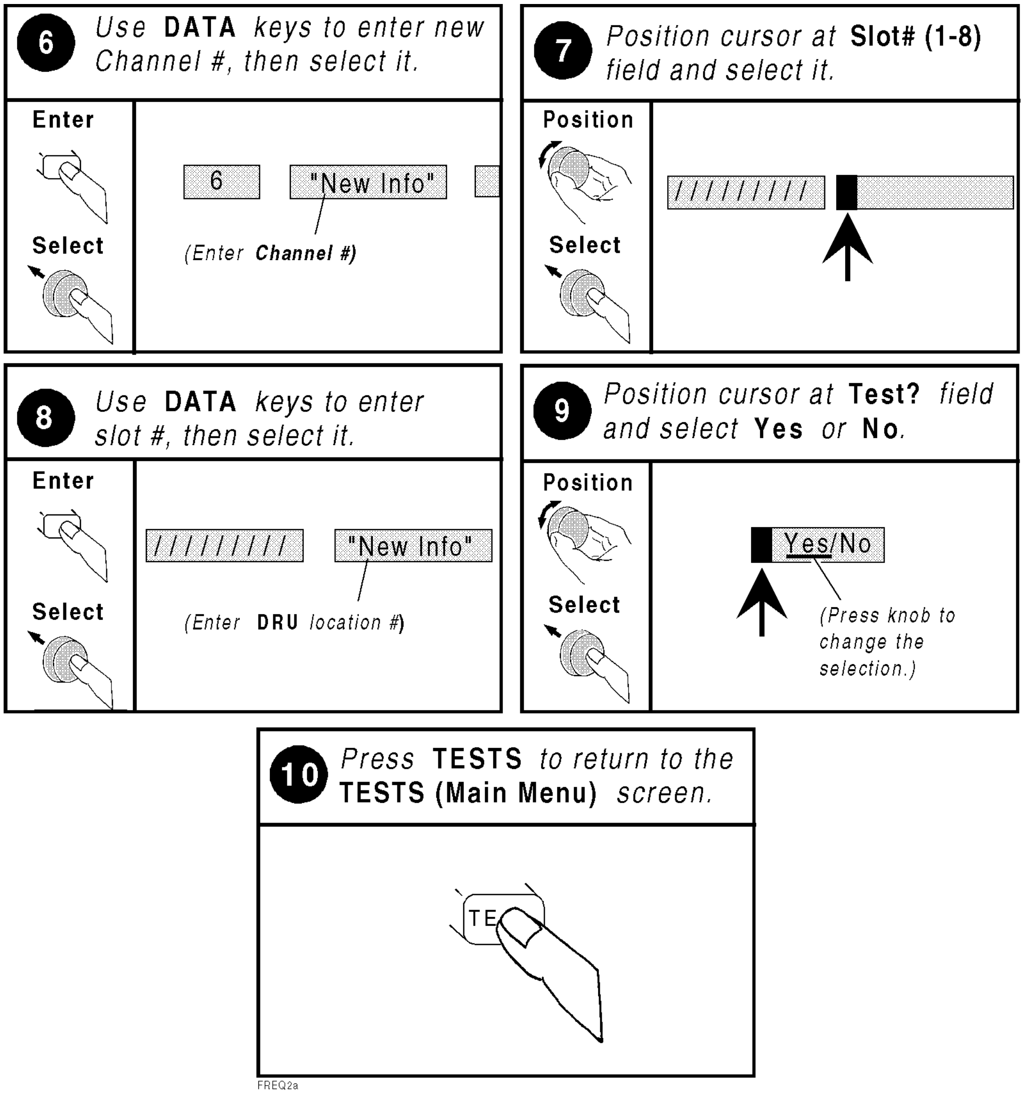
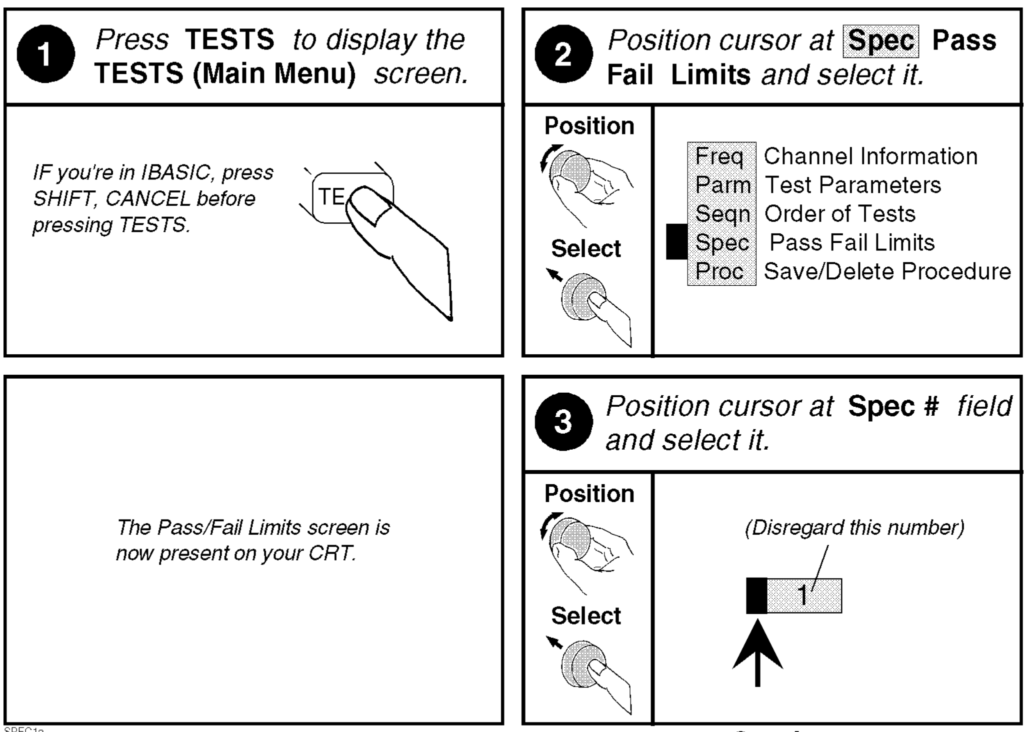

6 Use DATA keys to enter new Channel #, then select it.
Enter
Select
6
"New Info"
(Enter Channel #)
7 Position cursor at Slot# (1-8) field and select it.
Position
Select
8 Use DATA keys to enter slot #, then select it.
Enter
Select
"New Info"
(Enter DRU location #)
9 Position cursor at Test? field and select Yes or No.
Position
Select
Yes/No
(Press knob to change the selection.)
10 Press TESTS to return to the TESTS (Main Menu) screen.
TE
FREQ2a

Changing Pass/Fail Limits

Pass/Fail limits define the values with which a measurement result is compared to determine if the UUT meets its specified standards. Default values are included in the Test Software. These values may be changed to suit your particular requirements.

This section describes how to change the pass/fail (upper and lower) limits using the Pass/Fail Limits screen. **See "Pass/Fail Limit (Specification) Descriptions," in chapter 5, on page 229** for a description of each pass/fail limit. For information on saving customized pass/fail limits, see **"Saving a Test Procedure" on page 91**.

How to Change Pass/Fail Limits



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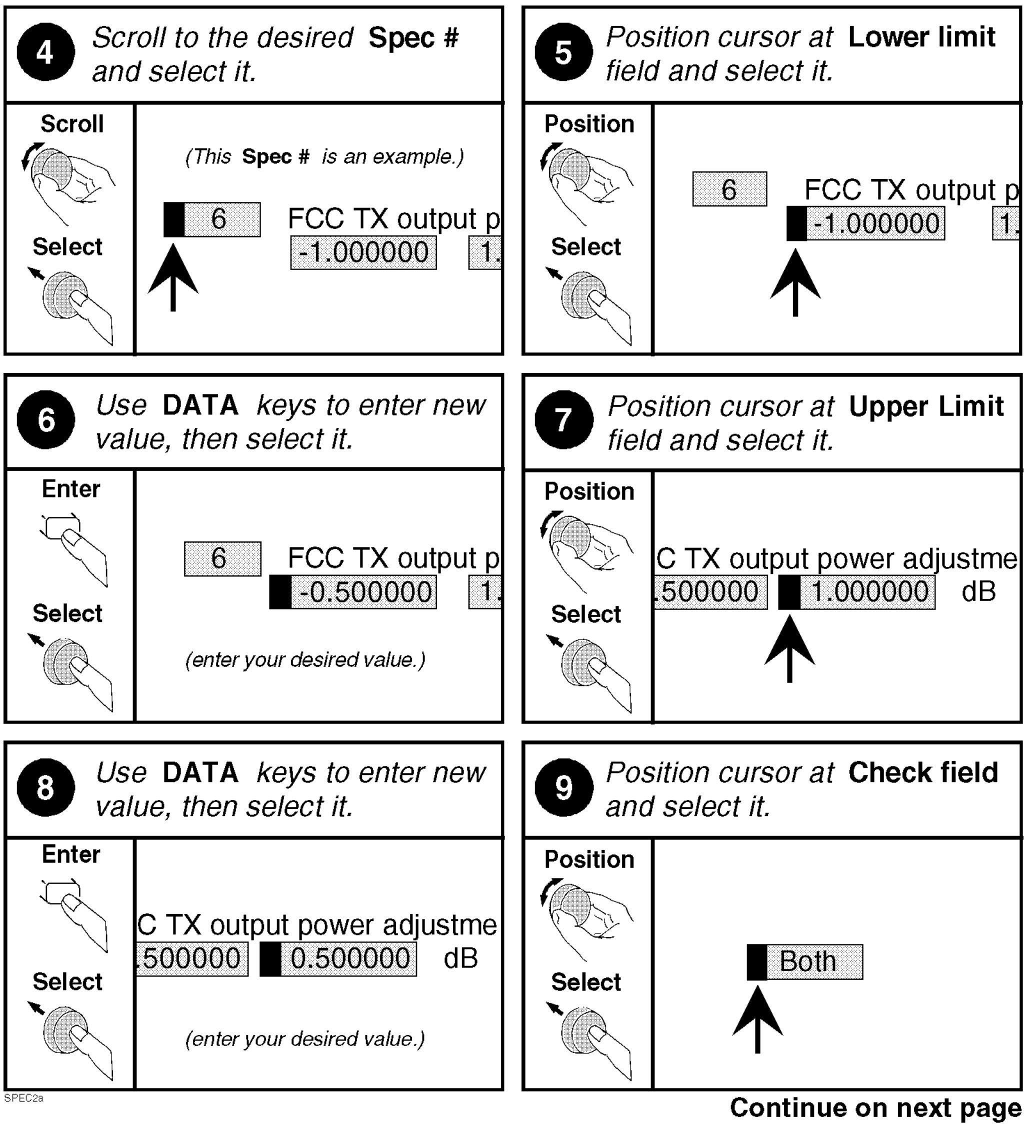

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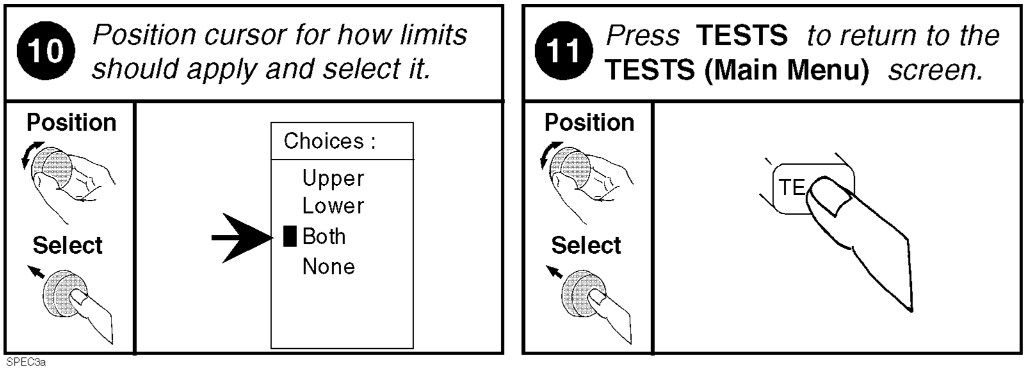
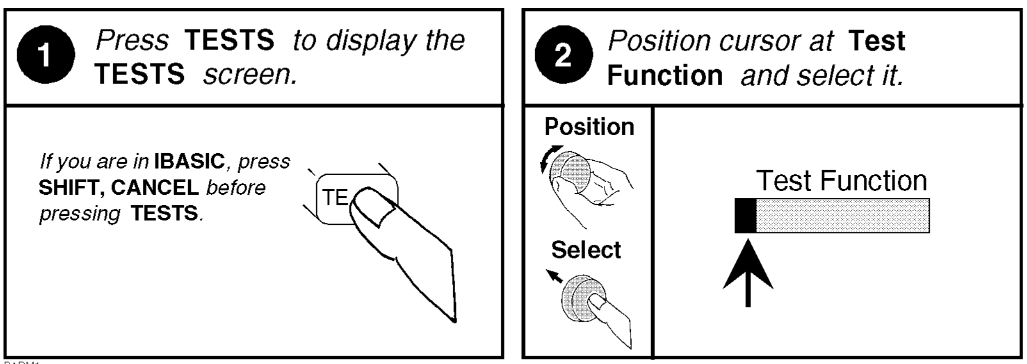

10
Position cursor for how limits should apply and select it.
Position
Select
Choices :
Upper
Lower
Both
None
11
Press TESTS to return to the TESTS (Main Menu) screen.
Position
Select
TE
SPEC3a

Changing the Test Parameters

The Test Software uses parameters to optimize the test environment and conditions for the testing situation. Many of the test parameters are determined by examining the test requirements. The Test Software comes with default settings for test parameters. Review the defaults for the application requirements.

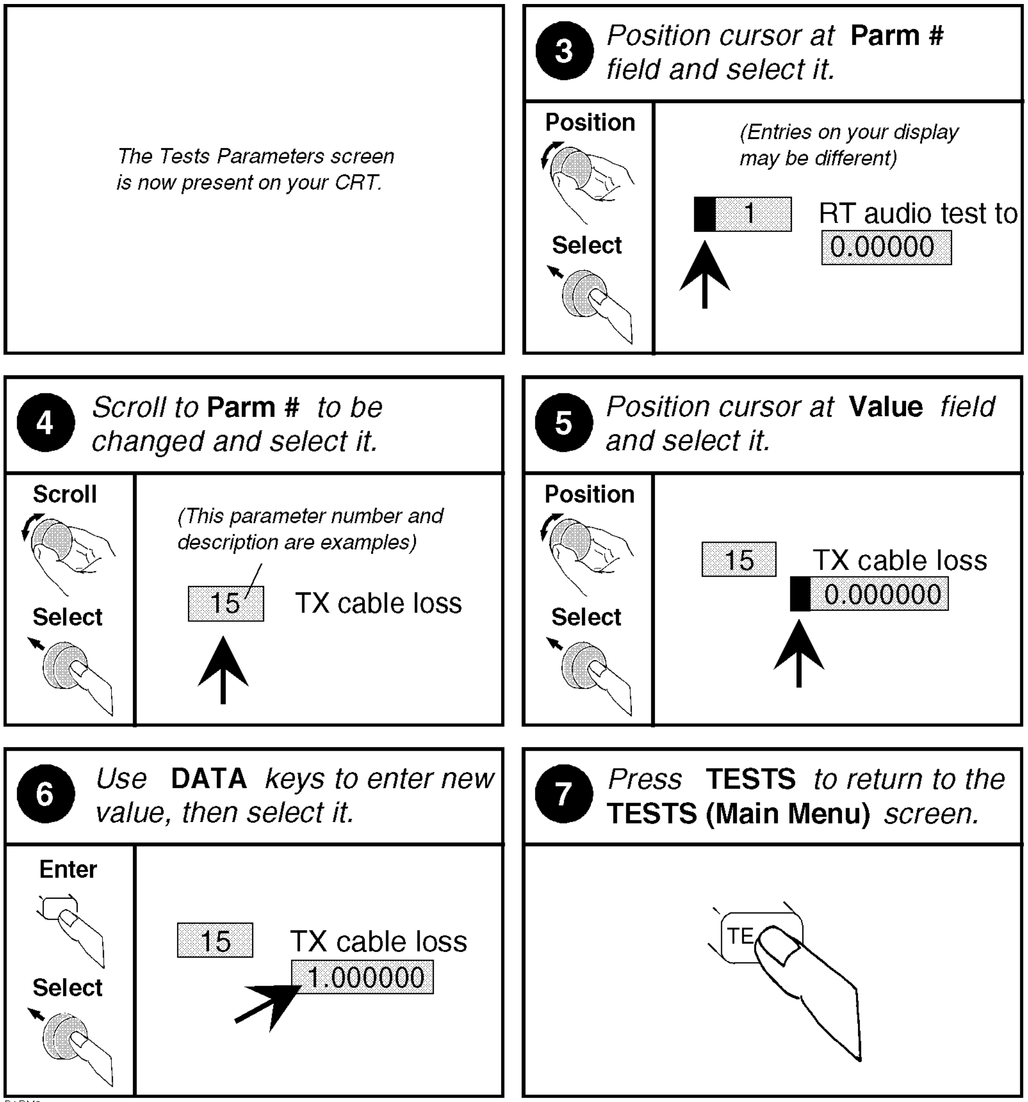
This section describes how to change test parameters using the Test Parameters screen to optimize your testing conditions. See **chapter 5, "Test, Parameter, and Pass/Fail Limit Descriptions"** for a description of each test parameter. For information on saving customized test parameters, **"Saving a Test Procedure" on page 91**.

How to Change the Test Environment and Conditions



PARM1

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

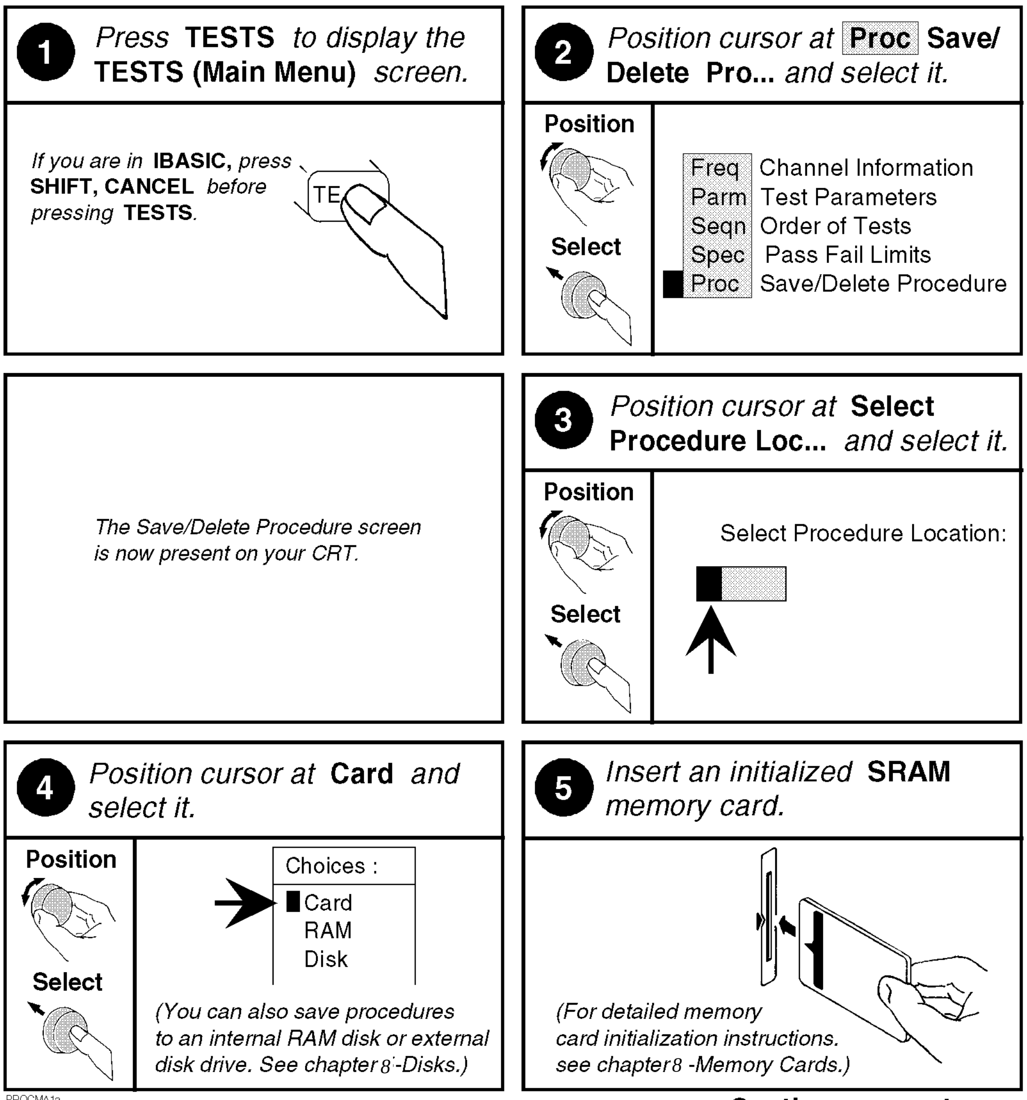
Saving a Test Procedure

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 an SRAM card.

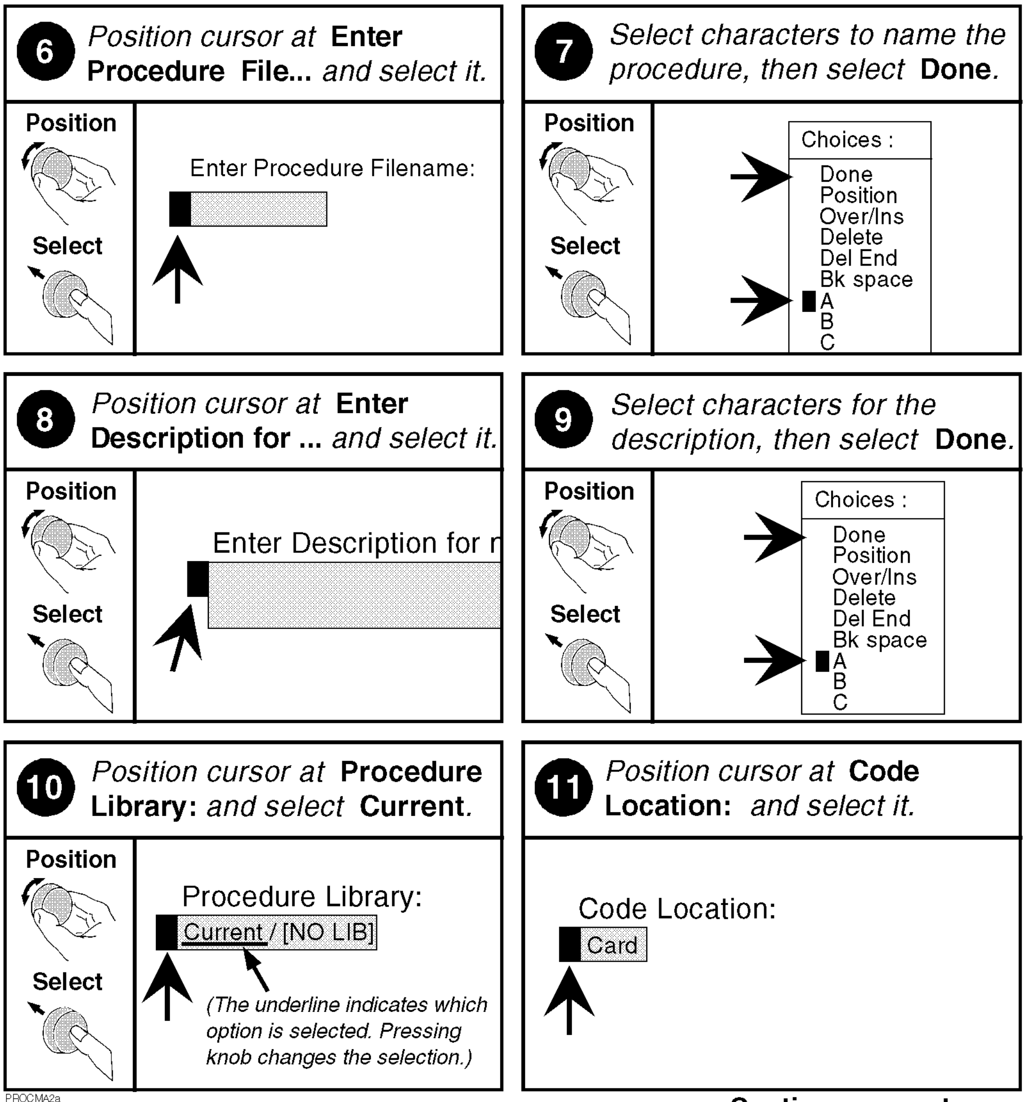
When you save a procedure, you will be saving the channel information, test parameters, pass/fail limits, and testing order, plus a library that contains the names of all test parameters, pass/fail limits, and tests that are resident in the Test Software. The library file comes from the Test Software and cannot be modified. The library file will be automatically saved on the SRAM card that is being used to store the new test procedure.

The following example shows how to save a new procedure to an SRAM card. For more information concerning procedures, **see "Procedures," in chapter 6, on page 276**.

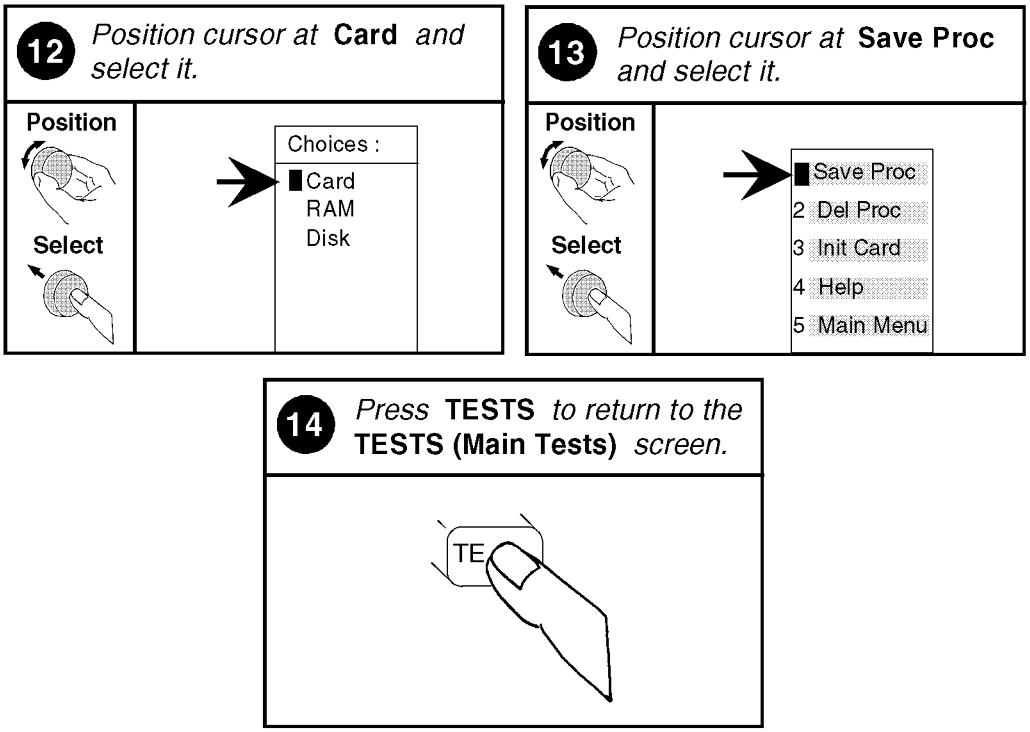
How to Save a Test Procedure



Continue on next page



Continue on next page



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, b) 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

The Execution Conditions screen defines where and when test output will occur. You may elect to:

- Display output on the Test Set screen only, or display on the screen and print hardcopy. (**Output Results To**)

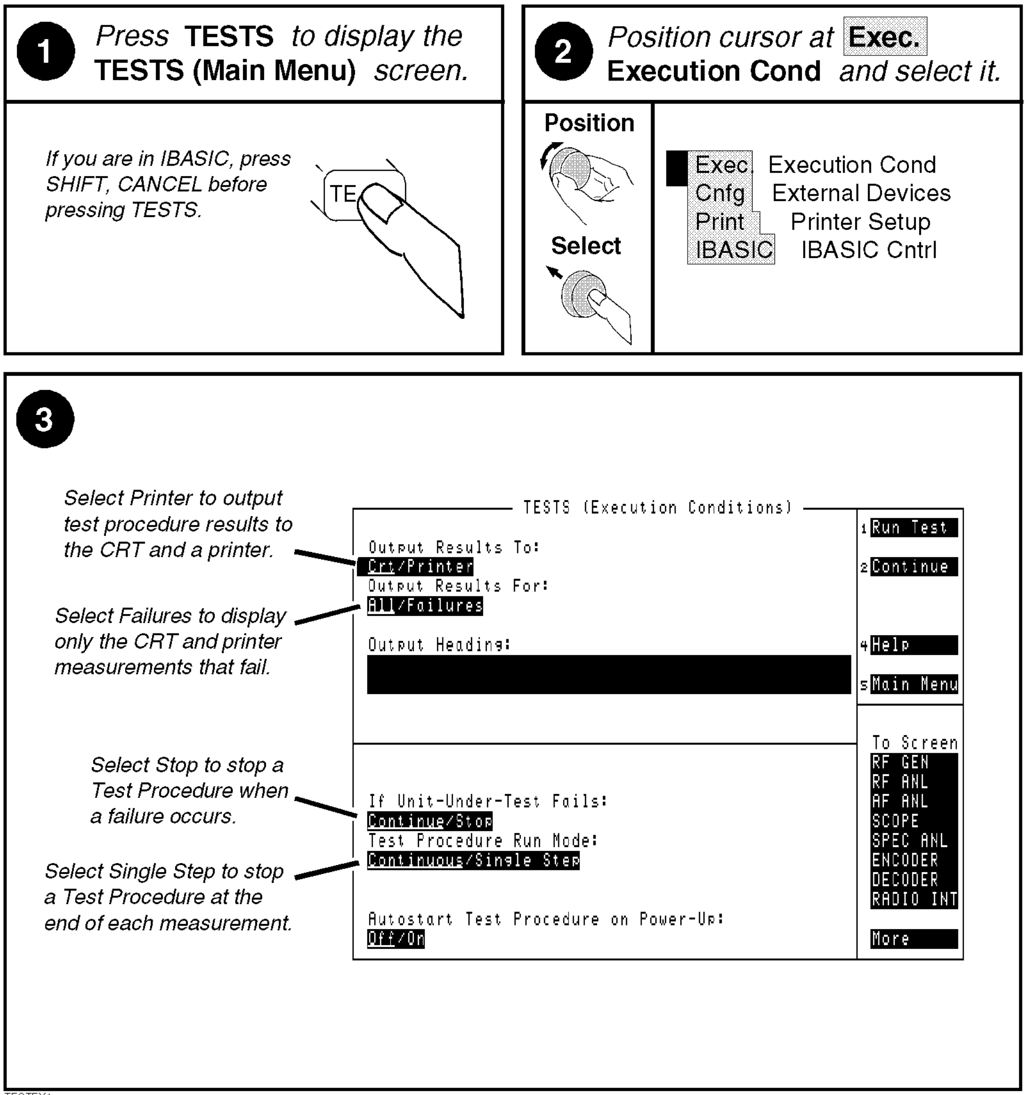
NOTE: If printing test results is desired, after selecting **Printer**, additional steps are required to connect and configure the printer. See "Printing," in chapter 6, on page 267.

- 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, repeat the measurement, or go to the Laptop Emulator to send commands to the Base Station. (**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, repeat the measurement, or go to the Laptop Emulator Mode to send commands to the Base Station. (**Test Procedure Run Mode**)
- Start the program automatically when the Test System is powered on. (**Autostart Test Procedure on Power-up**)

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

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

How to Change Test Execution Conditions



TESTEX1a

Printing and Saving Test Results

Printing and saving test results are features of the Test Software that require additional equipment and configuration. See "Printing," in chapter 6, on page 267 for detailed descriptions and instructions for these features.

5

Test, Parameter, and Pass/Fail Limit Descriptions

Overview

This Test Software includes a smart card pre-programmed with ten procedures.

Each procedure is a collection of tests that have been customized for a specific application. In Base Station testing, procedures are useful in reducing the testing time, limiting the amount of knowledge required to run test equipment, and reducing the chance for error.

Reduces testing time: Procedures are pre-defined and include tests that are performed in a specific order. The Test Software will step the user through the correct sequence of tests and prompt the user for any required input. Tests are also ordered so that minimal cable change is required.

Limits knowledge required: Procedures are specifically helpful in guiding less experienced users through complicated sets of tests. Results are collected and displayed on the Test Set screen in an organized and understandable format.

Reduces the chance for error: Prompts will appear for any required inputs and diagrams will appear to assist the user in instances in which cable changes are required. Warnings will appear if test parameters or results are not within a reasonable range, and, in many instances, the Test Software will provide troubleshooting steps for approaching the problem.

Available Procedures

The following procedures are pre-programmed on the smart card:

- NT_SHLF
- NT_RMC
- QCK_SHLF
- QCK_RMC
- TDMASHLF
- TDMA_RMC
- TST_SHLF
- TST_RMC
- LCR_A
- LCR_B
- ANT_SWP
- CAB_LOSS
- BER_TST

Detailed descriptions of each procedure follow the **"Cable Loss Test" on page 100** and **"Initialization Screen" on page 101** of this chapter. Instructions for loading a procedure are located in **chapter 1, "Getting Started with Firmware Above Revision A.15.00"**.

CAUTION: BEFORE SELECTING A PROCEDURE

In order for procedures to report accurate results, the *Cable Loss Test* must be completed and the *Initialization Screen* formatted.

Cable Loss Test

At the start of all procedures a cable loss test screen will appear. The cable loss test allows the Test Set to measure and store the loss associated with the cables to be used during testing. The Test Set provides greater accuracy by accounting for these losses in future tests.

It is important for the user to note that the cable loss test screen will appear after any power cycle of the Test Set. This serves as a safety net since the cable loss test is a necessary step in the testing procedure. The cable loss values stored during this test may be changed on the Initialization Screen or by re-running the test.

The Initialization Screen will be discussed in detail in the following section.

Initialization Screen

The Initialization Screen will precede all procedures except for **PROCEDURE_11 ANT_SWEEP**, in which the settings are not used.

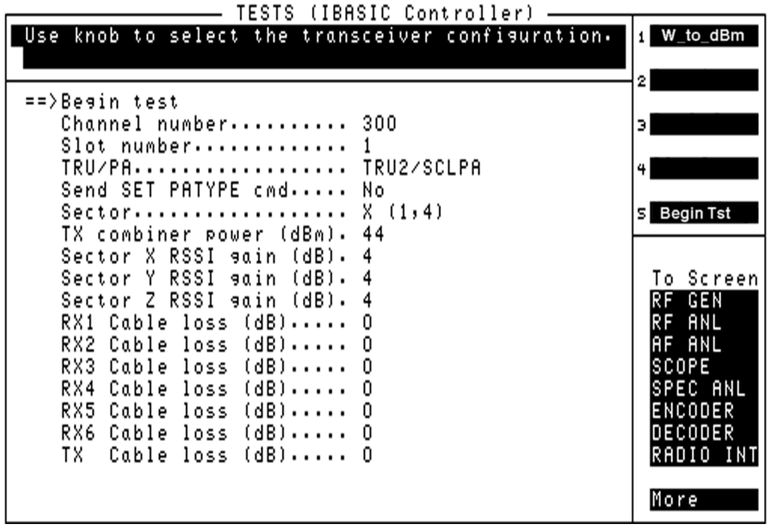


Figure 10

Description of Initialization Screen Parameters:

- **`Channel number`**

  Enter the channel number to be tested. See **"PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]" on page 214**.

- **`Slot number`**

  Enter the slot number to be tested. (This is the location of the TRU in the shelf. Locations are numbered 1 through 8 starting from the front left.)

- **Base Station radio**

  Select the **Base Station Radio** field to enter the choice for radio type from the **Choices:** list.

  Various types of Northern Telecom TRU Base Stations may be tested using the Test Software, dependent upon the procedure selected in the **Select Procedure Filename:** field on the SOFTWARE MENU screen.

NOTE: For an MCPA, there is no accessible test point other than the RMC test points. Thus, it is recommended that you not use PROCEDURES_01, 03, 05, and 07, which are associated with testing at the shelf.

If you select PROCEDURE_01, 02, 03, 04, 07, 08, 11, 12, or 13, the following list of Base Station types will appear for selection. Note that these are all 850-MHz Base Station types.

TRU1/MPA
TRU2/MPA
TRU2/SCLPA
TRU2/DPA
TRU2/NONE
TRU2/MCPA
TRU2/FMPA+

If you select PROCEDURE_05, 06, 11, 12, or 13, the following list of Base Station types will appear for selection.

TRU1/MPA
TRU2/MPA
TRU2/SCLPA
TRU2/DPA
TRU2/NONE
TRU2/MCPA
TRU2/FMPA+
TRU3/SCLPA
TRU3/DPA
TRU3/NONE
TRU3/MCPA

- **Send SET PATYPE cmd**

  Select whether you wish to send the SET PATYPE command to the Base Station. When you select the field, the **Yes/No** section of the field will toggle.

  If the field is set to **No** and you toggle it to **Yes**, the Test Software will display a screen explaining that the command should be sent only the first time that the PA is installed with the TRU, and that it should not be sent if the TRU and PA have been in service. read the text and press the k1 (**Yes**) key or the k2 (**No**) key, as appropriate.

If you are testing a TRU2 radio without a PA (PA type NONE) such as on an Urbancell or Microcell, when you send the SET PATYPE command to the Base Station, it sets the default maximum power to 15 dBm and the nominal gain to –12 dB. It is recommended that these settings be left as set by the command. However, if you must change the settings, the overall value (maximum power minus nominal gain) must be 27. Thus, a maximum power of 27 dBm and a nominal gain of 0 dB are appropriate.

- **Sector**

  Select the sector to be tested; **X**, **Y**, **Z**, **PARM**, or **ALL**. **PARM** refers to the antennas selected by **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]** and **PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]**.

- **TX shelf power (dBm)**, or
  TX combiner power (dBm), or
  TX MCPA power (dBm)

  One of these fields will appear on the Initialization Screen under any of the following sets of conditions:

  If you are testing a TRU with an MCPA power amplifier, such as in an Urbancell.

  If you are testing a TRU with an FMPA+ power amplifier.

  If you are not reading the maximum power from the TRU internal settings and using that reading as the reference power. This is controlled by the fact that **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0. This will be the case for PROCEDURES_02, 03, 04, 06, 08, and 09.

  Dependent upon your selection in the **Base Station Radio** field of the Initialization Screen, the Test Software will perform as follows:

If **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 0 and **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0, with any Base Station type selection in the **Base Station Radio** field, the **TX Shelf Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error.

If **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 1 and **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0, one of the following two display conditions will occur:

If any Base Station type except MCPA is selected in the **Base Station Radio** field, the **TX Combiner Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error. Take into account the losses of the combiner network when entering the value for TX power on the Initialization Screen. Generally, these losses reduce the power output of the PA by 3 to 4 dB.

If a Base Station of type MCPA is selected in the **Base Station Radio** field, the **TX MCPA Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error (see **table 6**).

If **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 1 and **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, one of the following three display conditions will occur:

If a Base Station of type MCPA is selected in the **Base Station Radio** field, the **TX MCPA Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error (see **table 6**).

If a Base Station of type FMPA+ is selected in the **Base Station Radio** field, the **TX Combiner Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error. Take into account the losses of the combiner network when entering the value for TX power on the Initialization Screen. Generally, these losses reduce the power output of the PA by 3 to 4 dB.

If any Base Station type except MCPA or FMPA+ is selected in the **Base Station Radio** field, none of the three fields will appear on the Initialization Screen. The power read from the TRU internal settings will be used in the measurement.

If **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 0 and **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, one of the following three display conditions will occur:

If a Base Station of type MCPA is selected, the **TX Shelf Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error (see **table 6**).

If a Base Station of type FMPA+ is selected, the **TX Shelf Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error.

If any Base Station type except MCPA or FMPA+ is selected in the **Base Station Radio** field, none of the three fields will appear on the Initialization Screen. The power read from the TRU internal settings will be used in the measurement.

Table 6 **Nominal Urbancell Site Per-carrier Power Level at the Duplexer Antenna Port**

	1 MCPA module	2 MCPA modules	3 MCPA modules
8 channels	3.80 W/35.8 dBm	7.50 W/38.8 dBm	11.20 W/40.5 dBm
16 channels	1.90 W/32.8 dBm	3.70 W/35.7 dBm	5.60 W/37.5 dBm
24 channels	1.25 W/31 dBm	2.70 W/34.3 dBm	3.70 W/35.7 dBm
32 channels	0.90 W/29.5 dBm	1.85 W/32.7 dBm	2.80 W/34.5 dBm

- **`Sector X RSSI gain (dB)` `Sector Y RSSI gain (dB)` `Sector Z RSSI gain (dB)`**

  When testing at the typical **original** receive multi-coupler (RMC) input, the sector gain is 4 dB. In a typical **enhanced** RMC, the sector gain is 4 to 6 dB. This accounts for the path gain between the RMC input and the radio backplane input. If testing is conducted at the shelf, the Test Software will always compensate the RF generator input level for the receiver shelf splitter loss. This makes the RF signal level appear to be at the radio backplane. In such case, there is no gain and the sector gain during shelf testing is 0 dB.

  For example, suppose that the path gain is 4 dB and an RF signal of –84 dBm is applied to the RMC. Theoretically, a radio with no internal received signal strength indicator (RSSI) offset will report a –80 dBm RSSI level. Since the detector in a radio is not ideal, in some instances, an internal RSSI offset is required to make the radio report –80 dBm. Because the reported RSSI level is different from the input level, the Test Software must use this difference to properly set the RSSI offset and check the RSSI linearity level. The three **`Sector Gain`** fields on the Initialization Screen indicate to the Test Software the difference between the input level and the reported level.

  It is possible for the receiver path gain to be increased to improve the signal strength in rural areas or decreased to reduce intermodulation in urban areas. In this case, the path gain is no longer 4 dB. Depending on the design of the system to be tested, it might be proper for the sector gains on the Initialization Screen to remain at 4 dB, or it might not. Consult with your engineering department to determine how to set the offsets for these areas.

It is also possible to use the sector gains to create an artificial receiver path gain or path loss (sometimes referred to as a system offset) to vary the handoff levels between sectors. To allow for sector variations, three sector gain fields (X, Y, and Z) have been provided on the Initialization Screen. Varying handoff levels between sectors will probably result in better system performance if done correctly, and will certainly result in worse system performance if not done correctly.

- **`RX1…RX6 cable loss(dB)`**

  These parameters contain the RX cable loss values stored during the cable loss test, and may be edited on this screen. The Test Set RF signal generator level will be compensated for the cable loss values. For example, if the RX1 cable loss is set to 1 dB, the generator level will be increased by 1 dB to compensate for the RX1 cable loss only when the RX1 path is being tested.

- **`TX cable loss`**

  This field contains the TX cable loss value stored during the cable loss test, and may be edited on this screen. This value is added to the TX power measurements to compensate for the cable loss.

Procedure Descriptions

The HP 11807B Option 044 TRU/DRU Test Software card comes preprogrammed with 13 procedures, each with a different setting of testing order, parameter, and pass/fail limit defaults. The following section describes each of those procedures.

PROCEDURE_01 NT_SHLF

This procedure performs RX measurements at the Receiver Shelf and TX measurements at the PA Shelf, as depicted in **figure 3 on page 56**. This procedure performs both analog and digital tests. Only the receivers and transmitters on the shelf that is being tested will be affected. Therefore, service to the rest of the cell site will be unaffected.

The tests performed in this procedure are similar to those performed in PROCEDURE_02 NT_RMC. The default settings for the more important parameters are as follows:

- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, so that the TX power is referenced from the internal settings in the TRU (for calculating power error).
- **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 0, so that the TX power will not be adjusted.
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 0, so that the TX measurements are performed at the PA Shelf.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

This procedure is the same as PROCEDURE_05 TST_SHELF, except that it does not perform TEST_01 TRU Read and Store TRU Settings and TEST_32 GN PA LED Alarm and TRU Display.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_45 - RX and RXD Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**
- **TEST_31 - TXD Standard Tests**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 127**.

PROCEDURE_02 NT_RMC

This procedure performs RX measurements at the Receive Multicoupler (RMC) and TX measurements at the Duplexer/Combiner, as depicted in **figure 4 on page 57**. This procedure performs both analog and digital tests. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

The tests performed in this procedure are similar to those performed in PROCEDURE_01 NT_SHLF. The default settings for the more important parameters are as follows:

- **PASS/FAIL LIMIT_36 TXD TDMA mod acc magnitude error (%)** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 2, so that the TX power will automatically be adjusted to the value entered on the Initialization Screen.
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 1, so that the TX measurements are performed at the Combiner.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

This procedure is the same as PROCEDURE_06 TST_RMC, except that it does not perform TEST_01 TRU Read and Store TRU Settings and TEST_32 GN PA LED Alarm and TRU Display.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_45 - RX and RXD Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**
- **TEST_31 - TXD Standard Tests**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 127**.

PROCEDURE_03 QCK_SHLF

This procedure performs RX measurements at the Receiver Shelf and TX measurements at the PA Shelf, as depicted in **figure 3 on page 56**. This procedure performs analog tests only. Only the receivers and transmitters on the shelf that is being tested will be affected. Therefore, service to the rest of the cell site will be unaffected.

The TESTs performed in this procedure are similar to those performed in PROCEDURE_04 QCK_RMC. The default settings for the more important parameters are as follows:

- **PARAMETER_44 TX wideband data test BW [0=no 1=yes]** is set to 0, so that it does not check the data bandwidth spectrum of the transmitted signal using the spectrum analyzer.

The tests performed in this procedure are the same ones that are performed in PROCEDURE_04 QCK_RMC. The default settings for the following parameters constitute the differences between this procedure and PROCEDURE_04 QCK_RMC:

- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, so that the TX power is referenced from the internal settings in the TRU (for calculating power error).
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 0, so that the TX measurements are performed at the PA Shelf.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_29 - RX Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** section of this chapter.

PROCEDURE_04 QCK_RMC

This procedure performs RX measurements at the RMC and tx measurements at the Duplexer/Combiner, as depicted in **figure 4 on page 57**. This procedure performs analog tests only. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

The TESTs performed in this procedure are similar to those performed in PROCEDURE_03 QCK_TST. The default settings for the more important parameters are as follows:

- **PARAMETER_44 TX wideband data test BW [0=no 1=yes]** is set to 0, so that it does not check the data bandwidth spectrum of the transmitted signal using the spectrum analyzer.

The tests performed in this procedure are the same ones that are performed in PROCEDURE_03 QCK_SHLF. The default settings for the following parameters constitute the differences between this procedure and PROCEDURE_03 QCK_SHLF:

- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 1, so that the TX measurements are performed at the Combiner.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_29 - RX Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** section of this chapter.

PROCEDURE_05 TDMASHLF

This procedure performs RX measurements at the Receiver Shelf and TX measurements at the PA Shelf, as depicted in **figure 3 on page 56**. It performs digital tests only. Therefore, TRU3 Base Stations are included along with other TRU units. Only the receivers and transmitters on the shelf that is being tested will be affected. Service to the rest of the cell site will be unaffected.

The tests performed in this procedure are similar to those performed in PROCEDURE_08 TDMA_RMC. The default settings for the more important parameters are as follows:

- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, so that the TX power is referenced from the internal settings in the TRU (for calculating power error).
- **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 0, so that the TX power will not be adjusted.
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 0, so that the TX measurements are performed at the PA Shelf.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 1, so that a TRU3 Base Station may be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_01 - TRU Read and Store TRU Settings**
- **TEST_45 - RX and RXD Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**
- **TEST_31 - TXD Standard Tests**
- **TEST_32 - GN PA LED Alarm and TRU Display**

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** of this chapter.

PROCEDURE_06 TDMA_RMC

This procedure performs RX and TX measurements at the RMC and the transmit Combiner, as depicted in **figure 4 on page 57**. It performs digital tests only. Therefore, TRU3 Base Stations are included along with other TRU units. The antennas for the cell site must be disconnected. Service to the entire cell site will be interrupted.

The tests performed in this procedure are similar to those performed in PROCEDURE_07 TDMASHLF. The default settings for the more important parameters are as follows:

- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 2, so that the TX power will automatically be adjusted to the value entered on the Initialization Screen.
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 1, so that the TX measurements are performed at the Combiner.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 1, so that a TRU3 Base Station may be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_45 - RX and RXD Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**
- **TEST_31 - TXD Standard Tests**
- **TEST_32 - GN PA LED Alarm and TRU Display**
- **TEST_01 - TRU Read and Store TRU Settings**

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** of this chapter.

PROCEDURE_07 TST_SHLF

This procedure performs RX measurements at the Receiver Shelf and TX measurements at the PA Shelf, as depicted in **figure 3 on page 56**. This procedure performs both analog and digital tests. Only the receivers and transmitters on the shelf that is being tested will be affected. Therefore, service to the rest of the cell site will be unaffected.

The tests performed in this procedure are similar to those performed in PROCEDURE_06 TST_RMC. The default settings for the more important parameters are as follows:

- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, so that the TX power is referenced from the internal settings in the TRU (for calculating power error).
- **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 0, so that the TX power will not be adjusted.
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 0, so that the TX measurements are performed at the PA Shelf.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_01 - TRU Read and Store TRU Settings**
- **TEST_45 - RX and RXD Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**
- **TEST_31 - TXD Standard Tests**
- **TEST_32 - GN PA LED Alarm and TRU Display**

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** of this chapter.

PROCEDURE_08 TST_RMC

This procedure performs RX measurements at the RMC and TX measurements at the Duplexer/Combiner, as depicted in **figure 4 on page 57**. This procedure performs both analog and digital tests. The antennas for the cell site must be disconnected, Therefore, service to the entire cell site will be interrupted.

The tests performed in this procedure are similar to those performed in PROCEDURE_05 TST_SHLF. The default settings for the more important parameters are as follows:

- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 2, so that the TX power will automatically be adjusted to the value entered on the Initialization Screen.
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 1, so that the TX measurements are performed at the Combiner.
- **PARAMETER_49 GN test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters.

Tests Used

- **TEST_33 - GN Standard PA and ANT Connections**
- **TEST_45 - RX and RXD Quick Tests**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_30 - TX Quick Tests**
- **TEST_31 - TXD Standard Tests**
- **TEST_32 - GN PA LED Alarm and TRU Display**
- **TEST_01 - TRU Read and Store TRU Settings**

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** of this chapter.

PROCEDURE_09 LCR_A

This procedure is designed to verify that the operation of the locating receiver is within specifications. This procedure contains tests for RSSI Offset and Path Gain. RSSI Offset and Path Gain require that the test be configured as depicted in **figure 4 on page 57**.

During this procedure, testing of the RSSI across the frequency range of all channels is performed. Users may select the desired channels on the Channel Information screen. For more information on the Channel Information screen **see "Specifying Channel Information (Edit Frequency)," in chapter 4, on page 83**.

RSSI adjustments can only be made on the first channel tested! If after the first channel is adjusted, other channels fail, you may want to check the RX filter, duplexer, cables, 8-way splitter, or the TRU.

Tests Used

- **TEST_12 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**

This procedure is designed to test receiver A only. In order to test receiver B, use the next procedure, LCR_B. More information regarding changing the sequence of tests can be found in **chapter 4**.

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** section of this chapter.

PROCEDURE_10 LCR_B

This procedure is designed to verify that the operation of the locating receiver is within specifications. This procedure contains tests for RSSI Offset and Path Gain. RSSI Offset and Path Gain require that the test be configured as depicted in **figure 4 on page 57**.

During this procedure, testing of the RSSI across the frequency range of all channels is performed. Users may select the desired channels on the Channel Information screen. For more information on the Channel Information screen **see "Specifying Channel Information (Edit Frequency)," in chapter 4, on page 83**.

RSSI adjustments can only be made on the first channel tested! If after the first channel is adjusted, other channels fail, you may want to check the RX filter, duplexer, cables, 8-way splitter, or the TRU.

Tests Used

- **TEST_13 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**

This procedure is designed to test receiver B only. In order to test receiver A, use the previous procedure, LCR_A. More information regarding changing the sequence of tests can be found in **chapter 4**.

Tests are arranged in the order above to minimize testing time. Descriptions of the specific tests listed above can be found in the **"Test Descriptions" on page 127** section of this chapter.

PROCEDURE_11 ANT_SWEEP

This procedure is designed to perform return loss measurements on an antenna.

Tests Used

- **TEST_37 - GN Swept Return Loss**

The description of the specific test listed above can be found in the **"Test Descriptions" on page 127**.

PROCEDURE_12 CAB_LOSS

This procedure performs the swept loss test for checking connection path losses.

The purpose of this procedure is to allow the Test Set to measure and store the losses associated with the cables to be used during testing (see **"Cable Loss Test" on page 100**). Through this procedure, the Test Set can provide greater accuracy in later tests. You may customize this procedure by adding additional tests and then save it as a new procedure on an SRAM card for future use. For more information, see **"Customizing Testing" on page 78**.

Tests Used

- **TEST_40 - GN Cable Loss**

The description of the specific test listed above can be found in the **"Test Descriptions" on page 127**.

PROCEDURE_13 BER_TST

This procedure performs RX bit error rate (BER) tests on Base Stations, as depicted in **figure 3 on page 56**, and **figure 4 on page 57**. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

It is required that the following parameters be set as shown:

- **PARAMETER_20 RX BER RF level** is set to −113 dBm, so that the BER measurement are performed at that level.
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1, so that tests are performed at the RMC.
- **PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]** is set to 10.0025.

Tests Used

- **TEST_43 - RXA Bit Error Rate (BER) Screen**
- **TEST_44 - RXB Bit Error Rate (BER) Screen**

This procedure is designed to test both receivers. It first runs TEST_43 to test Receiver A, and then runs TEST_44 to test Receiver B.

For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 127**.

Testing Philosophy

This section offers suggestions that will help you to devise a plan to maximize your testing efficiency. Use this section to customize a testing sequence for the cell site requirements.

Testing the Transceiver Shelf as a Unit

The transceivers in Northern Telecom cell sites are located on shelves with space for eight transceivers per shelf. The antenna inputs on all eight transceiver are connected together through a splitter, the other side of which is a single antenna input on the back of the shelf. Thus, in an omni site, there are two antenna outputs on the back of the shelf that connect to all eight receivers. In a sectored site, there are six antenna inputs on the back of the shelf.

Since all eight transceiver antenna inputs are tied together, it is logical to test all eight transceivers as a unit. The Test Software can be set up to allow you to test the eight transceivers in this manner. This is done by creating a test procedure with the AMPS channel for each of the eight transceivers listed in the Channel Information (or Edit Frequency) screen. **See chapter 4, "Using the Test Software with FW Above Revision A.15.00"**. A procedure set up this way will run all the tests defined in the Order of Tests (or Edit Sequence) screen on the first defined transceiver channel number, then run the set of tests on the second defined transceiver channel, and so forth until all the channels in the Channel Information (or Edit Frequency) screen are tested.

Once you have created a procedure with all of the channels for a particular cell site defined in the Channel Information (or Edit Frequency) screen, you may save that procedure on a card for testing at a future date. For testing on a different shelf, you will change the channel numbers in the **`Channel#`** (or **`RX Chan Info`**) field to match the channels for the transceivers on that shelf. If you wish to test all of transceivers as a unit, you must set the **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]** to 0.

Testing Transceivers Individually

The Test Software is shipped with the default for this **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]** set to 1. In this state, the Test Software will read the entries in the **`Channel number`** and **`Slot number`** fields on the Initialization Screen at the start of each test sequence, and will test only that one channel.

Testing at the Receiver Shelf Versus the RMC

Receiver testing can be performed at either the receiver shelf or the RMC. If testing is conducted at the shelf, the Test Software will compensate the Test Set RF generator for cable losses and the losses in the eight-way-splitter in the shelf. This will make the desired RF signal level appear to be at the receiver input on the radio backplane. When testing is conducted at the RMC, the Test Set RF generator is will be compensated for only cable losses. In this case the desired RF level will be referenced at the input on the RMC.

It is important to keep in mind the location at which receiver testing is performed when interpreting your test results.

RSSI Offset

The Received Signal Strength Indicator (RSSI) is a mechanism by which the Base Station reports the signal strength of a particular Mobile Station for the purpose of assisting the switch in making intelligent hand-off decisions. When a Mobile Station is engaged in a call on a cellular network, its signal strength is reported to the switch by the current Base Station TRU with which the Mobile Station is communicating, locating TRUs in other sectors, and the locating TRUs in nearby cell sites. This information is ultimately used to determine if a hand-off is required and, if so, which cell is the best hand-off candidate. For the switch to accurately make hand-off decisions, it must receive accurate information about the strength of the Mobile Station in question. TRUs in Northern Telecom Base Station receivers are equipped with an RSSI detector to facilitate the task of measuring the Mobile Station signal strength. Although the RSSI detector is calibrated on a per-TRU basis when the TRU is manufactured, the reported value is affected by cable losses and system offsets when it is placed into service at the Base Station. Therefore, it should be re-calibrated as part of the Base Station system so that the reported RSSI value will represent accurately the signal quality of the Mobile Station in that system. Default conventions exist to accommodate system gains associated with receive multi-coupler (RMC) units. The conventions, offsets, and calibration topics are described in this section.

Signals received by the Base Station antennas are distributed to the individual receivers via an RMC. The RMC typically includes a preselector filter, followed by an amplifier and a signal splitter. The preselector prevents undesired signals from being applied to the amplifier stage, and the amplifier stage compensates for the loss in the signal splitter. To maintain or slightly enhance receiver performance, a small amount of excess net gain is provided by the RMC. In some instances, this gain is adjustable. In large rural cells, the gain may be increased to improve system sensitivity. However, increased gain might lead to generation of undesirable intermodulation products. Therefore, it is not desirable to increase the gain setting in urban environments. The nominal gain of the RMC unit is 4 dB in **original** RMCs and 6 dB in the newer **enhanced** RMC. It should not be adjusted without a complete understanding of its effect on system performance. The convention used in the Northern Telecom cellular system is that the switch expects a gain of 4 dB between the antenna and the receiver unit. With this convention in place, a properly performing TRU in a system will report an RSSI value 4 dB higher than the actual signal applied to the input of the RMC.

With this as background information, the structure of the procedures and parameters in the Test Software become clear. When maintaining or correcting a fault at a Base Station, the technician can use one of the techniques described in this section to restore service in the least disruptive way, while, at the same time, maintaining peak performance from the cell site.

Scenario: Scheduled Off-Hours Out-of-Service Maintenance

Procedure_02 NT_RMC can be used for this type of testing. During this procedure, the antenna must be disconnected and the signal to one diversity path of an entire sector is interrupted. A –84 dBm signal is injected into the RMC antenna port and the RSSI value is read from the TRU. A reported RSSI value of –80 dBm is expected from the TRU. If –80 dBm is not reported, a correction factor is sent to the TRU to correct for any system offsets. Again, this procedure may be performed during in-service hours with the caveat that one diversity receive path will be disrupted to all of the TRUs on the sector under test. However, note that there are six RSSI values. In an omni-directional site, only two values are required (1 and 4) as opposed to a sectored site, where all six values must be measured.

Scenario: Unscheduled In-Service Maintenance

When it becomes necessary to replace a transceiver unit during in-service operating hours it is possible to perform an RSSI alignment while disrupting only one diversity path on one shelf, as opposed to disrupting all the TRUs on that sector. This alignment procedure will not yield exact results, but should provide adequate performance until a full out-of-service test can be performed. An excellent way to begin this alignment is to run TEST_01, upload the TRU data to the Test Set from the TRU to be replaced or, if that is not possible, from a TRU that is physically located close to the transceiver to be replaced, then, download this information to the replacement TRU.

Once this procedure is complete, Procedure_01 NT_SHLF, can be performed to verify that alignment is satisfactory. During this procedure, a signal is applied to the TRU shelf that contains the replaced TRU. The signal is routed to all eight TRUs on that shelf through the eight-way splitter that is in the shelf with nominal loss of 11 dB. If the assumption holds true that the loss is the same to the two TRUs under test, then the reported RSSI value should be the same. The absolute value will depend on the RMC gain, but this can be determined only by disrupting one of the diversity signals to the whole sector. If the results of the two TRUs do not match, the RSSI offset can be adjusted manually.

This procedure is predicated on the assumption that the adjacent unit is known to be in alignment. An adjacent unit is chosen as a reference so that the cabling loss, and therefore the system gain, will be similar to the unit under test. Although it is outside the scope of this description, note that this procedure will often provide a good starting point for the transmitter path alignment.

Using the Stop-On-Fail Mode to Customize Testing

An additional method for customizing testing is to make use of the stop-on-fail Test Software mode. When enabled, this mode will pause the test sequence if the equipment under test fails to meet its specification limits. Once the test sequence is paused, you may elect to repeat the test, accept the failure and continue, or access the Laptop Emulator Mode to perform radio control operations. For more details, see **"PARAMETER_46 GN if test fails [0=continue 1=stop]" on page 227** and also **"Test Execution Conditions" on page 289**.

Saving Cell Site Parameters on a Card for Later Use

Since the configuration of each cell site is different, the Test Software is customizable to accommodate the site variations. On the Test Set screen, you may customize the procedures to correspond to each cell site configuration. You may change testing sequence, testing conditions, test channels, and pass/fail limits to conform to the system to be tested. Once you have created this customized procedure, you may save if for future maintenance of the particular cell site. See **"Saving a Test Procedure" on page 91** for a description of saving the procedure. You might wish to do this for each cell site.

Preprogrammed Procedures on the Smart Card

The procedures on the smart card are set up to test omni sites. To test a sectored site you must decide on the method for testing the receivers.

Since there are six antennas but only two receivers in each Base Station, you might wish to perform only one receiver test on all six antennas to verify all of the paths and perform all of the other receiver tests on just two antennas to make certain that each receiver is operating properly for each test. Two parameters in the Test Software package allow you to do what is described above: **PARAMETER_22 Removed RX RSSI offset test all ants** and **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**. Selecting 1 to either of these parameters will perform that particular test on all six antennas and perform all the other receiver tests on the antennas specified by the `Sector` field on the Initialization Screen. Testing in this manner will save test time.

If you wish to check every receiver on each antenna, select `All` in the drop-down `Choices:` list from the `Sector` field on the Initialization Screen. This is a very thorough test and it will take longer.

Read and Store TRU Parameters

There are no adjustments to be made in TRU testing. However, there are power, audio, RSSI settings, and nominal gain that may be downloaded to the Base Station. **TEST_01 - TRU Read and Store TRU Settings** allows you to check and download these settings. You might wish to include this test at the start of your testing sequence to verify and download the desired TRU parameters before initiating testing. This will allow you test the Base Station at the actual operating settings.

Test Descriptions

Tests are a series of measurements and one or more tests make up a procedure (see **chapter 4**). 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 and the associated parameters, pass/fail limits, and external equipment that are required.

The following types of analyzer settings are listed as applicable:

- IF Filter choices
- Audio filter choices
- Audio level detectors used
- Frequency counter gate times

The tests are derived from the Northern Telecom Cellular Handbook.

The first few letters in the parameter, pass/fail limit, and test names indicate the classification of the item. The classifications are:

- **GN** - General
- **RX** - Receiver
- **RXA** - Receiver A
- **RXB** - Receiver B
- **RTA** - Receiver A and Transmitter
- **RTB** - Receiver B and Transmitter
- **TRU** - Transmit Receive Unit
- **TX** - Transmitter
- **TXD** - TDMA Transmitter

TEST_01 - TRU Read and Store TRU Settings

NOTE: This test has functions that allow you to modify settings in the TRU. If you have this test in your sequence you should be careful not to inadvertently modify TRU settings.

Two columns of numeric information are displayed. The first, labelled **New Data**, contains temporary numbers that you can change and afterwards transfer to the TRU. The second column contains the actual TRU settings. This column is updated at the start of the test and after every action that changes or reads the TRU data.

Use this test when you need to transfer settings to and from the TRU or to print the TRU settings. An example of the use of this test is to copy measured RSSI offsets from the TRU you tested to other TRUs.

The following are examples of the use of TEST_01:

- Upload settings from an properly operating TRU so as to download those settings to a replacement TRU that has been installed in unscheduled in-service maintenance.
- Download settings when commissioning new TRUs or making a major modification to a site.
- Verify settings by comparing the column **TRU Data** with your system list, after starting TEST_01 or selecting **Upload TRU Data**.

Lists of settings and commands are displayed after the test starts.

At the start of this test, the Test Set will read the TRU data and load it into the column labelled **TRU Data**. Whatever was last set in the **New Data** column will remain.

The first eleven (11) TRU items may be changed in two ways:

- You may enter values into the **New Data** column by selecting the item and entering the desired number.
- You may enter values using the **Use default TRU parameters for New Data** command. In this case, the values entered into the parameters on the Test Parameters screen will be transferred to the **New Data** column.

Upload TRU Data will transfer the TRU data from the TRU to the column **TRU Data**. You can check the values that have been displayed.

Download all New Data to TRU & verify will transfer all of the items in the **New Data** column to the TRU. Then, the data will be read back into the **TRU Data** column. If the TRU has accepted and can correctly write back all of the new data, the two columns will contain the same values. If you have configured a printer to print test results, the TRU settings will be printed after exiting the test. **See "Printing," in chapter 6, on page 267**.

Download audio New Data to TRU & verify will transfer only the new data in the TX and RX audio sensitivity fields.

Download RSSI New Data to TRU & verify will transfer only the new data in the RSSI offset fields.

Press k5 (**Exit**) or select **Exit** from the list to exit this test. If TRU data has not changed, the Test Software will prompt **You have not downloaded the New TRU data. Do you want to do it now?** Press k1 (**Yes**) to return to the previous screen, or press k2 (**No**) to continue.

Parameters Used

- **PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)**
- **PARAMETER_02 TRU ANT2 RSSI offset (-35 to 35, incr 0.25) (dB)**
- **PARAMETER_03 TRU ANT3 RSSI offset (-35 to 35, incr 0.25) (dB)**
- **PARAMETER_04 TRU ANT4 RSSI offset (-35 to 35, incr 0.25) (dB)**
- **PARAMETER_05 TRU ANT5 RSSI offset (-35 to 35, incr 0.25) (dB)**
- **PARAMETER_06 TRU ANT6 RSSI offset (-35 to 35, incr 0.25) (dB)**
- **PARAMETER_07 TRU audio RX sens (-28 to -16, incr 0.1) (dBm)**
- **PARAMETER_08 TRU audio TX sens (-28 to -10, incr 0.1) (dBm)**
- **PARAMETER_09 TRU MPA max pwr (30.5 to 46.5, incr 0.25) (dBm)**
- **PARAMETER_10 TRU MPA pwr step size(1 to 4, incr 0.25) (dB)**
- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**

Pass/Fail Limits Used

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

TEST_02 - RXA SINAD Sensitivity

The Test Software provides two methods for the measurement of the sensitivity of the receivers in the TRU.

In the first method, the RF level into the receiver is iteratively varied until the measured SINAD is equal to the value entered into **PARAMETER_29 RX SINAD (dB)**. The RF level is checked against the **PASS/FAIL LIMIT_16 RX SINAD sensitivity RF level (dBm)** to determine the pass/fail status.

In the second method, the RF level entered into the **PARAMETER_30 RX SINAD RF level for set & measure (dBm)** is applied to the receiver, and the SINAD is measured. It is compared to **PASS/FAIL LIMIT_15 RX SINAD for set & measure (dB)** to determine the pass/fail status.

The Test Software chooses the method by checking the value in the **PARAMETER_32 RX SINAD test by set & meas [0=no 1=yes]**. Set this parameter to 1 if you want to use the second (set and measure) method.

The second method always provides results in a shorter time. However, it does not determine the actual RF level for a particular SINAD value.

Both methods check the sensitivity at the inputs to the receiver shelf. Select the inputs you wish to check by making entries into **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]** and the `Sector` field of the Initialization Screen. If **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]** is set to 1, the SINAD test will be run and all 3 RXA antennas will be checked, regardless of the Initialization Screen setting. Two parameters are provided so you may test SINAD using every antenna input, and perform other tests at a particular primary input.

The signal generator level will be set to account for the receiver shelf splitter loss if **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0. Enter the loss into the p **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**.

The sensitivity is measured by looping the receiver audio through the transmitter and demodulating the audio on the transmitter signal.

Analyzer Settings

- AF Filter: C-Message
- Number of SINAD Averages: 20
- Detector: rms before and after the 1 kHz notch

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_29 RX SINAD (dB)**
- **PARAMETER_30 RX SINAD RF level for set & measure (dBm)**
- **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**
- **PARAMETER_32 RX SINAD test by set & meas [0=no 1=yes]**
- **PARAMETER_33 RX SINAD test level deviation (kHz)**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_15 RX SINAD for set & measure (dB)**
- **PASS/FAIL LIMIT_16 RX SINAD sensitivity RF level (dBm)**

TEST_03 - RXB SINAD Sensitivity

This test is similar to **TEST_02 - RXA SINAD Sensitivity**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an *RXB* prefix.

TEST_04 - RXA SAT Detection

This test determines the SAT that receiver A (RXA) reports when each of the three SAT frequencies is modulated at 2 kHz deviation onto the RF signal that is applied to the inputs on the receiver shelf. Falsing in the absence of applied SAT modulation is also verified. The RF level of the signal is determined by the value in the **PARAMETER_28 RX SAT detection RF level (dBm)**.

The Test Software uses the value entered into the **`Sector`** field on the Initialization Screen to determine which of the receiver shelf inputs are tested. It is unlikely that all of the antenna inputs must have the SAT detection test performed on them.

If **PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]** is set to 1, then the SAT deviation is changed to the extremes of 1.8 kHz and 2.2 kHz and SAT detection is performed at these points as well as at 2 kHz deviation.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_28 RX SAT detection RF level (dBm)**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

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

TEST_05 - RXB SAT Detection

This test is similar to **TEST_04 - RXA SAT Detection**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an *RXB* prefix.

TEST_06 - RXA ST Detection

This test determines the performance of the Signaling Tone detector in receiver A (RXA). An RF signal with a 10 kHz tone modulated at 8 kHz deviation is applied to RXA. ST presence is checked. The ST deviation is removed and ST falsing is checked. The RF level of the signal is determined by the value entered into **PARAMETER_34 RX ST detection RF level (dBm)**.

If **PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]** is set to 1, the deviation is changed to the extremes of 8.2 kHz and 8.8 kHz and ST detection is checked.

The Test Software uses the value entered into the **`Sector`** field on the Initialization Screen to determine which of the receiver shelf inputs are tested. It is unlikely that all of the receiver shelf inputs must have the ST detection test performed on them.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_34 RX ST detection RF level (dBm)**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

There are no pass/fail limits associated with this test.

TEST_07 - RXB ST Detection

This test is similar to **TEST_06 - RXA ST Detection**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an *RXB* prefix.

TEST_08 - RXA RSSI Linearity

This test checks the linearity of the reported RSSI as the RF level is varied from low to high. The RF levels can be set from –110 to –50 dBm in 10 dB steps with a check at 0 dBm. The RF signal is modulated with a 6 kHz SAT tone at 2 kHz deviation and a 1 kHz audio tone. The deviation of the audio tone is defined in **PARAMETER_15 RX RSSI 1 kHz audio deviation (0 to 20) (kHz)**.

The low RF level is set by **PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)** and the high RF level is set by **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)**. To check the level at 0 dBm, enter **`0`** in parameter 17. This will check the –50 dBm level, then skip to the 0 dBm level. To stop at –50 dBm, enter –**`50`** in parameter 17.

The signal from the RF generator can be applied at either the Base Station receiver shelf or at the RMC. This is determined by **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**. The generator RF level will be compensated for RX cable losses defined on the Initialization Screen regardless of the input location. If the signal is applied at the receiver shelf, the generator output will also be compensated for the receiver shelf splitter loss defined in **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**.

The output results may be displayed in one of two ways depending on the setup of the parameters in the Test Software.

If **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1, the following results are displayed:

- ANTx RSSI level @ –xx dBm: Reported RSSI level from the TRU at the –xx level.
- ANTx RSSI error @ –xx dBm: This is the RSSI error from the desired level. The RSSI pass/fail limits are compared against this RSSI error.

The RSSI error is calculated by using the following equation:

RSSI error = Reported RSSI - Sector Gain - RF level

The RSSI error takes into account the sector gain defined by the user on the Initialization Screen. This allows the user to define different gains between sectors or cell sites and still use the same pass/fail limit. (See the note at the end of this test description). If **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0, and **PARAMETER_16 RX RSSI lin chk w/o offset [0=no 1=yes]** is set to 1, the following results are displayed:

- ANTx RSSI @ –xx dBm: This is the reported RSSI level from the TRU at the –xx level.
- ANTx RSSI without RSSI offset: This is the reported RSSI without the TRU internal RSSI offset.
- ANTx RSSI error @ –xx dBm: This is the RSSI error from the desired level. The RSSI pass/fail limits are compared against this RSSI error.

The RSSI without offset is calculated by using the following equation:

RSSI without offset = Reported RSSI - RSSI offset

The RSSI error is calculated by using the following equation:

RSSI error = Reported RSSI - RSSI offset - RF level

NOTE: When testing at the typical original receive multi-coupler (RMC) input, the sector gain is 4 dB. In a typical enhanced RMC, the sector gain is 4 to 6 dB. This accounts for the path gain between the RMC input and the radio backplane input. If testing is conducted at the shelf, the Test Software will always compensate the RF generator input level for the receiver shelf splitter loss. This makes the RF signal level appear to be at the radio backplane. In such case, there is no gain and the sector gain during shelf testing is 0 dB.

For example, suppose that the path gain is 4 dB and an RF signal of −84 dBm is input into the RMC. Theoretically, a TRU with no internal RSSI offset will report a −80 dBm RSSI level. Since the detector in a TRU is not ideal, in some cases the internal RSSI offset is needed to make the TRU report −80 dBm. Because the reported RSSI level is different than the input level, the Test Software needs to know the difference to properly set the RSSI offset and check the RSSI linearity level. The **`Sector Gain`** fields on the Initialization Screen are the method of telling the Test Software the difference between the input level and the reported level.

It is possible for the receiver path gain to be increased to improve the signal strength in rural areas or decreased to reduce intermods in urban areas. In this case, the path gain is no longer 4 dB. Depending on your system design, you may or may not want your sector gains on the Initialization Screen to remain at 4 dB. You should consult with your engineering department to determine how to set the offsets for these areas.

It is also possible to use the sector gains to create an artificial receiver path gain or path loss (sometimes referred to as a system offset) to vary the handoff levels between sectors. To allow for sector variations, three sector gains fields have been provided on the Initialization Screen. Varying handoff levels between sectors may result in better system performance if done correctly, and will certainly result in worse system performance if not done correctly.

Parameters Used

- PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]
- PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]
- PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)
- PARAMETER_15 RX RSSI 1 kHz audio deviation (0 to 20) (kHz)
- PARAMETER_16 RX RSSI lin chk w/o offset [0=no 1=yes]
- PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)
- PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)
- PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)
- PARAMETER_35 RX test w/external splitter [0=no 1=yes]
- PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]
- PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]
- PARAMETER_46 GN if test fails [0=continue 1=stop]

Pass/Fail Limits Used

- PASS/FAIL LIMIT_04 RX RSSI level @ 0 dBm (dB)
- PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)
- PASS/FAIL LIMIT_06 RX RSSI level err @ -60 dBm (dB)
- PASS/FAIL LIMIT_07 RX RSSI level err @ -70 dBm (dB)
- PASS/FAIL LIMIT_08 RX RSSI level err @ -80 dBm (dB)
- PASS/FAIL LIMIT_09 RX RSSI level err @ -90 dBm (dB)
- PASS/FAIL LIMIT_10 RX RSSI level err @ -100 dBm (dB)
- PASS/FAIL LIMIT_11 RX RSSI level err @ -110 dBm (dB)

TEST_09 - RXB RSSI Linearity

This test is similar to **TEST_08 - RXA RSSI Linearity**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an *RXB* prefix.

TEST_10 - Test Removed (was RXA RSSI Offset)

This test was removed from the TRU/DRU Test Software package. It is not available as a selection in the test sequence with the Northern Telecom TRU/DRU procedures.

To perform a similar test, use TEST_12 RXA RSSI/MCGAIN Offset and Gain.

TEST_11 Test Removed (was RXB RSSI Offset)

This test was removed from the TRU/DRU Test Software package. It is not available as a selection in the test sequence with the Northern Telecom TRU/DRU procedures.

To perform a similar test, use TEST_13 RXB RSSI/MCGAIN Offset and Gain.

TEST_12 - RXA RSSI/MCGAIN Offset and Gain

This test allows the user to perform measurements of the RSSI (received signal strength indicator) Offset and the RX Path Gain.

The signal from the RF generator can be applied at either the Base Station receiver shelf or at the RMC. This is determined by **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**. The generator RF level will be compensated for RX cable losses defined on the Initialization Screen regardless of the input location. If the signal is applied at the receiver shelf, the generator output will also be compensated for the receiver shelf splitter loss defined in **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**.

If **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1, and **PARAMETER_24 RX RSSI/MCGAIN chk rmc gain [0=no 1=yes]** is set to 1, the RX path gain test will be performed. The path gain test begins by making the measurement of path gain from the antenna to the TRU. This path gain includes the RMC (receive multicoupler) gain, receiver shelf splitter loss, and any cable losses associated with the signal path. The test is performed in the following manner. The Test Set injects an RF signal into the RMC input, which is modulated at the deviation determined by **PARAMETER_15 RX RSSI 1 kHz audio deviation (0 to 20) (kHz)**. This value is typically 2.9 kHz. The Test Software queries the TRU for the reported RSSI level. The resulting path gain is determined by the equation below and is displayed on the screen.

Path Gain = Reported RSSI level - RSSI offset - Injected RF level

If the path gain exceeds the limits set by **PASS/FAIL LIMIT_35 TXD TDMA mod acc frequency error (Hz)** path gain the user will be given the option to adjust the RMC gain. Selecting **yes**, will display an adjustment meter. Manually adjust the RMC gain until needle lies within the specification lines of the meter.

Once the adjustment has been made, the user can choose to repeat the measurement to verify the adjustment was made correctly.

NOTE: It is not recommended that you make changes to the RMC gain without thoroughly examining other factors that may have caused error. The Test Set will provide several scenarios for you to examine before making any hardware adjustments.

The second part of this test measures the RSSI Offset and allows the user to compensate for differences in path gain and detector variances in individual receivers by adjusting the internal TRU RSSI offset (MCGAIN). The Test Set injects the modulated RF signal into the RMC input or receiver shelf input. The Test Software queries the TRU for the reported RSSI level, and calculates the RSSI error using the following equation:

RSSI error = reported RSSI from TRU - sector gain - RF level.

If the resulting RSSI error exceeds the limits set by **PASS/FAIL LIMIT_13 RX RSSI/MCGAIN offset error (dB)**, the Test Software will adjust the TRU RSSI Gain until the reported RSSI error equals zero to minimize RSSI error, if **PARAMETER_23 RX RSSI/MCGAIN adj [0=no 1=fail 2=always]** is set to 1 or 2. If the Test Software cannot set the offset after five attempts, the user will be prompted to manually set the offset.

The last part of the test is a query of the RSSI offset value that has been programmed into the radio. The programmed value is compared to **PASS/FAIL LIMIT_40 RX RSSI/MCGAIN internal rssi offset (dB)** to determine if the programmed value is within acceptable limits.

NOTE: When testing at the typical original receive multi-coupler (RMC) input, the sector gain is 4 dB. In a typical **enhanced** RMC, the sector gain is 4 to 6 dB. This accounts for the path gain between the RMC input and the radio backplane input. If testing is conducted at the shelf, the Test Software will always compensate the RF generator input level for the receiver shelf splitter loss. This makes the RF signal level appear to be at the radio backplane. In such case, there is no gain and the sector gain during shelf testing is 0 dB.

For example, suppose that the path gain is 4 dB and an RF signal of –84 dBm is input into the RMC. Theoretically, a TRU with no internal RSSI offset will report a –80 dBm RSSI level. Since the detector in a TRU is not ideal, in some cases the internal RSSI offset is needed to make the TRU report –80 dBm. Because the reported RSSI level is different than the input level, the Test Software needs to know the difference to properly set the RSSI offset and check the RSSI linearity level. The **`Sector Gain`** fields on the Initialization Screen are the method of telling the Test Software the difference between the input level and the reported level.

It is possible for the receiver path gain to be increased to improve the signal strength in rural areas or decreased to reduce intermods in urban areas. In this case, the path gain is no longer 4 dB. Depending on your system design, you may or may not want your sector gains on the Initialization Screen to remain at 4 dB. You should consult with your engineering department to determine how to set the offsets for these areas.

It is also possible to use the sector gains to create an artificial receiver path gain or path loss (sometimes referred to as a system offset) to vary the handoff levels between sectors. To allow for sector variations, three sector gains fields have been provided on the Initialization Screen. Varying handoff levels between sectors may result in better system performance if done correctly, and will certainly result in worse system performance if not done correctly.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_13 RX RSSI/MCGAIN offset error (dB)**
- **PASS/FAIL LIMIT_14 RX RSSI/MCGAIN path gain (dB)**
- **PASS/FAIL LIMIT_40 RX RSSI/MCGAIN internal rssi offset (dB)**

TEST_13 - RXB RSSI/MCGAIN Offset and Gain

This test is similar to **TEST_12 - RXA RSSI/MCGAIN Offset and Gain**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an *RXB* prefix.

TEST_14 - RTA Audio Level

This test uses RF loopback and measures the level of the TX FM deviation that results from a modulated signal applied to an RX input. The Test Set signal generator level is set to –50 dBm and modulated at a deviation of 2.9 kHz at a 1 kHz rate. The TRU audio sensitivities are set to –18 dBm. The TX FM deviation is measured and compared to the value in **PASS/FAIL LIMIT_03 RT audio deviation (kHz)**.

After the test the TX and RX audio sensitivities are restored to their original values.

Analyzer Settings

- IF Filter: 30 kHz bandwidth
- AF Filter 1: 300 Hz HPF
- AF Filter 2: 3 kHz LPF
- Detector: rms times 1.414

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_03 RT audio deviation (kHz)**

TEST_15 - RTB Audio Level

This test is the same as **TEST_14 - RTA Audio Level** applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an *RXB* prefix.

TEST_16 - TX Frequency Error

This test turns on the PA connected to the transceiver being tested, measures the frequency and computes the frequency error based on the channel number entered into the **Channel** field on the Initialization Screen.

The PA power is set to level 0.

Pass/fail limits and measured results are displayed in kHz.

The tune mode of the RF analyzer in the Test Set is set to **Auto**. In this mode the Test Set will acquire the strongest signal that exceeds the frequency counter threshold. At least one milliwatt must be supplied to the Test Set RF IN/OUT connector for the counter to acquire and measure the frequency.

Analyzer Settings

- Frequency Counter Gate Time: 50 ms

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_20 TX frequency error (kHz)**

TEST_17 - TX Maximum Power and Power Level

This test checks the Power Amplifier power output at each of the power levels selected in parameter 42 TX power, test down to pwr lev. See the description of **"PARAMETER_42 TX power, test down to pwr lev (0-7)" on page 225**.

Adjustment

NOTE: If a Base Station of type NONE or MCPA is to be tested, the Test Software will check the maximum power and the nominal gain. If the settings are incorrect, the Test Software will display a prompt for the settings. The combination of the two settings (maximum power and nominal gain) must be less than 27. If the settings are incorrect and you elect to continue without changing the settings, the power step checks will not be performed.

If you select a type MCPA Base Station in the **`Base station Radio`** field of the Initialization Screen, no adjustment procedure will be performed.

If you select a Base Station of any type other than MCPA in the **`Base station Radio`** field of the Initialization Screen, the Test Software will perform the adjustment procedure if all three of the following conditions are met:

If the power level is 0.

If **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 1 or 2.

If **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0.

There is also a further condition, and that pertains to whether the selected Base Station radio is type FMPA+, or not.

If you select the FMPA type in the **`Base Station Radio`** field in the Initialization Screen, and if PARAMETER_41 is set to 1 or 2, the Test Software will display a meter and prompt you to set the power level by adjusting the FMPA+ front panel trimming potentiometer.

If you select any type other than FMPA in the **`Base Station Radio`** field in the Initialization Screen, the Test Software will adjust automatically the internal TRU maximum power setting to obtain the entered value.

Results Output

Results will be calculated and displayed for power and loss as described in the following sections.

Power Calculation and Display

Three outputs will be displayed for each power level tested:

- TX power level x in dBm
- TX power level x in Watts
- TX pwr x err from (calculated power) dBm

The measured power error for power level 0 will be compared with the values entered in **PASS/FAIL LIMIT_22 TX power error at power level 0 (dB)**. The measured power error for power levels 1 through 7 will be compared with the values entered in **PASS/FAIL LIMIT_21 TX power error (dB)**.

The calculated power will be determined by the following equation:

*Calculated Power = Max Power – [Power Level (0 to 7) * Power Step]*

In this equation, the maximum power and the power step will be obtained as follows:

Max Power will be obtained by one of the following two methods:

1. If **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1 and the Base Station type is not MCPA or FMPA+, the Max Power will be determined by reading the TRU max power from the internal settings in the TRU.
2. If PARAMETER_39 is set to 0, the Max Power will be determined by reading the value entered on the Initialization Screen. If the power amplifier is type FMPA+ or MCPA, this second method will be always used.

Power Step will be obtained by reading the TRU internal power step setting.

Loss Calculation and Display

The combiner and duplexer loss will be computed by the Test Software if **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0 and the Base Station radio selected is not type FMPA+, MCPA, or NONE. The Test Software will display the result.

- TX combiner/duplexer loss

  or

- TX backplane loss

The combiner/duplexer and backplane loss will be compared with the value entered in **PASS/FAIL LIMIT_19 TX combiner/duplexer or backplane loss**.

This loss will be computed using the following equation:

Combiner/ Duplexer + Backplane Loss = TRU Internal Power Level –Measured Power Level

or

Backplane Loss = TRU Internal Power Level –Measured Power Level

Important Considerations

The PA power will be measured using a peak detector connected to the output of a dual-diode RF detector. If there is amplitude modulation on the signal, the measured power will include the effect of the peak fluctuations of the power and will read higher than the average power. The residual AM should be checked if there is higher than expected power. (See **TEST_19 - TX Residual AM on page 158**.)

Power measurement accuracy depends on the accuracy of the values that you have obtained for the TX path losses. Path losses may be measured using the Measure Cable Loss test, which is invoked from the `Utilities` field in the Initialization Screen.

Measurement accuracy will be degraded for power levels below 5 dBm.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_39 TX duplexer/combiner loss**
- **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]**
- **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]**
- **PARAMETER_42 TX power, test down to pwr lev (0-7)**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_19 TX combiner/duplexer or backplane loss**
- **PASS/FAIL LIMIT_21 TX power error (dB)**
- **PASS/FAIL LIMIT_22 TX power error at power level 0 (dB)**

TEST_18 - TX SAT Frequency and Deviation

This test sets the TX SAT to each of the three SAT frequencies, measures the transmitted SAT frequency and deviation, and compares the results to pass/fail limits. The power is set to power level 0.

At the end of the test, the SATGEN is turned off, and the PA power is turned off.

Analyzer Settings

- IF Filter: 30 kHz bandwidth
- AF Filter 1: 300 Hz HPF
- AF Filter 2: 15 kHz LPF
- Detector: rms times 1.414
- Frequency Counter Gate Time: 1 s

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_25 TX SAT deviation (kHz)**
- **PASS/FAIL LIMIT_26 TX SAT frequency error (Hz)**

TEST_19 - TX Residual AM

This test checks the residual AM of the PA. The power is set to power level 0. The TRU RF tone generator is turned on during this test.

The PA is turned off when the test is complete.

Analyzer Settings

- IF Filter: 230 kHz
- AF Filter 1: 50 Hz HPF
- AF Filter 2: 15 kHz LPF
- Detector: rms

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_23 TX residual AM deviation (%)**

TEST_20 - TX Residual FM

This test checks the residual FM of the PA. The power level is set to power level 0.

Analyzer Settings

- IF Filter: 30 kHz
- AF Filter 1: 300 Hz HPF
- AF Filter 2: 3 kHz LPF
- Detector: rms

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_23 TX residual AM deviation (%)**

TEST_21 - TX Wideband Data Deviation

This test checks the deviation of the transmitted signal when it is transmitting wideband data. The wideband signal applied to the transmitter is demodulated and the positive and negative peak excursions are measured and compared to **PASS/FAIL LIMIT_28 TX wideband data deviation (kHz)**.

If **PARAMETER_44 TX wideband data test BW [0=no 1=yes]** is set to 1, the data bandwidth spectrum of the transmitted signal will also be checked. A spectrum analyzer span of 50 kHz would be used which sets the resolution BW to 1 kHz. The signal is measured on the spectrum analyzer with the spectrum analyzer reference level set 10 dB above the level queried from Base Station maximum power setting. The level of the signal offset from the carrier by plus and minus 12 kHz is checked using the marker function of the spectrum analyzer. The results are compared with **PASS/FAIL LIMIT_27 TX wideband data BW @ +/-12 kHz offset (dBc)**.

Analyzer Settings

For wideband data deviation

- IF Bandwidth: 230 kHz
- AF Analyzer Filter 1: 50 Hz HPF
- AF Analyzer Filter 2: >99 kHz LPF
- Detectors: Peak +

For TX data bandwidth @ +/– 12 kHz

- Spectrum Analyzer Span: 50 kHz
- Detector: Peak hold

Parameters Used

- PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]
- PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]
- PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]
- PARAMETER_44 TX wideband data test BW [0=no 1=yes]
- PARAMETER_46 GN if test fails [0=continue 1=stop]

Pass/Fail Limits Used

- PASS/FAIL LIMIT_27 TX wideband data BW @ +/-12 kHz offset (dBc)
- PASS/FAIL LIMIT_28 TX wideband data deviation (kHz)

TEST_22 - TX 1 kHz Tone Generator

This test is performed to verify the accuracy of the modulated RF signal transmitted by the Base Station. The test is executed in the following manner:

- Test Set instructs the Base Station to generate a 1 kHz tone with 8 kHz deviation.
- Base station transmits the desired tone with deviation.
- Test Set receives and demodulates the signal sent by the Base Station.
- This demodulated signal is tested for any frequency error with respect to the expected 1 kHz. Limits for the frequency error are set as indicated in **PASS/FAIL LIMIT_17 TX 1 kHz tone generator audio frequency (Hz)**.
- The deviation of the 1 kHz tone is measured and compared to the expected 8 kHz deviation. Limits for the deviation error are set as indicated in **PASS/FAIL LIMIT_18 TX 1 kHz tone generator FM deviation (kHz)**.

Analyzer Settings

- Detector: Pk+
- Filter 1: 300 Hz HPF
- Filter 2: 3 kHz LPF
- IF Filter: 30 kHz

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_17 TX 1 kHz tone generator audio frequency (Hz)**
- **PASS/FAIL LIMIT_18 TX 1 kHz tone generator FM deviation (kHz)**

TEST_23 - TXD TDMA Uncalibrated Power

This test measures the power of the transmitter while it is transmitting in the digital mode. The power meter in the Test Set is used to measure the power of the TDMA signal. A correction factor is used to correct for the characteristics of the power meter. The HP 83204A, Option 001, TDMA Dual-Mode Cellular Adapter is not required to run this test. Another TDMA power test, **TEST_24 - TXD TDMA Calibrated Power** measures the TDMA signal at an intermediate frequency in the HP 83204A, Option 001. See the description of **TEST_24 - TXD TDMA Calibrated Power on page 165**.

POWER MEASUREMENT ACCURACY

The power measurement accuracy obtained in this test depends on the level of the amplitude modulation that results from the digital modulation on the TDMA signal. A correction factor for the characteristics of the power meter was obtained using a signal with a very low Error Vector Magnitude. If the signal you are measuring has amplitude modulation that is much different from that of an ideal signal, a power measurement error will be introduced. If you run **TEST_24 - TXD TDMA Calibrated Power** these sources of error will not be present. Use TEST_24 if you suspect there may be an error. Use TEST_23 if you want to measure the power of a TDMA transmitter without an HP 83204A, Option 001, TDMA Dual-Mode Cellular Adapter attached to the top of an HP 8921A Test Set. TEST_23 runs somewhat faster than TEST_24 because the TRU is kept in the digital mode throughout the test.

This test checks the Modulating Power Amplifier power output at each of the power levels selected in **PARAMETER_42 TX power, test down to pwr lev (0-7)**. See the description of this parameter later in this chapter.

If **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, the maximum power is determined by reading the TRU max power from the internal settings in the TRU. If parameter 40 is set to 0, the maximum power is determined by reading the value entered on the Initialization Screen.

The power error is compared to the pass/fail limit and is displayed after the power measurement is made.

Power measurement accuracy depends on the accuracy of the values you have obtained for the PA path losses. Path losses are measured using **TEST_40 - GN Cable Loss**, which is automatically executed each time the Test Set power is cycled.

At the end of the test, the PA is turned off and set to power level 0.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_39 TX duplexer/combiner loss**
- **PARAMETER_42 TX power, test down to pwr lev (0-7)**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_39 TXD TDMA power error (dB)**

TEST_24 - TXD TDMA Calibrated Power

THIS TEST RUNS ON THE HP8921A, OPTIONS 500, 503

This test runs on only the HP 8921A Test Set, Options 500 or 503. The HP 8921A, Option 500 is a combination of an HP 8921A and an HP 83204A, Option 001, TDMA Cellular Adapter. The HP 8921A, Option 503 is a combination of an HP 8921A and an HP 83204A, Option 003, TDMA/CDPD Cellular Adapter.

This test measures the power of the TRU while it is transmitting in the digital mode. Power is measured at the intermediate frequency (IF) of the HP 83204A, Option 001, TDMA Dual-Mode Cellular Adapter. In order to calibrate the paths leading from the Test Set RF IN/OUT connector to the HP 83204A, Option 001 IF, an analog mode signal is activated in the TRU. The power of this signal is measured using the Test Set power meter and the HP 83204A, Option 001. A calibration factor is then used to determine subsequent digital mode power measurements. The analog signal is activated and measured prior to each digital mode measurement.

The power is checked at each of the power levels selected in **PARAMETER_42 TX power, test down to pwr lev (0-7)**. See the description of this parameter later in this chapter. If **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1, the maximum power is determined by reading the TRU max power from the internal settings in the TRU. If parameter 40 is set to 0, the maximum power is determined by reading the value entered on the Initialization Screen.

The power error is compared to **PASS/FAIL LIMIT_39 TXD TDMA power error (dB)** and is displayed after the power measurement is made.

Power measurement accuracy depends on the accuracy of the values you have obtained for the PA path losses. Path losses may be measured using **TEST_40 - GN Cable Loss** which is automatically executed each time the Test Set power is cycled.

At the end of the test, the PA is turned off and set to power level 0.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_39 TX duplexer/combiner loss**
- **PARAMETER_42 TX power, test down to pwr lev (0-7)**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_39 TXD TDMA power error (dB)**

TEST_25 - TXD TDMA Adjacent Channel Power

THIS TEST RUNS ON THE HP 8921A, OPTIONS 500, 503

This test runs on only the HP 8921A Test Set, Options 500 or 503. The HP 8921A, Option 500 is a combination of an HP 8921A and an HP 83204A, Option 001, TDMA Cellular Adapter. The HP 8921A, Option 503 is a combination of an HP 8921A and an HP 83204A, Option 003, TDMA/CDPD Cellular Adapter.

This test measures the adjacent channel power in several channels in the vicinity of the channel you have entered into the **Channel** field on the Initialization Screen. The adjacent channel power is the ratio of the power in a measurement bandwidth to the power of the desired transmitter signal.

In this test the Test Software sets the PA power to a level of 46.5 dBm. At the end of the test, the PA is turned off and set to power level 0. The PA power is set back to its original level.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_28 TX wideband data deviation (kHz)**
- **PASS/FAIL LIMIT_29 TXD TDMA adjacent channel power (dB)**
- **PASS/FAIL LIMIT_30 TXD TDMA alternate 1 channel power (dB)**
- **PASS/FAIL LIMIT_31 TXD TDMA alternate 2 channel power (dB)**

TEST_26 - TXD TDMA Modulation Accuracy

THIS TEST RUNS ON THE HP8921A, OPTIONS 500, 503

This test runs on only the HP 8921A Test Set, Options 500 or 503. The HP 8921A, Option 500 is a combination of an HP 8921A and an HP 83204A, Option 001, TDMA Cellular Adapter. The HP 8921A, Option 503 is a combination of an HP 8921A and an HP 83204A, Option 003, TDMA/CDPD Cellular Adapter.

This test measures the accuracy of the modulation on the transmitted signal. Several sources of error are calculated and displayed. See the pass/fail limits listed for this test for the descriptions of these items that contribute to the modulation accuracy.

The PA power is set to Power Level 0 for this test.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_32 TXD TDMA mod acc error vector mag peak (%)**
- **PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)**
- **PASS/FAIL LIMIT_34 TXD TDMA mod acc EVM 10 averages (%)**
- **PASS/FAIL LIMIT_35 TXD TDMA mod acc frequency error (Hz)**
- **PASS/FAIL LIMIT_36 TXD TDMA mod acc magnitude error (%)**
- **PASS/FAIL LIMIT_37 TXD TDMA mod acc origin offset (dBc)**
- **PASS/FAIL LIMIT_38 TXD TDMA mod acc phase error (deg)**

TEST_27 - RX Standard Tests

NOTE: This test preforms a comprehensive receiver check. It is similar to **TEST_29 - RX Quick Tests**. However, the total time for this test is considerably longer than that of Test 29. This test is included in the current software version to provide backward compatibility for those users who need it.

This test performs the receiver tests in an optimum order to minimize cable connections. The tests are performed in the following order:

First on Receiver A

- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_04 - RXA SAT Detection**
- **TEST_06 - RXA ST Detection**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_14 - RTA Audio Level**

then on Receiver B

- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_05 - RXB SAT Detection**
- **TEST_07 - RXB ST Detection**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_15 - RTB Audio Level**

The antennas on which each test is performed is determined by the `Sector` field on the Initialization Screen and **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**.

The first antenna will be tested completely before testing of the next antenna begins. This will minimize the cable connections, and hence speed up the testing process.

To speed up testing when RSSI Linearity is selected to be tested on all antennas, the RSSI level will be checked on the primary antennas at the RF levels determined by **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)** and **PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by parameter 25 RX RSSI/MCGAIN off RF level (–50 to –110). The primary antennas are those selected in the `Sector` field on the Initialization Screen.

Analyzer Settings

Analyzer settings will change throughout the test. Refer to the settings for each of the individual tests.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_15 RX RSSI 1 kHz audio deviation (0 to 20) (kHz)**
- **PARAMETER_16 RX RSSI lin chk w/o offset [0=no 1=yes]**
- **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)**
- **PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)**
- **PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)**
- **PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_28 RX SAT detection RF level (dBm)**
- **PARAMETER_29 RX SINAD (dB)**
- **PARAMETER_30 RX SINAD RF level for set & measure (dBm)**
- **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**
- **PARAMETER_32 RX SINAD test by set & meas [0=no 1=yes]**
- **PARAMETER_33 RX SINAD test level deviation (kHz)**
- **PARAMETER_34 RX ST detection RF level (dBm)**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_03 RT audio deviation (kHz)**
- **PASS/FAIL LIMIT_04 RX RSSI level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI level err @ -60 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI level err @ -70 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI level err @ -80 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI level err @ -90 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI level err @ -100 dBm (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI level err @ -110 dBm (dB)**
- **PASS/FAIL LIMIT_15 RX SINAD for set & measure (dB)**
- **PASS/FAIL LIMIT_16 RX SINAD sensitivity RF level (dBm)**

TEST_28 - TX Standard Tests

NOTE: This test performs a comprehensive transmitter check. It is similar to **TEST_30 - TX Quick Tests**. However, the total time for this test is considerably longer than that of Test 30. This test is included in the current software version to provide backward compatibility for those users who need it.

This test performs the analog transmitter tests in the following order:

- **TEST_16 - TX Frequency Error**
- **TEST_17 - TX Maximum Power and Power Level**
- **TEST_18 - TX SAT Frequency and Deviation**
- **TEST_19 - TX Residual AM**
- **TEST_20 - TX Residual FM**
- **TEST_21 - TX Wideband Data Deviation**

Analyzer Settings

Analyzer settings will change throughout the test. Refer to the settings for each of the individual tests.

Parameters Used

- PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]
- PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]
- PARAMETER_39 TX duplexer/combiner loss
- PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]
- PARAMETER_41 TX power adjust [0=no 1=fail 2=always]
- PARAMETER_42 TX power, test down to pwr lev (0-7)
- PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]
- PARAMETER_44 TX wideband data test BW [0=no 1=yes]
- PARAMETER_46 GN if test fails [0=continue 1=stop]

Pass/Fail Limits Used

- PASS/FAIL LIMIT_19 TX combiner/duplexer or backplane loss
- PASS/FAIL LIMIT_20 TX frequency error (kHz)
- PASS/FAIL LIMIT_21 TX power error (dB)
- PASS/FAIL LIMIT_22 TX power error at power level 0 (dB)
- PASS/FAIL LIMIT_23 TX residual AM deviation (%)
- PASS/FAIL LIMIT_25 TX SAT deviation (kHz)
- PASS/FAIL LIMIT_26 TX SAT frequency error (Hz)
- PASS/FAIL LIMIT_27 TX wideband data BW @ +/-12 kHz offset (dBc)
- PASS/FAIL LIMIT_28 TX wideband data deviation (kHz)

TEST_29 - RX Quick Tests

This test performs all the RX measurements, similar to **TEST_27 - RX Standard Tests**, however, because of differences in the code, it runs considerably faster.

This test performs the receiver tests in an optimum order to minimize cable connections. The tests are performed in the following order:

First on Receiver A

- **TEST_12 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_14 - RTA Audio Level**
- **TEST_04 - RXA SAT Detection** (does not check falsing)
- **TEST_06 - RXA ST Detection** (does not check falsing)

then on Receiver B

- **TEST_13 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_15 - RTB Audio Level**
- **TEST_05 - RXB SAT Detection** (does not check falsing)
- **TEST_07 - RXB ST Detection** (does not check falsing)

The antennas on which each test is performed is determined by the **`Sector`** field on the Initialization Screen, and **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**, and **PARAMETER_26 RX RSSI/MCGAIN test all ants [0=no 1=yes]**.

The first antenna will be tested completely before testing of the next antenna begins. This will minimize the cable connections, and hence speed up the testing process.

To speed up testing when RSSI Linearity is selected to be tested on all antennas, the RSSI level will be checked on the primary antennas at the RF levels determined by **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)** and **PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)**. The primary antennas are those selected in the **`Sector`** field on the Initialization Screen.

Analyzer Settings

Analyzer settings will change throughout the test. Reference the settings for each of the individual tests.

Parameters Used

- PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]
- PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]
- PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)
- PARAMETER_15 RX RSSI 1 kHz audio deviation (0 to 20) (kHz)
- PARAMETER_16 RX RSSI lin chk w/o offset [0=no 1=yes]
- PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)
- PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)
- PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)
- PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]
- PARAMETER_28 RX SAT detection RF level (dBm)
- PARAMETER_29 RX SINAD (dB)
- PARAMETER_30 RX SINAD RF level for set & measure (dBm)
- PARAMETER_31 RX SINAD test all ants [0=no 1=yes]
- PARAMETER_32 RX SINAD test by set & meas [0=no 1=yes]
- PARAMETER_33 RX SINAD test level deviation (kHz)
- PARAMETER_34 RX ST detection RF level (dBm)
- PARAMETER_35 RX test w/external splitter [0=no 1=yes]
- PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]
- PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]
- PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]
- PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]
- PARAMETER_46 GN if test fails [0=continue 1=stop]

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_03 RT audio deviation (kHz)**
- **PASS/FAIL LIMIT_04 RX RSSI level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI level err @ -60 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI level err @ -70 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI level err @ -80 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI level err @ -90 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI level err @ -100 dBm (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI level err @ -110 dBm (dB)**
- **PASS/FAIL LIMIT_13 RX RSSI/MCGAIN offset error (dB)**
- **PASS/FAIL LIMIT_14 RX RSSI/MCGAIN path gain (dB)**
- **PASS/FAIL LIMIT_15 RX SINAD for set & measure (dB)**
- **PASS/FAIL LIMIT_16 RX SINAD sensitivity RF level (dBm)**

TEST_30 - TX Quick Tests

This test performs all the TX measurements, similar to **TEST_28 - TX Standard Tests**, however, because of differences in the code, it runs considerably faster.

This test performs the transmitter tests in an optimum order to minimize cable connections. The tests are performed in the following order:

- **TEST_16 - TX Frequency Error**
- **TEST_18 - TX SAT Frequency and Deviation**
- **TEST_22 - TX 1 kHz Tone Generator**
- **TEST_20 - TX Residual FM**
- **TEST_21 - TX Wideband Data Deviation**

Analyzer Settings

Analyzer settings will change throughout the test. Refer to the settings for each of the individual tests.

Parameters Used

- PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]
- PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]
- PARAMETER_39 TX duplexer/combiner loss
- PARAMETER_42 TX power, test down to pwr lev (0-7)
- PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]
- PARAMETER_44 TX wideband data test BW [0=no 1=yes]
- PARAMETER_46 GN if test fails [0=continue 1=stop]

Pass/Fail Limits Used

- PASS/FAIL LIMIT_17 TX 1 kHz tone generator audio frequency (Hz)
- PASS/FAIL LIMIT_18 TX 1 kHz tone generator FM deviation (kHz)
- PASS/FAIL LIMIT_20 TX frequency error (kHz)
- PASS/FAIL LIMIT_23 TX residual AM deviation (%)
- PASS/FAIL LIMIT_25 TX SAT deviation (kHz)
- PASS/FAIL LIMIT_26 TX SAT frequency error (Hz)
- PASS/FAIL LIMIT_27 TX wideband data BW @ +/-12 kHz offset (dBc)
- PASS/FAIL LIMIT_28 TX wideband data deviation (kHz)

TEST_31 - TXD Standard Tests

This test performs the digital transmitter tests in the following order:

- **TEST_26 - TXD TDMA Modulation Accuracy**
- **TEST_25 - TXD TDMA Adjacent Channel Power**
- **TEST_24 - TXD TDMA Calibrated Power**

This test performs these tests more quickly than if separated because it does not calibrate the DSP gain as often.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_39 TX duplexer/combiner loss**
- **PARAMETER_42 TX power, test down to pwr lev (0-7)**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_29 TXD TDMA adjacent channel power (dB)**
- **PASS/FAIL LIMIT_30 TXD TDMA alternate 1 channel power (dB)**
- **PASS/FAIL LIMIT_31 TXD TDMA alternate 2 channel power (dB)**
- **PASS/FAIL LIMIT_32 TXD TDMA mod acc error vector mag peak (%)**
- **PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)**
- **PASS/FAIL LIMIT_34 TXD TDMA mod acc EVM 10 averages (%)**
- **PASS/FAIL LIMIT_35 TXD TDMA mod acc frequency error (Hz)**
- **PASS/FAIL LIMIT_36 TXD TDMA mod acc magnitude error (%)**
- **PASS/FAIL LIMIT_37 TXD TDMA mod acc origin offset (dBc)**
- **PASS/FAIL LIMIT_38 TXD TDMA mod acc phase error (deg)**
- **PASS/FAIL LIMIT_39 TXD TDMA power error (dB)**

TEST_32 - GN PA LED Alarm and TRU Display

This TEST determines if the PA LED alarm and the TRU display are functioning. First the LED alarm is turned on and the user is prompted to press the **k1** (`Yes`) key if it lighted. (The PA LED is checked for each PA except NONE.) Then, the TRU display is set to all 8s for all TRUs except TRU3. If the display is functioning properly, press the **k1** (`Yes`) key.

If you press the **k2** (`No`) key for either of the answers, the results will be captured as a failure.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**

Pass/Fail Limits Used

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

TEST_33 - GN Standard PA and ANT Connections

This test displays an arrangement of connections to the TRU and the Test Set. If you are using a sequence of tests other than those in the supplied procedures, you may wish to place this test at the start of your sequence. It will provide you with the necessary prompts for some of the equipment connections.

This test displays the following setup:

- RS-232 Control Connections.
- RF IN/OUT from the Test Set to the Base Station PA # (based on the TRU # selected in the **Slot** field on the Initialization Screen).
- DUPLEX OUT from the Test Set to the Base Station ANT # (based on the value entered in the **Sector** field of the Initialization Screen).

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_26 RX RSSI/MCGAIN test all ants [0=no 1=yes]**
- **PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**

Pass/Fail Limits Used

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

TEST_34 - GN Laptop Emulator

This test gives you a way to send commands to the TRU and display responses on the Test Set screen. You can run this test standalone or insert it in your test sequence. This test can also be accessed by k5 (**Laptop**) when a failure causes the test to stop, if the **If Unit-Under-Test Fails:** field is set to **Stop** (on the **Execution Conditions** screen).

COMMANDS MAY CHANGE TRU TEST CONDITIONS

Sending a command to the TRU may change a condition required for testing. If you are running this test in a sequence with other tests, ensure that the proper state of the TRU is returned so testing can be performed.

Functions are displayed on the Test Set screen. You can use the knob to select a command. When you press the knob, available choices will be displayed. Use the knob to select choices or enter characters, and use the data keypad to enter numbers. After you enter the data or make a choice, the command together with the parameters will be sent to the TRU.

Responses from the TRU are displayed in the lower part of the screen. If the TRU does not respond within 10 seconds, **NO DATA** will be displayed on the Test Set screen.

Screen Display Keys

Press the USER key **Page Up** to display commands that are above the top of the displayed list. Press the USER key **Page Down** to display commands that are below the bottom of the displayed list.

Non-command Selections

Selecting **Break** from the command list is equivalent to pressing the BREAK key on an RS-232 terminal.

From the command list, you can select **Manual** to create and send a command that is not displayed in the command list. After selecting **Manual** you will be asked to enter the characters in the command. Press the knob if the upper two fields are not already highlighted. Use the cursor control choices, such as **Position**, together with the characters in the **Choices:** column to compose the command and parameters you wish to send. Choose **Done** when the command is complete.

The Test Software does not perform any checks on the command you have composed.

Exiting the Test

Selecting **Exit control** will cause the test to exit. Or, press the k5 (**Exit**) when you are done. It performs the same function as the **Exit control** selection.

Press k2 (**TRU Data**) to display the current values in the TRU and enter and download new ones. The functions available on this screen are similar to those in **TEST_01 - TRU Read and Store TRU Settings**. You can return to the main part of the Base Station commands test by pressing k5 (**Exit**) when the TRU Data screen is displayed. See the description of **TEST_01 - TRU Read and Store TRU Settings on page 128**.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- For the parameters that are used after k2 (**TRU Data**) is pressed, see the description of **TEST_01 - TRU Read and Store TRU Settings on page 128**.

Pass/Fail Limits Used

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

TEST_35 - GN Manual Switch Control

This test can be used to manually control RF switches in your system. The RF switches can be ones controlled by the optional Radio Interface Board or switches in the HP 3488A Switch Matrix.

Place this test as the only test in a sequence, or at a point in your sequence when you have to manually control a switch.

This test is added so that you can manually control the switches to any position to calibrate your cables. Therefore, you will probably want to make a test sequence with this test first, followed by **TEST_40 - GN Cable Loss**. Repeat these two tests in the sequence for as many switch positions as you wish to calibrate.

This test will not run successfully unless your switches are configured with entries on the External Devices (or Edit Configuration) screen. **See "Configuration," in chapter 6, on page 241**.

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_36 - GN Data Collection File Transfer

This test is designed to simplify the process of transferring data collection files from a memory card to an external device.

- The user is prompted to remove the Test Software card and insert the memory card containing saved data collection files
- A new screen containing the following fields will appear:
  - Output port:
  - Transfer selected files
  - Purge (delete) selected files
  - Exit data collection-file-transfer
  - File List
- Select the desired output port. The choices are: HP-IB, addr 701, or serial port
- Files to be transferred must be selected from the list at bottom of screen. Rotate the knob to the file list and select the desired tests. Selected tests will display an asterisk (*) next to them.
- Select “Transfer selected files.” Files marked with an asterisk (*) will automatically be transferred to the specified output port.
- The user may also delete any unwanted files from the memory card by selecting the files to be deleted as described above and then selecting “Purge (delete) selected files.”

NOTE: For more information regarding data collection, **see "Data Collection (Saving and Retrieving Test Results)," in chapter 6, on page 247**. For more information regarding HP-IB or Serial Port printing, **see "Printing," in chapter 6, on page 267**.

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_37 - GN Swept Return Loss

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 **"PARAMETER_13 GN RF lev for VSWR and cable loss tests (dBm)" on page 215** 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 the AMPS Channel Return Loss Test provided with the HP 11807A Option 100 System Support Tests Software. This test measures the return loss at a frequency offset from a selectable range of AMPS channels. See the *System Support Tests User's Guide* (part number 11807-90141) for details on loading and running this test.

This test measures the return loss of a cable or device in the swept mode. A SWR bridge and a 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 267**.

Table 7 **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

VSWR can be calculated from the return loss. The following table contains some of the values from a calculation.

Table 8 **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 determine the approximate 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.

TYPICAL 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 greater than 25 dB should be considered excellent. For best results, the cable output should be terminated in 50 ohms.

Parameters

- **PARAMETER_13 GN RF lev for VSWR and cable loss tests (dBm)**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/fail limits

- **PASS/FAIL LIMIT_02 GN VSWR for swept return loss (dB)**

TEST_38 - Test Removed (was GN Discrete Return Loss)

This test was removed from the TRU/DRU Test Software package. It is not available as a selection in the test sequence with the Northern Telecom TRU/DRU procedures.

To perform a similar test, use the RF Tools software card provided with the Northern Telecom Test Software package. The equivalent test is the AMPS Channel Return Loss Test. See the “RFTOOLS: Library: Procedure, Test, and Parameter Descriptions” Chapter of the *System Support Tests User’s Guide* (part number 11807-90141) for information on running the test.

TEST_39 - Test Removed (was GN Cable Fault)

This test was removed from the TRU/DRU Test Software package. It is not available as a selection in the test sequence with the Northern Telecom TRU/DRU procedures.

To perform a similar test, use the RF Tools software card provided with the Northern Telecom Test Software package. The equivalent test is the AMPS Channel Return Loss Test. See the “RFTOOLS: Library: Procedure, Test, and Parameter Descriptions” Chapter of the *System Support Tests User’s Guide* (part number 11807-90141) for information on running the test.

TEST_40 - GN Cable Loss

To ensure that your cables are properly calibrated, this test is automatically runs prior to the selected test procedure, each time the Test Set is turned off then back on again.

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 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 OUT and ANT IN 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 it will remain in the Test Set memory until you change it. You may change it by running the test again and saving the new test results, 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.

Saving test-cable losses examples:

- *Using multiple RX cables:* If an optional switch is being used, the cable loss test may need to be repeated for one TX cable and up to six different RX cables. The six different RX cables are stored as separate RX1, RX2,…RX6 parameters. For example, after the first test-cable loss is determined select k3 (**`RX1 loss`**).

  That cable loss value is now stored in the **`RX1 cable loss`** field in the Initialization Screen. Press k1 (**`Continue`**). Press k1 (**`Yes`**) after the Test Software prompts you for a new cable loss measurement. The Test Software will return to the connection diagram, where you may disconnect the first test-cable and connect a new one. The test will repeat the measurement on the new cable. When the measurement is completed, the user will again be prompted to select the desired parameter to store the test-cable loss. Press k5 (**`More loss`**), then k1 (**`RX2 loss`**). Note that if you select k3 (**`RX1`**) again, the Test Software will overwrite the parameter previously stored at the beginning of this example. This process can be repeated for up to six different RX test-cables. Stored TX and RX values can be verified at the Initialization Screen.

- *Using one RX cable:* If the same test-cable is going to be used for one or more receivers, you do not need to step through the cable loss test multiple times. A test-cable loss can be stored for several different RXs by consecutively selecting each RX desired. For example, if 2 dB is determined as the loss for a test-cable it can be stored as both RX1 and RX4 in the following way. When prompted to store the value, press k3 (**`RX1 loss`**). The Test Software displays a message that 2 dB is being stored as the RX1 loss. Next press k5 (**`More loss`**), then k1 (**`RX2 loss`**). The Test Software displays a message that 2 dB is being stored as the RX2 loss. It can be verified at the Initialization Screen that both parameter RX1 and RX2 are 2 dB. Press k1 (**`Continue`**). After you have completed testing your cable and the Test Software displays the question prompt **`“Do you want to repeat the loss measurement”`**, press k2 (**`No`**) and the test will end.

Parameters Used

- **PARAMETER_13 GN RF lev for VSWR and cable loss tests (dBm)**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_02 GN VSWR for swept return loss (dB)**

TEST_41 - RXA Bit Error Rate (BER)

NOTE: This test cannot be performed on TRU1 Base Stations.

This test runs on only the HP 8921A Test Set, Options 500 or 503. The HP 8921A, Option 500 is a combination of an HP 8921A and an HP 83204A, Option 001, TDMA Cellular Adapter. The HP 8921A, Option 503 is a combination of an HP 8921A and an HP 83204A, Option 003, TDMA/CDPD Cellular Adapter.

This TEST measures the bit error rate (BER) of the TRU receiver RXA using an RF loopback method. In this method, the Test Software configures the TRU in TDMA mode and then loops the receiver back to the transmitter. The Test Set then injects TDMA modulated RF signal with a pseudo-random bit pattern into the receiver at the RF level set by **PARAMETER_20 RX BER RF level**.

The signal generator level will be set to account for the receiver shelf splitter loss if **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0. Enter the loss into **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**.

While the system is in this configuration, the TDMA pseudo-random bit pattern is looped back to the transmitter. The Test Software then digitally demodulates the bit pattern and compares the received pattern with the transmitted pattern. The number of bits in error versus the number of bits in the transmitted pattern represent the percentage of error, or bit error rate (BER).

The resulting BER is then compared with the specification in **PASS/FAIL LIMIT_41 RX Bit Error Rate (BER)**.

NOTE: In PASS/FAIL LIMIT_37, because of the nature of the measurement, you need select only an upper limit.

If the Base Station is any type except TRU3, this test may be performed on timeslot 1, 2, or 3, or on all timeslots, according to the setting of **PARAMETER_21 RX BER test timeslots [1,2,3=slot,4=all]**. If the Base Station is a TRU3 type, this test is may be performed only on timeslot 1.

More bits used in the BER measurement provide a higher confidence level in the BER measurement. Set the total number of bits used in the measurement in PARAMETER_19. See the description of **PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]** for information on setting the number of bits.

In order to perform the loopback BER measurement, timing alignment must be maintained between the transmitted RF signal from the TRU transmitter and the received RF signal sent to the Base Station receiver. The Test Software maintains this timing alignment. However, in some instances, the Test Software might have difficulty in maintaining the alignment and might abort the measurement.

To preclude problems and improve the timing alignment, make certain that the Test Set is thoroughly warm. This requires that the Test Set be turned on for at least 30 minutes prior to the measurement.

Also, it is possible to lock the Test Set to the Base Station 48.6-kHz TDMA reference, but this is ordinarily not required. If you wish to use the Base Station reference, set **PARAMETER_48 GN TDMA Reference [0=10 MHz 1=48.6 kHz]** to 1.

Further improvement in the timing alignment may be made by making certain that the Base Station is connected to the Mobile Telephone Exchange (MTX) Switch. The timing from this switch is more accurate than that of the Base Station in free-run mode.

Still further, you may reduce the number of bits measured during a single measurement by reducing the Y component (slots per average) of the bits in PARAMETER_19.

The typical BER RF level is –113 dBm. Using this level usually results in a BER of less than one percent.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]**
- **PARAMETER_20 RX BER RF level**
- **PARAMETER_21 RX BER test timeslots [1,2,3=slot,4=all]**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_46 GN if test fails [0=continue 1=stop]**
- **PARAMETER_48 GN TDMA Reference [0=10 MHz 1=48.6 kHz]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_41 RX Bit Error Rate (BER)**

TEST_42 - RXB Bit Error Rate (BER)

NOTE: This test cannot be performed on TRU1 Base Stations.

This TEST is the same as **TEST_41 - RXA Bit Error Rate (BER)**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_43 - RXA Bit Error Rate (BER) Screen

NOTE: This test cannot be performed on TRU1 Base Stations.

This TEST measures the bit error rate (BER) of the TRU receiver RXA using an RF loopback method. In this method, the Test Software configures the TRU in TDMA mode and then loops the receiver back to the transmitter. The Test Set then injects TDMA modulated RF signal with a pseudo-random bit pattern into the receiver at the RF level set by **PARAMETER_20 RX BER RF level**.

While the system is in this configuration, the TDMA pseudo-random bit pattern is looped back to the transmitter. The Test Software then digitally demodulates the bit pattern and compares the received pattern with the transmitted pattern. The number of bits in error versus the number of bits in the transmitted pattern represent the percentage of error, or bit error rate (BER). After each measurement, the BER percentage is repetitively displayed on the Test Set screen. The total number of bits measured and the number of bit errors is also displayed on the screen.

If the Base Station is any type except TRU3, this test may be performed on timeslot 1, 2, or 3, or on all timeslots, according to the setting of **PARAMETER_21 RX BER test timeslots [1,2,3=slot,4=all]**. If the Base Station is a TRU3 type, this test is may be performed only on timeslot 1.

There are two measurement screen modes: Average, and Single. To toggle between the Average and Single mode, press the k3 (**`Average/Single`**) key. To end the measurement in either Average or Single Mode, press the k5 (**`Return`**) key.

Average Mode

In average mode, BER measurements are performed on a repetitive basis. The bits and the bit errors for each consecutive BER measurement are added to those of the previous measurement. The BER percentage is displayed on the Test Set screen, and is the average for all bits accumulated. The total number of slots (260 bits per slot) in each individual measurement is determined by the Y component in PARAMETER_46. See the description of **PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]** for information on setting the number of slots per average.

More bits used in the BER measurement provide a higher confidence level in the BER measurement. If you accumulate bits for a longer period, the BER measurement will be more accurate. If you wish to re-start the average and zero the bits and bit errors, press the k2 (**Restart**) key.

Single Mode

In single mode, a BER measurement is performed repetitively on one timeslot only (260 bits). The BER percentage for each measurement is displayed on the Test Set screen, but there is no accumulation of bits or bit errors in the displayed BER measurement results. This mode is most valuable for troubleshooting.

For either mode, the initial RF level is set by PARAMETER_20. However, you may change the RF level using the k4 (**RF Level**) key. Press the key momentarily and the Test Software will prompt you at the top of the Test Set screen to enter the level in the **RF Level** field using either the knob or the DATA ENTRY keys.

The signal generator level will be set to account for the receiver shelf splitter loss if **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0. Enter the loss into **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**.

In order to perform the loopback BER measurement, timing alignment must be maintained between the transmitted RF signal from the TRU transmitter and the received RF signal sent to the Base Station receiver. The Test Software maintains this timing alignment. However, in some instances, the Test Software might have difficulty in maintaining the alignment and might abort the measurement.

To preclude problems and improve the timing alignment, make certain that the Test Set is thoroughly warm. This requires that the Test Set be turned on for at least 30 minutes prior to the measurement.

Also, it is possible to lock the Test Set to the Base Station 48.6-kHz time base, oscillator, but this is ordinarily not required. If you wish to use the Base Station oscillator, set **PARAMETER_48 GN TDMA Reference [0=10 MHz 1=48.6 kHz]** to 1.

Further improvement in the timing alignment may be made by making certain that the Base Station is connected to the Mobile Telephone Exchange (MTX) Switch. The timing from this switch is more accurate than that of the Base Station in free-run mode.

Still further, you may reduce the number of bits measured during a single measurement by reducing the Y component (slots per average) of the bits in PARAMETER_19.

The typical BER RF level is –113 dBm. Using this level usually results in a BER of less than one percent.

In the lower section of the Test Set screen is general test status information. This section includes two fields. These are:

`Measurement Status` field - Indicates **`Good`** for acceptable status or **`Bad`** for non-acceptable status.

`Timing Alignment Drift in Bits` field - Indicates the drift in number of bits. The Test Software will correct for drift bits greater than ±2.

Parameters Used

- **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]**
- **PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]**
- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]**
- **PARAMETER_20 RX BER RF level**
- **PARAMETER_21 RX BER test timeslots [1,2,3=slot,4=all]**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_48 GN TDMA Reference [0=10 MHz 1=48.6 kHz]**

Pass/Fail Limits Used

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

TEST_44 - RXB Bit Error Rate (BER) Screen

NOTE: This test cannot be performed on TRU1 Base Stations.

This TEST is the same as **TEST_43 - RXA Bit Error Rate (BER) Screen**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_45 - RX and RXD Quick Tests

This TEST performs all of the RX and RXD measurements in a manner similar to that of **TEST_29 - RX Quick Tests**.

This TEST performs the receiver TESTs in an optimum order to minimize cable connections.

TESTs are performed in the following order:

First, on all selected antennas of Receiver A:

- **TEST_12 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_14 - RTA Audio Level**
- **TEST_41 - RXA Bit Error Rate (BER)**
- **TEST_04 - RXA SAT Detection** (does not check falsing)
- **TEST_06 - RXA ST Detection** (does not check falsing)

Then, on all selected antennas of Receiver B:

- **TEST_13 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_15 - RTB Audio Level**
- **TEST_42 - RXB Bit Error Rate (BER)**
- **TEST_05 - RXB SAT Detection** (Does not check falsing.)
- **TEST_07 - RXB ST Detection** (Does not check falsing.)

The antennas on which each TEST is performed are determined by the **`Sector`** field on the Initialization Screen, and **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**, and **PARAMETER_26 RX RSSI/MCGAIN test all ants [0=no 1=yes]**.

The first antenna will be tested completely before testing of the next antenna begins. This will minimize the cable connections, and thus speed the testing process.

Chapter 5
Test, Parameter, and Pass/Fail Descriptions

To reduce testing time when RSSI linearity is selected to be tested on all antennas, the RSSI level will be checked on the primary antennas at the RF levels determined by **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)** and **PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)**. The primary antennas are those selected in the **`Sector`** field on the Initialization Screen.

Analyzer Settings

Analyzer settings will change throughout the TEST. Refer to the settings for each of the individual TESTs.

Parameters Used

- **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**
- **PARAMETER_15 RX RSSI 1 kHz audio deviation (0 to 20) (kHz)**
- **PARAMETER_16 RX RSSI lin chk w/o offset [0=no 1=yes]**
- **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)**
- **PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)**
- **PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]**
- **PARAMETER_20 RX BER RF level**
- **PARAMETER_21 RX BER test timeslots [1,2,3=slot,4=all]**
- **PARAMETER_23 RX RSSI/MCGAIN adj [0=no 1=fail 2=always]**
- **PARAMETER_24 RX RSSI/MCGAIN chk rmc gain [0=no 1=yes]**
- **PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)**
- **PARAMETER_26 RX RSSI/MCGAIN test all ants [0=no 1=yes]**
- **PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_28 RX SAT detection RF level (dBm)**
- **PARAMETER_29 RX SINAD (dB)**
- **PARAMETER_30 RX SINAD RF level for set & measure (dBm)**
- **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**
- **PARAMETER_32 RX SINAD test by set & meas [0=no 1=yes]**
- **PARAMETER_33 RX SINAD test level deviation (kHz)**
- **PARAMETER_34 RX ST detection RF level (dBm)**
- **PARAMETER_35 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_03 RT audio deviation (kHz)**
- **PASS/FAIL LIMIT_04 RX RSSI level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI level err @ -60 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI level err @ -70 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI level err @ -80 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI level err @ -90 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI level err @ -100 dBm (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI level err @ -110 dBm (dB)**
- **PASS/FAIL LIMIT_13 RX RSSI/MCGAIN offset error (dB)**
- **PASS/FAIL LIMIT_14 RX RSSI/MCGAIN path gain (dB)**
- **PASS/FAIL LIMIT_40 RX RSSI/MCGAIN internal rssi offset (dB)**
- **PASS/FAIL LIMIT_41 RX Bit Error Rate (BER)**

TEST_46 - RXD Quick Tests

This TEST performs all of the RX and RXD measurements in a manner similar to that of **TEST_29 - RX Quick Tests**.

This TEST performs the receiver TESTs in an optimum order to minimize cable connections.

TESTs are performed in the following order:

First, on all selected antennas of Receiver A:

- **TEST_12 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_41 - RXA Bit Error Rate (BER)**

Then, on all selected antennas of Receiver B:

- **TEST_13 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_42 - RXB Bit Error Rate (BER)**

The antennas on which each TEST is performed are determined by the `Sector` field on the Initialization Screen, and **PARAMETER_31 RX SINAD test all ants [0=no 1=yes]**, and **PARAMETER_26 RX RSSI/MCGAIN test all ants [0=no 1=yes]**.

The first antenna will be tested completely before testing of the next antenna begins. This will minimize the cable connections, and thus speed the testing process.

To reduce testing time when RSSI linearity is selected to be tested on all antennas, the RSSI level will be checked on the primary antennas at the RF levels determined by **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)** and **PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)**. The primary antennas are those selected in the `Sector` field on the Initialization Screen.

Analyzer Settings

Analyzer settings will change throughout the TEST. Refer to the settings for each of the individual TESTs.

Parameters Used

- PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)
- PARAMETER_16 RX RSSI lin chk w/o offset [0=no 1=yes]
- PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)
- PARAMETER_18 RX RSSI linearity RF level low (- 110 Min) (dB)
- PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]
- PARAMETER_20 RX BER RF level
- PARAMETER_21 RX BER test timeslots [1,2,3=slot,4=all]
- PARAMETER_23 RX RSSI/MCGAIN adj [0=no 1=fail 2=always]
- PARAMETER_24 RX RSSI/MCGAIN chk rmc gain [0=no 1=yes]
- PARAMETER_25 RX RSSI/MCGAIN off RF level (-50 to -110) (dBm)
- PARAMETER_26 RX RSSI/MCGAIN test all ants [0=no 1=yes]
- PARAMETER_35 RX test w/external splitter [0=no 1=yes]
- PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]
- PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]
- PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]

Pass/Fail Limits Used

- PASS/FAIL LIMIT_04 RX RSSI level @ 0 dBm (dB)
- PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)
- PASS/FAIL LIMIT_06 RX RSSI level err @ -60 dBm (dB)
- PASS/FAIL LIMIT_07 RX RSSI level err @ -70 dBm (dB)
- PASS/FAIL LIMIT_08 RX RSSI level err @ -80 dBm (dB)
- PASS/FAIL LIMIT_09 RX RSSI level err @ -90 dBm (dB)
- PASS/FAIL LIMIT_10 RX RSSI level err @ -100 dBm (dB)
- PASS/FAIL LIMIT_11 RX RSSI level err @ -110 dBm (dB)
- PASS/FAIL LIMIT_13 RX RSSI/MCGAIN offset error (dB)
- PASS/FAIL LIMIT_14 RX RSSI/MCGAIN path gain (dB)
- PASS/FAIL LIMIT_40 RX RSSI/MCGAIN internal rssi offset (dB)
- PASS/FAIL LIMIT_41 RX Bit Error Rate (BER)

TRU 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 4, on page 78**.

The list of parameters is arranged alphabetically. The first few letters in the title of each parameter indicate its classification. The classifications are:

RX - Receiver

RXA - Receiver A

RXB - Receiver B

TRU - Transmit Receive Unit

TX - Transmitter

TXD - TDMA Transmitter

ZZZZ - Test/demo mode selection

PARAMETER_01 TRU ANT1 RSSI offset (–35 to 35, incr 0.25) (dB)

This parameter is used to provide a default value for the RSSI Offset (MC Gain) values you may wish to download to the TRU. The value you enter into this parameter will be placed in the column labelled **`New Data`** when you run **TEST_01 - TRU Read and Store TRU Settings** and choose the action **`Use default TRU parameters for New Data`**. See **TEST_01 - TRU Read and Store TRU Settings on page 128**.

PARAMETER_02 TRU ANT2 RSSI offset (–35 to 35, incr 0.25) (dB)

See the description of **"PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)" on page 212**.

PARAMETER_03 TRU ANT3 RSSI offset (–35 to 35, incr 0.25) (dB)

See the description of **"PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)" on page 212**.

PARAMETER_04 TRU ANT4 RSSI offset (–35 to 35, incr 0.25) (dB)

See the description of**"PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)" on page 212**.

PARAMETER_05 TRU ANT5 RSSI offset (–35 to 35, incr 0.25) (dB)

See the description of **"PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)" on page 212**.

PARAMETER_06 TRU ANT6 RSSI offset (–35 to 35, incr 0.25) (dB)

See the description of **"PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)" on page 212**.

PARAMETER_07 TRU audio RX sens (–28 to –16, incr 0.1) (dBm)

This parameter is used to set the sensitivity of the receive section of the radio. The value entered (in dBm) into this parameter field defines the audio output level when a carrier modulated with 2.9 kHz of FM is presented to the antenna inputs.

The parameter value can be downloaded into the TRU using two methods:

- Running TEST_01 allows the user to read the TRU settings and send updated settings for the audio sensitivity to the TRU. See the description of **"TEST_01 - TRU Read and Store TRU Settings" on page 128** for details.
- If you set PARAMETER_47 to **1**, the value for this parameter will be downloaded to the radio at the start of testing. See the description of **"PARAMETER_47 TRU set audio sens at start [0=no 1=yes]" on page 227**.

PARAMETER_08 TRU audio TX sens (–28 to –10, incr 0.1) (dBm)

This parameter is used to set the sensitivity of the modulation section of the radio. The value entered (in dBm) into this parameter field defines the audio output level that, when applied to the audio inputs of the radio, will produce a 2.9 kHz FM deviation at the transmitter.

The parameter value can be downloaded into the TRU using two methods:

- Running TEST_01 allows the user to read the TRU settings and send updated settings for the audio sensitivity to the TRU. See the description of **"TEST_01 - TRU Read and Store TRU Settings" on page 128** for details.
- If you set PARAMETER_47 to **1**, the value for this parameter will be downloaded to the radio at the start of testing. See the description of **"PARAMETER_47 TRU set audio sens at start [0=no 1=yes]" on page 227**.

PARAMETER_09 TRU MPA max pwr (30.5 to 46.5, incr 0.25) (dBm)

See the description of **"PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)" on page 212**.

The value in this parameter is not used by the Test Software when measuring TX power. The Test Software uses the value uploaded from the TRU.

PARAMETER_10 TRU MPA pwr step size(1 to 4, incr 0.25) (dB)

See the description of **"PARAMETER_01 TRU ANT1 RSSI offset (-35 to 35, incr 0.25) (dB)" on page 212**.

The value in this parameter is not used by the Test Software when measuring TX power. The Test Software uses the value uploaded from the TRU.

PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]

This parameter allows you to select where you want the channel information to be read from:

- the entries in the frequency table (select 0),
- the entry in the **`Channel`** field on the Initialization Screen (select 1),
- the channel numbers from the frequency table for LCR testing (select 2).

If you select 2, the Initialization Screen will only be displayed one time, at the start of testing on the first channel. Additional channels can then be tested without setting up the TRU each time.

PARAMETER_12 GN read TRU load & rev data [0=no 1=yes]

This parameter allows the Test Software to read the following information from the Base Station:

- Load number:
- ROM load:
- EEPROM CRC check:
- HW version:
- Serial #:
- PA FW
- PA HW
- PA PEC
- PA S/N

This information is reported on the screen with the test results, and will be printed if the Data Collection function is used.

PARAMETER_13 GN RF lev for VSWR and cable loss tests (dBm)

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

PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)

This parameter is only used if **PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0.

The value in this parameter is added to the values of other losses in the system to determine the required correction to the Test Set signal generator RF output level. For example, if this parameter is set to 11 dB, the RF generator level will be increase by 11 dB to compensate for the splitter loss. The purpose of this parameter is to reference RX measurements at the shelf to the TRU backplane RF input.

For the eight-way receiver shelf splitter, the value is typically 11 dB.

You will have to obtain the value for this parameter from TRU documentation or from Northern Telecom.

PARAMETER_15 RX RSSI 1 kHz audio deviation (0 to 20) (kHz)

This parameter sets the deviation level of the 1 kHz audio tone in the RSSI Linearity, RSSI Offset/MCGAIN, and RSSI Offset tests (TESTs 8-13).

PARAMETER_16 RX RSSI lin chk w/o offset [0=no 1=yes]

This parameter allows the Test Software to check RSSI linearity in TEST_08/09 RXA/B RSSI Linearity, without the TRU internal offset. Removing the internal offset allows a check of RSSI linearity without having to change the pass/fail limits.

PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)

This parameter sets the highest level for the RF signals injected into the RMC input by the Test Set. This level is arrived at by incrementing 10 dB at a time from the value entered in parameter 18 RX RSSI linearity RF level low, and skipping if necessary to end with the maximum level entered in this parameter.

The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen. If the signal is applied to the receiver shelf inputs, the RF level is also corrected for the receiver shelf splitter loss in parameter 14 RX rcvr shelf splitter loss. See the description for **"PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)" on page 215**.

In **TEST_27 - RX Standard Tests** and **TEST_29 - RX Quick Tests**, only the primary antennas are tested at this range of RF levels, to optimize testing time. Secondary antennas are tested at the single value entered in parameter 25 RX RSSI/ MCGAIN off RF level. Primary antennas are determined by the **`Sector`** field on the Initialization Screen.

PARAMETER_18 RX RSSI linearity RF level low (– 110 Min) (dB)

This parameter sets the lowest level for the RF signals injected into the RMC input by the Test Set. This level is then incremented 10 dB at a time until it reaches the value entered in **PARAMETER_17 RX RSSI linearity RF level high (0 Max) (dB)**.

The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen. If the signal is applied to the receiver shelf inputs, the RF level is also corrected for the receiver shelf splitter loss in parameter 14 RX rcvr shelf splitter loss. See the description for**"PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)" on page 215**.

In **TEST_27 - RX Standard Tests** and **TEST_29 - RX Quick Tests**, only the primary antennas are tested at this range of RF levels, to optimize testing time. Secondary antennas are tested at the single value entered in **PARAMETER_25 RX RSSI/ MCGAIN off RF level (-50 to -110) (dBm)**. Primary antennas are determined by the **`Sector`** field on the Initialization Screen.

PARAMETER_19 RX BER [XXXX.YYYY X=avers Y=slots/aver]

NOTE: This is a new parameter with this version of the Test Software. The parameter previously described as PARAMETER_19 has been deleted. That parameter had been associated with TEST_10 and TEST_11, which were deleted in a previous Test Software version change.

Enter the desired number of slots or bits to be measured for bit error rate (BER) tests. The number that you substitute for XXXX (averages) to the left of the decimal point determines the number of times that a single BER measurement will be performed and averaged. The number that you substitute for YYYY (slots per average) to the right of the decimal point determines the number of TDMA timeslots that make up that single BER measurement. There are 260 bits of data in a timeslot.

The maximum number for either XXXX or YYYY is 1,000. Using more bits results in a higher confidence level for the BER results. However, using more bits requires more time for the measurement.

NOTE: In either of the following sets of tests, four digits must be entered in each instance, and leading zeroes are significant. For instance, if you wish to perform 100 averages of 20 slots each, enter the numbers as follows: 100.0020

Bit Error Rate (BER) Tests:

In bit error rate (BER) tests (TEST_41 and TEST_42), the combination of these two numbers correspond to the total number of bits measured, as shown in the following equation:

$$\text{Total Bits} = \text{XXXX} \times \text{YYYY} \times 260$$

It is best to use a combination of X and Y to reach the desired number of bits to be measured. Using Y for the number of measurements will decrease the time for the measurement, but it will not allow the Test Set as much opportunity to maintain the proper timing relationship between the Base Station and the Test Set.

Example: If you require less than 10,000 bits for a test, use a Y number between 10 and 100.

Example: If you require more than 100,000 bits for a test, increase the Y number to a maximum of 1,000. If this results in difficulty with timing between the Test Set and the Base Station, reduce the Y number somewhat and try again.

Bit Error Rate (BER) Screen Tests:

In bit error rate (BER) screen tests (TEST_43 and TEST_44), only the YYYY number is used to arrive at the total number of bits to be measured, as shown in the following equation:

Total Bits = YYYY $\times$ 260

In these TESTs, the BER results are shown after each single measurement. In such case, you determine how many averages to perform.

PARAMETER_20 RX BER RF level

NOTE: This is a new parameter with this version of the Test Software. The parameter previously described as PARAMETER_20 has been deleted. That parameter had been associated with TEST_10 and TEST_11, which were deleted in a previous Test Software version change.

Enter the RF level at which the BER measurement is to be performed.

Bit Error Rate (BER) Tests:

In bit error rate (BER) tests (TEST_41 and TEST_42), the number entered is used as the RF level for all measurements.

Bit Error Rate (BER) Screen Tests:

In bit error rate (BER) screen tests (TEST_43 and TEST_44), the number entered is always used as the RF level for the initial measurement, and perhaps it is used for all others. However, you may adjust the RF level during the TEST by pressing the k4 (`RF Level`) key and following the on-screen prompts.

PARAMETER_21 RX BER test timeslots [1,2,3=slot,4=all]

NOTE: This is a new parameter with this version of the Test Software. The parameter previously described as PARAMETER_21 has been deleted. That parameter had been associated with TEST_10 and TEST_11, which were deleted in a previous Test Software version change.

Enter the selection for the timeslot or timeslots from which the data will be used in the BER measurement.

Bit Error Rate (BER) Tests:

In bit error rate (BER) tests (TEST_41 and TEST_42), you may select any timeslot or all timeslots.

- If you select 1, all of the data bits from timeslot 1 will be measured.
- If you select 2, all data bits from timeslot 2 will be measured.
- If you select 3, all data bits from timeslot 3 will be measured.
- If you select 4, data bits from timeslot 1 will be measured and reported, then data bits from timeslot 2, then data bits from timeslot 3.

Bit Error Rate (BER) Screen Tests:

In bit error rate (BER) screen tests (TEST_43 and TEST_44), the operation for selections 1, 2, and 3 are the same as for TEST_41 and TEST_42. However, selection 4 is not applicable.

PARAMETER_22 Removed RX RSSI offset test all ants

This parameter, which determines which of the antenna ports ANT1 through ANT6 will have a signal applied during the measurement of RSSI offset, is no longer used. It was used only in TEST_10 RXA RSSI Offset and TEST_11, RXB RSSI Offset, both of which were removed in a previous Test Software version change.

TEST_10 RXA RSSI Offset and TEST_11 RXB RSSI Offset and the associated parameters **had** been included for some time to provide backward compatibility with the earlier versions of this Test Software (A.00.00). This is no longer required. Use TEST_12 RXA RSSI/MCGAIN Offset and Gain and TEST_13 RXB RSSI/MCGAIN Offset and Gain instead.

PARAMETER_23 RX RSSI/MCGAIN adj [0=no 1=fail 2=always]

This parameter determines if the Test Software should adjust the TRU RSSI Offset (MCGain) until the reported RSSI error equals zero. If this parameter is set to 0, no adjustments will be made.

If this parameter is set to 1, an adjustment will be made if

- RSSI offset error exceeds the limits set by **PASS/FAIL LIMIT_13 RX RSSI/ MCGAIN offset error (dB)**

If this parameter is set to 2, an adjustment will be made, regardless of the measurement results.

PARAMETER_24 RX RSSI/MCGAIN chk rmc gain [0=no 1=yes]

This parameter determines whether RMC gain is checked during TEST_12/13 RXA/B RSSI/MCGAIN Offset and Gain. See **TEST_12 - RXA RSSI/MCGAIN Offset and Gain on page 145** for more information.

PARAMETER_25 RX RSSI/MCGAIN off RF level (–50 to –110) (dBm)

This parameter sets the RF level applied to the TRU receiver during TEST_12/13 RXA/B RSSI/MCGAIN Offset and Gain. The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen.

If the signal is applied to the receiver shelf inputs, the RF level is also corrected for the receiver shelf splitter loss in parameter 14 RX rcvr shelf splitter loss.

See the description for **"PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)" on page 215**.

For **TEST_27 - RX Standard Tests** and **TEST_29 - RX Quick Tests**, this value is used for checking the RSSI level on the secondary antennas (set by the **`Sector`** field on the Initialization Screen).

PARAMETER_26 RX RSSI/MCGAIN test all ants [0=no 1=yes]

This parameter determines the antenna ports on the receiver shelf that will be checked during TEST_12/13 RXA/B RSSI/MCGAIN Offset and Gain. This parameter overrides the value entered in the **`Sector`** field on the Initialization Screen, for TEST_12 and 13 only.

PARAMETER_27 RX SAT & ST test @ extremes [0=no 1=yes]

This parameter is used to test SAT and ST under extended test conditions.

See the description of **TEST_04 - RXA SAT Detection on page 134**.

PARAMETER_28 RX SAT detection RF level (dBm)

This parameter sets the signal generator level that is applied to the receiver during SAT tests when the minimum detectable level must be determined.

The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen. If the signal is applied to the receiver shelf inputs, the RF level is also corrected for the receiver shelf splitter loss in **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**. See the description for **"PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)" on page 215**.

PARAMETER_29 RX SINAD (dB)

This parameter is used when the SINAD set & measure method is not selected. The RF level is adjusted to the SINAD level defined by this parameter during TEST_02/03 RXA/B SINAD Sensitivity. Normally this value is set to 12 dB.

See **"PARAMETER_30 RX SINAD RF level for set & measure (dBm)" on page 221**.

PARAMETER_30 RX SINAD RF level for set & measure (dBm)

This parameter sets the level that is applied to the TRU during SINAD tests when the set and measure method is used. This level is the minimum RF level at which the SINAD must be acceptable.

The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen. If the signal is applied to the receiver shelf inputs, the RF level is also corrected for the receiver shelf splitter loss in **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**. See the description for**"PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)" on page 215** earlier in this section.

PARAMETER_31 RX SINAD test all ants [0=no 1=yes]

This parameter determines the antenna ports on the receiver shelf that will be checked during TEST_02/03 RXA/B SINAD Sensitivity. This parameter overrides the value entered in the **`Sector`** field on the Initialization Screen, for TEST_02/03 only.

PARAMETER_32 RX SINAD test by set & meas [0=no 1=yes]

This parameter determines which of two methods is to be used for the measurement of receiver sensitivity.

In the first method, chosen with a 0 entered into this parameter, the RF level that results in a particular SINAD value is determined through an iterative technique.

In the second method, “set and measure”, the RF level is set by the value in **PARAMETER_30 RX SINAD RF level for set & measure (dBm)** and the SINAD is measured and compared to **PASS/FAIL LIMIT_15 RX SINAD for set & measure (dB)** for set & measure.

See **TEST_02 - RXA SINAD Sensitivity on page 131** earlier in this chapter.

PARAMETER_33 RX SINAD test level deviation (kHz)

This parameter is used to set the level of the FM deviation of the RF signal generator when TEST_02/03 RXA/B SINAD Sensitivity are being performed.

PARAMETER_34 RX ST detection RF level (dBm)

This parameter sets the signal generator level that is applied to the receiver during Signaling Tone tests, when the minimum detectable level must be determined.

The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen. If the signal is applied to the receiver shelf inputs, the RF level is also corrected for the receiver shelf splitter loss in **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**. See the description for**"PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)" on page 215** earlier in this section.

PARAMETER_35 RX test w/external splitter [0=no 1=yes]

In some cases it is beneficial to use a six-way external Splitter between the Test Set duplex output and the six antenna inputs on the receiver shelf. This reduces the number of connections that must be made during testing. If you want to use the external Splitter, set this parameter to 1. Doing this will draw the correct diagrams for the user on the Test Set screen.

NOTE: Make sure you compensate for the Splitter loss by adding it to each **RX1 through 6 cable loss** field on the Initialization Screen.

To account for Splitter loss

- Use the **RX1 through 6 cable loss** fields on the Initialization Screen.

PARAMETER_36 RX tests perform at [0=Rcvr shelf 1=RMC]

Set this parameter to reflect the point at which receiver tests are to be performed at the cell site.

The two most common locations are the receiver shelf or the RMC input. The user will be prompted for the correct connection based on this parameter setting. If this parameter is set to 0, the Test Set RF generator will compensate for the receiver shelf splitter loss in **PARAMETER_14 RX rcvr shelf splitter loss (Typ 11 dB) (dB)**. If this parameter is set to 1, no compensation for the splitter will occur. The Test Set RF generator output is available at the DUPLEX OUT port.

TEST_10/11 RXA/B RSSI Offset cannot be performed at the shelf inputs.

NOTE: Connecting to the RMC will affect service on the whole cell site.

PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]

This parameter determines the antenna ports of the receiver shelf that will be used for tests of RXA if the **Sector** field on the Initialization Screen is set to **Parm**. None or all of the ports can also be chosen.

Enter **1**, **2**, or **3** to test RXA at a single antenna port.

When set to **7**, antenna inputs 1, 2, and 3 will be tested on RXA.

PARAMETER_38 RXB test ant [0=None 4,5,6=single 7=all]

See **"PARAMETER_37 RXA test ant [0=None 1,2,3=single 7=all]" on page 223**.

PARAMETER_39 TX duplexer/combiner loss

The value entered in this parameter is added to TX power measurements when **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 1 and **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]** is set to 1.

If PARAMETER_40 is set to 0 and PARAMETER_43 is set to 1, this parameter is used to compensate the default setting of the **TX Combiner Power (dBm)** field on the Initialization Screen. For example, under those conditions, the compensated power default setting would be 46.5 dBm minus the value entered in this parameter for an MPA. As other examples, the setting would be 47 for an SCLPA, and 30 for a NONE.

NOTE: The **TX Combiner Power (dBm)** field will appear on the Initialization Screen only if **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0; except if the power amplifier is type FMPA+, in which case, the field always will appear.

PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]

Enter the control choice to determine the manner in which the TRU power will be selected. Select 1 to direct the Test Software to read the reference power directly from the TRU internal settings. Select 0 to add the **TX Combiner Power (dBm)**field or the **TX Shelf Power (dBm)** field on the Initialization Screen so that you may enter the desired value.

The selection that determines which field (either the **TX Combiner Power (dBm)** field or the **TX Shelf Power (dBm)** field) will appear on the screen is dependent upon the setting of **PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**.

However, if the power amplifier is type FMPA+, the Test Software cannot reference the TX power from the Base Station. For this reason, one of the fields will always appear on the Initialization Screen.

PARAMETER_41 TX power adjust [0=no 1=fail 2=always]

Enter the control choice to determine whether a power measurement will be performed.

NOTE: If a Base Station of type NONE or MCPA is to be tested, the Test Software will check the maximum power and the nominal gain. If the settings are incorrect, the Test Software will display a prompt for the settings. The combination of the two settings (maximum power and nominal gain) must be less than 27. If the settings are incorrect and you elect to continue without changing the settings, the power step checks will not be performed.

If you select a type MCPA Base Station in the **Base station Radio** field of the Initialization Screen, no adjustment procedure will be performed.

If you select a Base Station of any type other than MCPA in the **Base station Radio** field of the Initialization Screen, the Test Software will perform the adjustment procedure if all three of the following conditions are met:

If the power level is 0.

If **PARAMETER_41 TX power adjust [0=no 1=fail 2=always]** is set to 1 or 2.

If **PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0.

There is also a further condition, and that pertains to whether the selected Base Station radio is type FMPA+, or not.

If you select the FMPA type in the **Base Station Radio** field in the Initialization Screen, and if PARAMETER_41 is set to 1 or 2, the Test Software will display a meter and prompt you to set the power level by adjusting the FMPA+ front panel trimming potentiometer.

If you select any type other than FMPA in the **Base Station Radio** field in the Initialization Screen, the Test Software will adjust automatically the internal TRU maximum power setting to the entered value.

PARAMETER_42 TX power, test down to pwr lev (0-7)

This parameter is used by the Test Software to determine the power levels that are checked while power tests are running.

Power levels from the highest level, down to the number entered into this parameter will be checked. For example, if this parameter is set to **6**, the test will check PA POWER 0 through PA POWER 6, the maximum through the next to minimum power level of the PA.

PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]

CAUTION If you connect to the duplexer or combiner outputs, no other transmitted signals can be present or damage will result to the Test Set RF input.

To make the transmitter measurements at the output of each PA, select 0. This will direct the user to connect to the Test Set RF input to the PA output on the PA shelf. You can make the transmitter measurements at the duplexer or combiner output. This reduces the number of connections the user has to make, but adds more uncertainty to the measurement.

Setting the parameter to 1 will cause the Test Software to instruct the user to connect to the combiner.

NOTE: Connecting to the combiner will affect service to the whole site.

PARAMETER_44 TX wideband data test BW [0=no 1=yes]

This function was automatic in earlier versions of the test Test Software (A.00.00), but as a parameter it now presents the user with the option to test data bandwidth spectrum when performing **TEST_21 - TX Wideband Data Deviation**.

If this parameter is set to 1, the Test Software will do the following:

- check the data bandwidth spectrum using the spectrum analyzer

PARAMETER_45 ZZZZ test mode [0=normal 1=demo]

This parameter is used to set up a demo mode.

When this parameter is set to 1, the Test Software will bypass most communication with the TRU, allowing the program to be demonstrated without the delay caused by TRU response time. This mode is useful if you are working in a training or practice situation without a TRU attached to the Test Set.

PARAMETER_46 GN if test fails [0=continue 1=stop]

This parameter is used to set up a “stop on failure” mode.

With this parameter set to **1**, a failure when testing will provide the user with choices on how to proceed:

- **Repeat** - the Test Set will take another reading for the same test and post the results. If the test fails again, the user can again choose from the four options of this list.
- **Continue** - this choice causes the testing to proceed despite the failed test. The next test of the sequence is then performed.
- **Abort** - the test will be stopped. If tests remain in the sequence, they will not be performed. A summary of the number of passed and failed tests will be printed and Test Software execution will halt.
- **Laptop** - pressing this USER key will take the user to the Laptop Emulator menu screen. This allows you to send control commands to the radio that may be required to continue on with testing. **See "TEST_34 - GN Laptop Emulator" on page 185**.

PARAMETER_47 TRU set audio sens at start [0=no 1=yes]

This parameter is used to instruct the Test Software to load the TX and RX audio sensitivities at the beginning of the test sequence.

- When set to 1 (**Yes**), the RX and TX audio sensitivity values will be downloaded to the radio (from PARAMETER_07 and PARAMETER_08) when the initial communication takes place at the start of testing.
- If set to 0 (**No**), the user can load the TX and RX sensitivities when running **"TEST_01 - TRU Read and Store TRU Settings" on page 128**.

See also **"PARAMETER_07 TRU audio RX sens (-28 to -16, incr 0.1) (dBm)" on page 213** and **"PARAMETER_08 TRU audio TX sens (-28 to -10, incr 0.1) (dBm)" on page 213**.

PARAMETER_48 GN TDMA Reference [0=10 MHz 1=48.6 kHz]

Enter the desired control choice to determine the TDMA reference to be used in test operations. Select 0 to use the Test Set internal oven controlled crystal oscillator; select 1 to use the external 48.6-kHz reference located in the Base Station.

PARAMETER_49 GN test TRU3 [0=no 1=yes]

Enter the control choice to indicate to the Test Software the type of the Base Station to be tested. Select 0 to indicate that the Base Station is of any type other than TRU3; select 1 to indicate that the Base Station is a TRU3 type.

- If you select 0, selection of TRU3 radio types will **not** be allowed in the **`Base Station Radio`** field of the Initialization Screen.
- If you select 1, selection of TRU3 radio types will be allowed in the **`Base Station Radio`** field of the Initialization Screen.

Pass/Fail Limit (Specification) Descriptions

Pass/fail limits define the values against which measurement results are compared to determine if the UUT meets the specified standards.

For information on editing Pass/Fail Limits, **see "Customizing Testing," in chapter 4, on page 78**.

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 Test 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 4, on page 91**. To print the list of pass/fail limits, **see "To Print Test Screens:," in chapter 6, on page 274**.

Pass/fail limits may be secured. **See "Securing a Procedure," in chapter 6, on page 281**.

The list of pass/fail limits is arranged alphabetically. The first few capital letters in the title of each pass/fail limit indicate its classification. The classifications are:

- GN=General
- RT=Receiver and Transmitter
- RX=Receiver,
- TX=Transmitter.

PASS/FAIL LIMIT_01 has been removed (was GN VSWR for discrete return loss (dB))

This pass/fail limit is no longer used by the TRU/DRU Test Software. The discrete return loss test has been removed from this test package. Refer to the AMPS Channel Return Loss test described in the *System Support Tests User's Guide* (part number 11807-90141).

PASS/FAIL LIMIT_02 GN VSWR for swept return loss (dB)

This pass/fail limit sets the minimum return loss that is acceptable for swept return loss.

PASS/FAIL LIMIT_03 RT audio deviation (kHz)

This pass/fail limit sets the acceptable range for the transmitter deviation when RF loopback is used to test the RX to TX gain path. See **TEST_14 - RTA Audio Level on page 150**.

PASS/FAIL LIMIT_04 RX RSSI level @ 0 dBm (dB)

This pass/fail limit sets the acceptable range of values for the reported level of the Received Signal Strength Indicator when 0 dBm is applied to an RX input of the receiver.

See **TEST_08 - RXA RSSI Linearity on page 138**.

PASS/FAIL LIMIT_05 RX RSSI level err @ –50 dBm (dB)

This pass/fail limit sets the acceptable error for the reported level of the Received Signal Strength Indicator when –50 dBm is applied to an RX input of the receiver.

See **TEST_08 - RXA RSSI Linearity on page 138**.

PASS/FAIL LIMIT_06 RX RSSI level err @ –60 dBm (dB)

See **"PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)" on page 230**. Replace “–50 dBm” with “–60 dBm”.

PASS/FAIL LIMIT_07 RX RSSI level err @ –70 dBm (dB)

See **"PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)" on page 230**. Replace “–50 dBm” with “–70 dBm”.

PASS/FAIL LIMIT_08 RX RSSI level err @ –80 dBm (dB)

See **"PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)" on page 230**.
Replace "–50 dBm" with "–80 dBm".

PASS/FAIL LIMIT_09 RX RSSI level err @ –90 dBm (dB)

See **"PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)" on page 230**.
Replace "–50 dBm" with "–90 dBm".

PASS/FAIL LIMIT_10 RX RSSI level err @ –100 dBm (dB)

See **"PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)" on page 230**.
Replace "–50 dBm" with "–100 dBm".

PASS/FAIL LIMIT_11 RX RSSI level err @ –110 dBm (dB)

See **"PASS/FAIL LIMIT_05 RX RSSI level err @ -50 dBm (dB)" on page 230**.
Replace "–50 dBm" with "–110 dBm".

PASS/FAIL LIMIT_12 RX RSSI offset level err @ –90 dBm (dB)

This pass/fail limit sets the acceptable offset of the reported RSSI when running TEST_10/11 RXA/B RSSI Offset.

See **TEST_10 - Test Removed (was RXA RSSI Offset) on page 143**.

PASS/FAIL LIMIT_13 RX RSSI/MCGAIN offset error (dB)

This sets the pass/fail limits for the RSSI Offset error in TEST_12/13 RXA/B RSSI/MCGAIN Offset and Gain. RSSI Offset error is determined using the following equation:

RSSI Offset error = reported RSSI from TRU - sector gain - RF level

If the resulting error exceeds the limits entered in this pass/fail limit, and **PARAMETER_23 RX RSSI/MCGAIN adj [0=no 1=fail 2=always]** is set to 1 or 2, the Test Software will adjust the TRU RSSI MC Gain until the reported RSSI error equals zero.

Chapter 5
Test, Parameter, and Pass/Fail Descriptions

PASS/FAIL LIMIT_14 RX RSSI/MCGAIN path gain (dB)

This sets the pass/fail limits for the RSSI path gain, including the RMC, receiver shelf splitter loss, and any cable losses associated with the signal path.

Gain is determined by the following equation:

Path Gain = Reported RSSI level - RSSI offset - Injected RF level

If the path gain exceeds the limits entered in this pass/fail limit, the user will be given the option to adjust the RMC gain. Choosing **yes** will display an adjustment meter.

PASS/FAIL LIMIT_15 RX SINAD for set & measure (dB)

If the measured SINAD is greater than the number entered into the lower limit of this pass/fail limit, then an RX sensitivity test will pass. For example, if the lower limit of this pass/fail limit is set to 12 dB, a sensitivity test will pass if the measured SINAD is greater than 12 dB. The RF level applied to the receiver is determined by **PARAMETER_30 RX SINAD RF level for set & measure (dBm)**. See **TEST_02 - RXA SINAD Sensitivity on page 131**.

PASS/FAIL LIMIT_16 RX SINAD sensitivity RF level (dBm)

This sets the limits for the TRU receiver RF input level when the receiver sensitivity for a particular SINAD is determined using an iterative technique.

See **TEST_02 - RXA SINAD Sensitivity on page 131**.

PASS/FAIL LIMIT_17 TX 1 kHz tone generator audio frequency (Hz)

This sets the limits for the frequency error measured in **TEST_22 - TX 1 kHz Tone Generator**. The Test Set instructs the Base Station to generate a 1 kHz tone with 8 kHz deviation. When the Test Set receives this tone, it demodulates it and compares the frequency with the upper and lower settings of this pass/fail limit.

PASS/FAIL LIMIT_18 TX 1 kHz tone generator FM deviation (kHz)

This sets the limits for the FM deviation measured in **TEST_22 - TX 1 kHz Tone Generator**. The Test Set instructs the Base Station to generate a 1 kHz tone with 8 kHz deviation. When the Test Set receives this tone, it demodulates it and compares the deviation with the upper and lower settings of this pass/fail limit.

PASS/FAIL LIMIT_19 TX combiner/duplexer or backplane loss

This sets the pass/fail limit of the TX combiner and/or duplexer loss which may be computed in **TEST_17 - TX Maximum Power and Power Level**.

The combiner and duplexer loss will be computed by the Test Software if the power reference is read from the Initialization Screen (**PARAMETER_40 TX pow ref from TRU settings [0=no 1=yes]** is set to 0), and the measurement is performed at the combiner (**PARAMETER_43 TX tests perform at [0=PA shelf 1=Comb]**. The results will be displayed and compared with the value entered in this pass/fail limit. This loss is computed using the following equation:

Combiner + Duplexer Loss = TRU Internal Power Level - *Measured Power Level*

PASS/FAIL LIMIT_20 TX frequency error (kHz)

This sets the pass/fail limit of the difference between the measured and assigned transmitter frequencies.

See **TEST_16 - TX Frequency Error on page 152**.

PASS/FAIL LIMIT_21 TX power error (dB)

This sets the pass/fail limit of the error of the PA output power when the TRU is in the analog mode. This pass/fail limit is used when the power error is checked at power levels 1 through 7.

See **TEST_17 - TX Maximum Power and Power Level on page 153**.

PASS/FAIL LIMIT_22 TX power error at power level 0 (dB)

This sets the pass/fail limit of the error of the PA output power when the TRU is in the analog mode. This pass/fail limit is used when the power error is checked at power level 0.

PASS/FAIL LIMIT_23 TX residual AM deviation (%)

This sets the pass/fail limits of the acceptable rms amplitude modulation of the PA output signal.

See **TEST_19 - TX Residual AM on page 158**.

PASS/FAIL LIMIT_24 TX residual FM (Hz)

This sets the pass/fail limits of the acceptable residual FM of the PA output signal.

PASS/FAIL LIMIT_25 TX SAT deviation (kHz)

This sets the maximum and minimum SAT tone FM deviation. Transmitter deviation resulting from the SAT tone is nominally 2 kHz.

See **TEST_18 - TX SAT Frequency and Deviation on page 157**.

PASS/FAIL LIMIT_26 TX SAT frequency error (Hz)

This sets the pass/fail limits of the error in the frequency of the 5970 Hz, 6000 Hz or 6030 Hz SAT tones modulated onto the transmitter.

See **TEST_18 - TX SAT Frequency and Deviation on page 157**.

PASS/FAIL LIMIT_27 TX wideband data BW @ +/–12 kHz offset (dBc)

This sets the pass/fail limits of the ratio of the power measured by the spectrum analyzer at frequencies offset from the carrier of the transmitted signal to the power of the signal.

The units dBc indicate dB referenced to the carrier.

See **TEST_21 - TX Wideband Data Deviation on page 160**.

PASS/FAIL LIMIT_28 TX wideband data deviation (kHz)

This sets the pass/fail limits of the maximum and minimum peak frequency deviation resulting from a wideband data signal.

See **TEST_21 - TX Wideband Data Deviation on page 160**.

PASS/FAIL LIMIT_29 TXD TDMA adjacent channel power (dB)

This sets the pass/fail limits of the ratio of the transmitter power in the adjacent channels to the power of the desired signal.

See **TEST_25 - TXD TDMA Adjacent Channel Power on page 167**.

PASS/FAIL LIMIT_30 TXD TDMA alternate 1 channel power (dB)

This sets the pass/fail limits of the ratio of the transmitter power in the alternate 1 channels to the power of the desired signal. The alternate 1 channels are two channels above and below the assigned channel.

See **TEST_25 - TXD TDMA Adjacent Channel Power on page 167**.

PASS/FAIL LIMIT_31 TXD TDMA alternate 2 channel power (dB)

This sets the pass/fail limits of the ratio of the transmitter power in the alternate 2 channels to the power of the desired signal. The alternate 2 channels are three channels above and below the assigned channel.

See **TEST_25 - TXD TDMA Adjacent Channel Power on page 167**.

PASS/FAIL LIMIT_32 TXD TDMA mod acc error vector mag peak (%)

See the description of **"PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)" on page 236**.

This pass/fail limit is the peak error vector magnitude over the sample period.

PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)

This sets the pass/fail limits of the difference in the actual transmitted phase and amplitude trajectory from the ideal one.

The transmitted signal can be imagined as a vector that rotates, due to the equivalent phase modulation on the signal, and changes in level, due to the equivalent amplitude modulation on the signal. The word “equivalent” is used because the signal is not actually independently phase and amplitude modulated. These modulations result from the 45-degree, shifted, differentially encoded, quadrature-phase shift-keying modulation. At certain times, called decision points, the phase error and amplitude error from ideal need to be within specified limits. The value of the vector that connects an ideal, mathematically derived vector to the transmitted vector is determined at the decision points. The values of these error vectors are summed using a square-root-of-the-sum-of-the-squares calculation. The error vector magnitude is the result of this calculation.

Prior to determining the transmitted vector to compare to the ideal vector, the characteristics of frequency error, origin offset, and amplitude droop are mathematically extracted. The first two items are separately specified. The last item is not relevant in the case of Base Station measurements and is not specified. See the descriptions of these pass/fail limits.

PASS/FAIL LIMIT_34 TXD TDMA mod acc EVM 10 averages (%)

See the description of**"PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)" on page 236**. This limit differs from the previously mentioned limit in that it computes the average error vector magnitude over 10 consecutive readings.

See **TEST_26 - TXD TDMA Modulation Accuracy on page 168**.

PASS/FAIL LIMIT_35 TXD TDMA mod acc frequency error (Hz)

See the description of **"PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)" on page 236**.

Prior to determining the transmitted vector for comparison to the ideal vector, the characteristics of frequency error, origin offset, and amplitude droop are mathematically extracted.

The frequency error of the signal is covered in this pass/fail limit.

PASS/FAIL LIMIT_36 TXD TDMA mod acc magnitude error (%)

See the description of **"PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)" on page 236**.

This pass/fail limit covers the error in the magnitude or amplitude due to the difference in the ideal and transmitted signal.

PASS/FAIL LIMIT_37 TXD TDMA mod acc origin offset (dBc)

See the description of **"PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)" on page 236**.

This pass/fail limit covers the characteristic of origin offset, which can be considered to be an unwanted, unmodulated signal at the carrier frequency, present in the transmitted signal.

The units dBc indicate dB referenced to the carrier.

PASS/FAIL LIMIT_38 TXD TDMA mod acc phase error (deg)

See the description of **"PASS/FAIL LIMIT_33 TXD TDMA mod acc error vector magnitude (%)" on page 236**.

This pass/fail limit covers the error in the phase due to the difference in the ideal and transmitted signal.

PASS/FAIL LIMIT_39 TXD TDMA power error (dB)

This sets the pass/fail limits of the average power of the transmitter while operating in the digital mode. This pass/fail limit is used in both of the tests that measure transmitter power in the digital mode.

PASS/FAIL LIMIT_40 RX RSSI/MCGAIN internal rssi offset (dB)

This sets the pass/fail limits of the internal RSSI offset value programmed into the radio.

See **"TEST_12 - RXA RSSI/MCGAIN Offset and Gain" on page 145** and **"TEST_13 - RXB RSSI/MCGAIN Offset and Gain" on page 149**.

PASS/FAIL LIMIT_41 RX Bit Error Rate (BER)

Enter the upper limit for the percentage of allowable error in the bit error rate (BER). This pass/fail limit is used in TEST_41 and TEST_42. It is not required that you enter a lower limit because of the nature of the measurement.

6

Reference (Alphabetical)

This chapter provides detailed descriptions of the features and functions of the HP 11807B Test 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 front panel.

Procedure: - Characters displayed on the Test Set screen.

k1 (**Run Test**) - A USER key in the column next to the Test Set screen. **Run Test** is displayed on the screen.

0.000000 - A field on the Test Set screen in which entries may be made.

Titles of documentation are printed in italics.

The term Test Set refers to the HP 8921A or the 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 screen, 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.

Configuration

Configuration defines the equipment arrangement that you use for data collection, RF switching, printing, and logging of Base Station messages. Below is an example of possible entries to the External Devices (or **`Edit Configuration`**) screen.

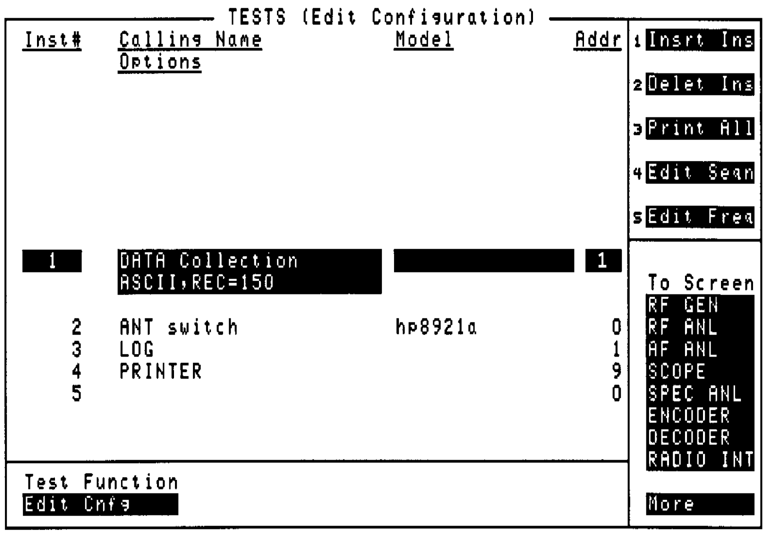


Figure 11 **An Example External Devices (Edit Configuration) Screen**

The entries shown in the example above set the Configuration to do the following:

- Collect data in an ASCII file using a memory card. 150 records are allocated.
- Use the Test Set Radio Interface Board to control a Switch Matrix.
- Log Base Station commands and messages to the screen.
- Print test results to a serial printer.

Messages and commands logged to the screen can quickly scroll off the top. These cannot be retrieved for subsequent display. If you wish to view this information, you may have to log to a terminal or printer. If you are using a terminal or serial printer, enter **`9`** into the **`Addr`** field on the **`External Devices`** (or **`Edit Configuration`**) screen.

Configuration Table

Table 9 and **Table 10** contain keywords that the Test Software will recognize. These keyword entries are made into the External Devices (or Edit Configuration) screen.

Keywords are entries you make that are used by the Test Software to provide information about the your particular RF signal path switches, printer and/or use of logging.

Numbers and uppercase characters in the calling names, options, and model numbers are necessary. Lower case characters are optional.

The numbers in the `Inst#` column correspond to the list item numbers produced by the Test Set firmware. Entries are not made into this column. The order of the configuration items can be different from that shown in the tables. For example, `LOGging` can be entered into `Inst# 1`.

Table 9 Data Collection and Logging Configuration

Purpose	Inst#	Calling Name Options	Model	Addr	Description
HP-IB/Serial Data Collection see *Data Collection*	1	DATA Collection	don't care	1	To memory card
	Options:[1]	File types of ASCII, or BDAT, or (EXT), [2] or blank,[3] REC=xxxxx		7xx[4]	LIF format LIF format DOS file type DOS or HP-UX file type[3] Number of records
	1	DATA Collection	don't care	9	Serial to external computer (laptop)

Table 9 **Data Collection and Logging Configuration**

Purpose	Inst#	Calling Name Options	Model	Addr	Description
Logging Commands/ Messages	3	LOGging	don't care	0	Logging off
	3	LOGging	don't care	1	Log to screen
	3	LOGging	don't care	7xx[4]	HP-IB printer
	3	LOGging	don't care	9	Serial printer

1. These options apply to memory card data collection, but they do not apply when collecting data with Addr=9.
2. A DOS file name extension. For example, the filename may be CELL1.EXT.)
3. DOS is used if the card format is DOS. HP-UX is used if the card format is LIF.
4. xx=Last two digits of HP-IB address.

Table 10 RF Switch Configuration

Purpose	Inst#	Calling Name Options	Model	Addr	Description
ANT Switching	4	ANT switch	HP 892xA	don't care (7xx not allowed)	Test Set Radio Interface
	Option:	LOW			Inverts polarity
	4	ANT switch	HP 3488A	7xx[1]	HP 3488A Switch/ Control Unit
PA Switching	5	PA switch	HP 892xA	don't care (7xx not allowed)	Test Set Radio Interface
	Option:	LOW			Inverts polarity

1. xx = Last two digits of HP-IB address.

To enter an item into External Devices (or Edit Configuration):

1. Press TESTS.
2. Select **External Devices** from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Position the cursor to the field in the column labeled **Inst#** and select it.
4. Rotate the knob and select the desired **Inst** number (the next available field).
5. Press USER (**Insrt Ins**) or USER **Delet Ins** to insert or delete instruments.
6. Position the cursor to the **Calling Name** field and select it.
7. Using the characters available in the **Choices Menu**, enter the desired **Calling Name**. (See table 9, "Data Collection and Logging Configuration" on page 242)
   - Use the ⇐ key to backspace.
   - Press CANCEL to cancel entries and retain the old entry.
8. Choose **Done** from the list after the entry is made.

9. Repeat for **`Options`**, **`Model`**, or **`Addr`** fields as appropriate. Default configuration entries have not been entered into the Test Software. Messages may be displayed if you do not make necessary entries into the **`External Devices`** (or **`Edit Configuration)`** screen.

The configuration remains in the Test Set battery-backed-up memory. The Configuration used after power-up is the same one that was in the Test Set memory when the last power-down occurred. The configuration is **not** saved with a Procedure to a memory card or RAM.

Copying Files

Files can be copied from one mass-storage device to another using IBASIC COPY commands. For example, to copy a file from a memory card to an SRAM memory card, load the program from the memory card into the Test Set, insert an initialized SRAM memory card, and then use the IBASIC SAVE command. Enter the following:

`SAVE "MY_TEST:INTERNAL"`

You can list the names of the files stored in a memory card catalog by using the IBASIC CAT command. To display a list of file names on a memory card, enter the following:

`CAT ":INTERNAL"` `or` **`CAT`**

If the mass storage is already defined to be the memory card, then **`":INTERNAL"`** is optional. If you are entering many characters into the IBASIC command line, you should connect a terminal to the Test Set. **See "Serial Port Connections for Data Collection," in chapter 3, on page 65**. You should also use a terminal if you have many files to list because file names displayed with the **`CAT`** IBASIC command scroll past the top of the Test Set screen and cannot be scrolled down.

IBASIC is used when writing your own programs and is not explained in this manual. If you wish to write your own IBASIC programs, you should acquire the following manuals:

- *HP Instrument BASIC User's Handbook* HP part number E2083-90000.
- *HP 8921A Programming Manual* HP part number 08921-90031.

See also: **"Data Collection (Saving and Retrieving Test Results)" on page 247** and **"Initializing a Memory Card" on page 262**.

Data Collection (Saving and Retrieving Test Results)

The Test Software has the capability to save test results to an SRAM memory card or to a PC.

Collection to a Memory Card

You will have to make entries into the **External Devices** (Edit Config) screen to describe the type of data collection you are using.

To configure **External Devices** entries:

1. Press TESTS
2. Select **External Devices** from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Position the cursor to the **Calling Name** field and select it.
4. Using the list of characters in the **Choices** menu, enter **DATA C** into the **Calling Name** next to **Inst# 1**. The entry will look like:

   1 DATA C

   Note: For some SW revisions, DATA C will appear in the **Choices** menu. In this case, you may select DATA C, then Done instead of typing each character individually.
5. Position cursor to the **Addr** field and select it.
6. Using the DATA keypad, enter a number into **Addr**, depending on the type of storage medium you will be using (press ENTER when finished).

If you are using a memory card, enter **1** into the **Addr**:

1 DATA C 1

Calling names can be entered in any order.

The Test Software supports data storage on Logical Interchange Format (LIF) and Disk Operating System (DOS) formats. Storage can be to any of the following file types:

- ASCII files under LIF
- BDAT files under LIF
- HP-UX files under LIF
- DOS files under DOS

You will be specifying the file type with the entry you make into the **Options** field immediately below **DATA C**. If no file type is entered, and the format is LIF, the Test Software will select an HP-UX file type. If no file type is entered, and the format is DOS, the Test Software will select a DOS file type. For example, if you are using a DOS file and you are not using an extension on the file name, the entry on this screen will look like (**x** is first unused **Inst#**):

```
x   DATA C    1
```

If you are using an ASCII, BDAT or HP-UX file, you can specify the number of records allocated to the file. The DOS file is automatically updated as data is stored, so record allocation is not required. If you are using HP-UX files, you will have to enter **REC=** to establish a usable number of records. **REC=20480** sets the size to be the same as the default number of 256 byte records used for ASCII files (80 × 256). You can enter the **REC=** after the file type. For example, to use an ASCII file with 200 records of 256 bytes each, you will enter **ASCII REC=200** into the **Options** field.

NOTE: For some Test Software revisions, **REC=** and **ASCII REC=** will appear in the **Choices** menu. In this case, you may select **REC=** or **ASCII REC=**, enter the number of records using the DATA keypad, then select **Done**, instead of typing in each character individually.

The display will appear as follows:

```
x   DATA C    1
          ASCII REC=200
```

The default number of records, used when no REC= entry is made, is 80.

Items in the **Options** field can be separated by a comma or a space.

See **"Initializing a Memory Card" on page 262** if using a new memory card. The file types under LIF can be used by the Test Set IBASIC controller and some HP workstations. The DOS format is required if you wish to use the card with a PC.

Table 11 Data Collection (Saving/Retrieving Tests) Configuration Summary

Inst#	Calling Name Options	Model	Addr	Description
x (first unused #)	DATA Collection	don't care	1	To memory card
Options:[1]	File types of ASCII, or BDAT, or (EXT),[2] or blank,[3] REC=xxxxx	don't care	7xx[4]	LIF format LIF format DOS file type DOS or HP-UX file type[3] Number of records
x (first unused #)	DATA Collection	don't care	9	Serial to external computer (laptop)

1. These options apply to memory card data collection, but do not apply when collecting data with Addr=9
2. A DOS file name extension. For example, the file name may be CELL1.EXT.
3. DOS is used if the card format isDOS.HP-UX is used if the card format is LIF
4. xx = last two digits of HP-IB address.

Retrieving Data from a Memory Card

See the description of **"TEST_36 - GN Data Collection File Transfer" on page 188** 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 12 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 serial port #*	Forms Path	*Enter path if used*
Printer I/F	None	Screen Size	*Enter the size*

Table 13 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 14 Remote Configuration Settings

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

To set up for data collection to a PC:

1. Press TESTS.
2. Select **External Devices** from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Position the cursor to the **Calling Name** field and select it.
4. Using the list of characters in the **Choices** menu, enter **DATA C** (next to **Inst# 1**):

```
1   DATA C
```

5. Position the cursor to the **Addr** field and select it.
6. Using DATA keypad, enter **9** and press ENTER:

```
1   DATA C     9
```

Calling names can be entered in any order.

Configuration for Terminal or PC Operation

It is preferable to enter long strings of characters into fields using a terminal. The characteristics of the serial port, when used for instrument control from a terminal or terminal emulator, are determined by settings on the Test Set I/O CONFIGURE screen.

Set the following:

- **`Serial In`** to **`Inst`**
- **`IBASIC Echo`** to **`On`**
- **`Inst Echo`** to **`On`**

Set the remaining configuration entries to match the settings of your terminal or PC program.

Equivalent Front-Panel Control Characters

The following **table 15** lists the terminal/computer keystrokes that equate to front-panel controls. *Each equivalent character must be preceded by the Escape key*.

For example, to remotely access the CONFIGURE screen, type Esc, C on your terminal/computer. (Be sure to use upper-case C for this example.)

Alternate sequences for 5 commonly-used functions are also available. Hold down the Ctrl (control) key and select the corresponding key for the desired function. (Example: Ctrl/H moves the cursor to the left one space.)

ENTER -^J or ^M

CANCEL - ^C

BACKSPACE - ^H

KNOB_TURN_CW - ^R

KNOB_TURN_CCW - ^L

Table 15 Equivalent Front-Panel Control Characters

<table>
<tr><th>Function</th><th>Equiv. ESC Char.</th><th>Function</th><th>Equiv. ESC Char.</th><th>Function</th><th>Equiv. ESC Char.</th></tr>
<tr><td>CANCEL</td><td>!</td><td>SAVE</td><td>G</td><td>PRESET</td><td>i</td></tr>
<tr><td>PERCENT MHZ_V</td><td>(</td><td>REF_SET</td><td>J</td><td>INCR_DIV_10</td><td>j</td></tr>
<tr><td>S_KHZ_MV</td><td>)</td><td>METER</td><td>K</td><td>INCR_SET</td><td>k</td></tr>
<tr><td>BACKSPACE</td><td>-</td><td>AVG</td><td>L</td><td>INCR_TIMES_10</td><td>l</td></tr>
<tr><td>ENTER</td><td>.</td><td>LO_LIMIT</td><td>M</td><td>DOWN</td><td>m</td></tr>
<tr><td>RELEASE</td><td>0</td><td>HI_LIMIT</td><td>N</td><td>UP</td><td>n</td></tr>
<tr><td>K1</td><td>1</td><td>E</td><td>R</td><td>SEVEN</td><td>o</td></tr>
<tr><td>K2</td><td>2</td><td>F</td><td>S</td><td>EIGHT</td><td>p</td></tr>
<tr><td>K3</td><td>3</td><td>B</td><td>U</td><td>NINE</td><td>q</td></tr>
<tr><td>K4</td><td>4</td><td>C</td><td>V</td><td>FOUR</td><td>r</td></tr>
<tr><td>K5</td><td>5</td><td>D</td><td>W</td><td>FIVE</td><td>s</td></tr>
<tr><td>K1_PRIME</td><td>6</td><td>A</td><td>X</td><td>SIX</td><td>t</td></tr>
<tr><td>K2_PRIME</td><td>7</td><td>EEX</td><td>Z</td><td>ONE</td><td>u</td></tr>
<tr><td>K3_PRIME</td><td>8</td><td>YES_ON_OFF</td><td>[</td><td>TWO</td><td>v</td></tr>
<tr><td>ASSIGN</td><td>9</td><td>NO_PPM_W</td><td>]</td><td>THREE</td><td>w</td></tr>
<tr><td>KNOB_TURN_CCW</td><td><</td><td>RX</td><td>a</td><td>ZERO</td><td>x</td></tr>
<tr><td>KNOB_TURN_CW</td><td>></td><td>TX</td><td>b</td><td>POINT</td><td>y</td></tr>
<tr><td>MSSG</td><td>A</td><td>DUPLEX</td><td>c</td><td>PLUS_MINUS</td><td>z</td></tr>
<tr><td>HELP</td><td>B</td><td>PREV</td><td>d</td><td>OHM_PCT_DEL_DBUV</td><td>{</td></tr>
<tr><td>CONFIG</td><td>C</td><td>TESTS_MAIN</td><td>e</td><td>DB_GHZ_DBM</td><td>|</td></tr>
<tr><td>HOLD</td><td>D</td><td>LOCAL</td><td>f</td><td>MS_HZ_UV</td><td>}</td></tr>
<tr><td>PRINT</td><td>E</td><td>RECALL</td><td>g</td><td></td><td></td></tr>
<tr><td>ADRS</td><td>F</td><td>MEAS_RESET</td><td>h</td><td></td><td></td></tr>
</table>

Exiting 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, press the DUPLEX key as a last step before continuing the Test 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`**).

Frequency Table

The frequency table is used to enter and store channel numbers and TRU/DRU slot location numbers (for example, location 1-8). Procedures may be set up to consecutively test all eight radios on a shelf by entering the information into the frequency table. The procedure (including the frequency table) may also be saved to an SRAM memory card for later use (see **"Procedures" on page 276**).

The **Test?** field is useful if you have saved all of the shelf information to a frequency table and wish to go back and test some (but not all) of the channels. By setting this field to **No** for the TRU location slot(s) you do not wish to test, you will retain the channel and shelf number information in the procedure, but not test the channel(s). Change this setting back to **Yes** when you wish to test the channel(s).

NOTE: **PARAMETER_11 GN enter chan [0=edit fr 1=prompt 2=LCR]** allows you to choose if the Test Software should read frequency information from the Frequency Table (set parm to 0), or from a prompt that will appear at the beginning of Run Test (set parm to 1). Setting this parameter to 1 will allow you to test only one channel at a time. The default setting for this parameter is 1. You must change it to 0 if you wish to use the frequency table.

To edit a frequency table:

1. Press TESTS.
2. Select **Channel Information** from the **SET UP TEST SET** list (or **Edit Freq** from the **Test Function** field).
3. Position the cursor to the **Channel#** (or **RX Chan Info**) field and select it.
4. Using the DATA keys, enter the channel number and select it.
5. Position the cursor to the **Slot# (1-8)** (or **TX Chan Info**) field and select it.
6. Using the DATA keys, enter the slot number (position on the shelf, 1-8), and select it.
7. Position the cursor to the **Test?** field and select it.
8. Press the knob to toggle the underline to the desired response (**Yes** or **No**).
9. Press TESTS to return to the Test Screen.

HP-IB Control Annunciators

The words, letters, and symbols at the top right corner of the screen 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 Test 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).

Logging

Logging is used to monitor all of the commands from the Test Set to the Base Station and all of the messages returning from the Base Station. These commands and messages may be displayed on the screen or output to a printer.

To enable the logging function:

1. Press TESTS.
2. Select **External Devices** from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Press k1 (**1 Insrt Ins**).
4. Position the cursor to the **Inst#** field and select it.
5. Rotate the knob to the first vacant **Calling Name** field and select it.
6. Position the cursor to the **Calling Name** field and select it.
7. Enter L O G into the Calling Name field by:
   a. rotating the knob and positioning the cursor beside L in the **Choices** field and selecting it.
   b. repeating for O and G.
   c. positioning the cursor to **Done** in the **Choices** field and selecting it.
8. Position the cursor to the **Addr** field and select it.
9. Choose output mode:
   a. For screen: Press 1 on the DATA keypad and press ENTER.
   b. For HP-IB printer: Press 70x on the DATA keypad and press ENTER.
   c. For serial printer: Press 9 on the DATA keypad and press ENTER.
10. Press TESTS to return to the TEST Main Menu screen.

NOTE: Logging occurs rapidly on the screen. To stop for inspection, press CANCEL. To continue, press the User Key k2 (**Continue**).

Memory Cards

Memory cards are inserted into the slot on the Test Set 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 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 (specification) values
- A Library file
- Procedures that you make, optimized for your application
- Data collection files
- Channel Information
- User defined keys

Two types of memory cards are available:

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

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

The Test 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 16 SRAM Memory Card Part Numbers

Memory	Part Number
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, to save ten different procedures will require 61 kilobytes of memory. The 64 kilobyte or 128 kilobyte card is sufficient.

The storage space required for data collection depends on the number of test results to be saved. Each page of test results that you save will require approximately 4 kilobytes of storage space. A page of test results is about 57 lines of screen or printer output.

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

Initializing a Memory Card

Initializing HP 11807B cards using the TESTS **Save/Delete Procedure** screen automatically defaults to LIF format. However, initializing cards from the **Save/Delete Procedure** screen is only available on HP 8921A Test Sets with firmware above revision A.15.00. If these settings do not match your needs, there is another method described below in which you may select the format.

To Initialize a Memory Card Using Save/Delete Screen

1. Press TESTS.
2. Select **Save/Delete Procedure** from the **CUSTOMIZE TEST PROCEDURE** list.
3. Insert the SRAM memory card in the slot on the front panel. (Make sure the switch on the card is not in the write-protected position).
4. Press k3 (**Init Card**).
5. Press Yes if you want to continue.

There are two other methods described below in which you may initialize the card and select the format. If you have a terminal emulator attached to the Test Set, you can type a command into the IBASIC command line. A second way to initialize a card is to run the ROM program RAM_MNG.

To initialize an SRAM memory card using IBASIC

1. Press TESTS.
2. Select **IBASIC Cntrl** from the **SET UP TEST SET** list (or **IBASIC** from the **Test Function** field).
3. Position the cursor to the IBASIC command line and select it.
4. Using the list of characters under the **Choices** menu, enter the following IBASIC command:

For LIF format: **INITIALIZE ":INTERNAL"**

For DOS format: **INITIALIZE "DOS:INTERNAL"**

To initialize an SRAM memory card using RAM_MNG

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 **`RAM_MNG`**).
6. Press k1 (**`Run Test`**).
7. Follow the displayed instructions.

NOTE: Loading RAM_MNG will delete any procedure or program in memory.

Retrieving Data from a Memory Card

See the description of **"TEST_36 - GN Data Collection File Transfer" on page 188** for information on retrieving data.

Parameters

Parameters are values that you enter to optimize your use of the Test Software. Many of the parameters are determined by examining your test requirements.

Default values are set into the Test 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. Before loading another procedure, save as a new procedure any parameters that you wish not to lose. See **"Saving a Procedure" on page 277**.

To print the parameters list, see **"To Print Test Screens:" on page 274**.

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 that you enter to set passing limits for tests. Default values are available in the Test Software. These have been derived from standard methods of measurement.

Pass/fail limits need not be changed when you select a test or change the tests in your procedure. Most tests have pass/fail limits.

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 the tests are contained in the test descriptions in chapter 4 of this manual. A lock is provided to prevent access to the pass/fail limits. See **"Saving a Procedure" on page 277**.

Pass/fail limits remain in the Test Set battery-backed-up memory until you select a procedure to run. Before loading another procedure, save as a new procedure any pass/fail limits that you wish not to lose. See **"Saving a Procedure" on page 277**.

To print the pass/fail limits list, see **"To Print Test Screens:" on page 274**.

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.

CHANGING SETTINGS WHILE PAUSED

If you make changes to instrument settings while the program is paused, subsequent operation may be unpredictable. Error messages might be displayed. See **"Exiting a Program" on page 255** in this chapter.

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 test 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)

There are four 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 268**).
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 269**).
3. Configure the Test Set for your printer and its interface (see **"Configuring the Test Set for Printing" on page 271**).
4. Instruct the Test Set what to print (see **"To Print Test Screens:" on page 274**).

Supported Printers

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

If you do not have one of these printers, consult your printer 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 rear-panel HP-IB connector with an HP-IB cable.

Serial Connection

A serial printer can be attached to the serial port. See **figure 12** . Use the following RJ-11 pins for this connection. You may order this cable from Hewlett-Packard using part number HP 08921-61038.

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

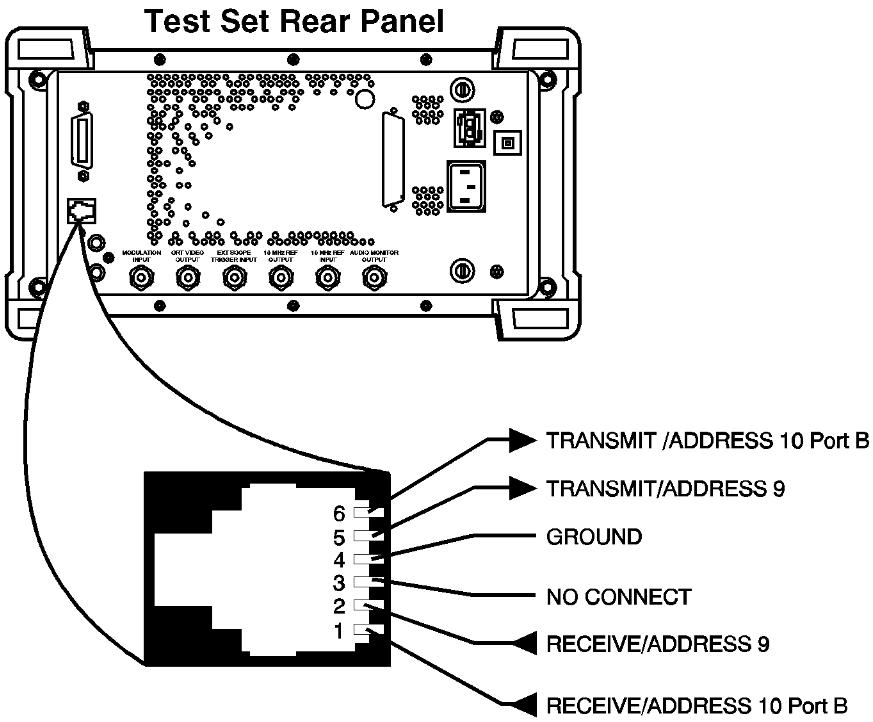


Figure 12 **Test Set RJ-11 Serial Port Connections**

Parallel Connection

NOTE: This parallel port is only available on Test Sets with serial prefix 3503 and above.

A parallel printer can be attached to the parallel port. Use the following **figure 13** for pin information. You may order this cable from Hewlett-Packard using part number HP C2950A.

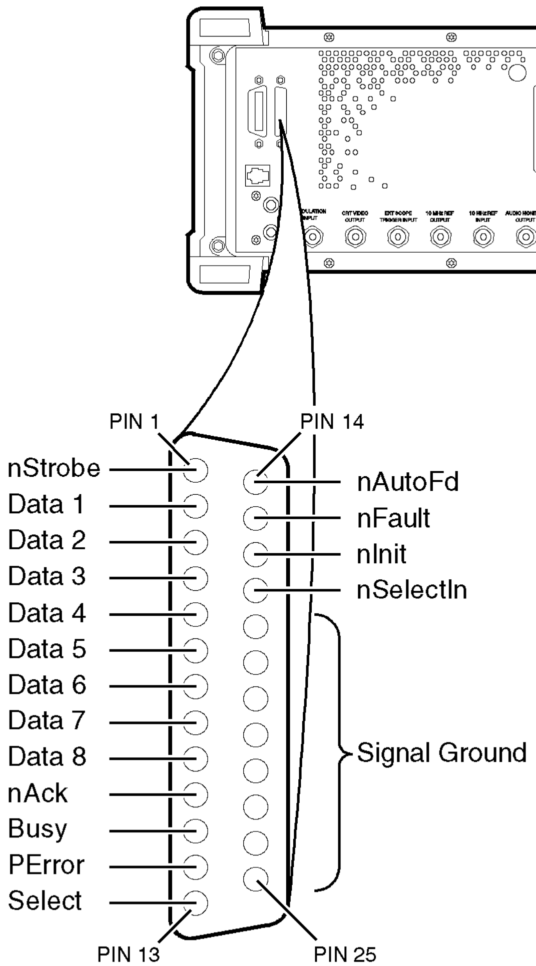


Figure 13 **Test Set Parallel Port Connections**

Configuring the Test Set for Printing

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

PRINTER SETUP DIFFERENCES

The HP 8921A has several firmware enhancements, some of which affect setting up for printing. The following **`Setup Printer`** section applies to users with:

- HP 8921A Test Sets with firmware above revision A.15.00.

The Test Set 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.

To Set Up Printer Using HP 8921A FW Above Rev A.15.00

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 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 Test Software comes with some pre-defined escape sequences compatible with HP printers, listed below, or you may enter others that are compatible with your printer (use your printer user manual for the available print features and corresponding escape sequences).

The Test Software has an implied escape character for the first sequence. You need only 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 sequences. 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.

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 17 **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 Test 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.

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 need not save a test sequence in a procedure. Each test can be stand-alone. After you choose a procedure, you can choose which of the tests to run.

When you save a procedure, you will save only test parameters, pass/fail limits, and a testing order. The memory card 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 that you use will be the library that is supplied with your Test Software. When you save your procedure, the library will be automatically saved on the same card.

The procedure(s) supplied with your Test Software will be listed in the **`Choices:`** column when you select the **`Select Procedure Filename:`** (or **`Procedure`**) field. Procedures will be displayed if your Test 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 or internal RAM by doing the following.

The SRAM memory card must be initialized before its first use. See **"To Initialize a Memory Card Using Save/Delete Screen" on page 262**.

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 memory card (HP 8921A firmware revision A.15.00 and above).

    a. Insert card in the slot on the Test Set 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 front-panel.
8. Verify that the card or other media is not write-protected. See **"Memory Cards" on page 259**.
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**, or **RAM**. 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 battery-backed-up memory. This location will usually be the Test 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 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**, or **RAM**.
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 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 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 284**.

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 Disk

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"
```

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

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 **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 **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 247**).

Serial Port

The 6-pin, RJ-11 connector contains two serial port that are used to input and output serial data. Serial data is used for entering programs, printing, and sending test results to a connected controller or terminal.

Operating Considerations

The two independently controllable serial ports have fixed select codes. Select code 9 is assigned to the primary “A” serial port and select code 10 to the “B” serial port. The primary serial port (select code 9) configuration settings can be made from either the I/O CONFIG screen or from an IBASIC program. The “B” serial port configuration settings can only be made from an IBASIC program. The two serial ports use a three wire connection format:

Primary Serial Port (select code 9):

Transmit (pin 5)
Receive (pin 2)
Ground (pin 4)

B Serial Port (select code 10):

Transmit B (pin 6)
Receive B (pin 1)
Ground (pin 4)

The single ground pin is shared by both ports (see **figure 14, "Test Set RJ-11 Serial Port Connections," on page 288**). The IBASIC controller can send and receive data from either port by using its assigned select code. The primary serial port (select code 9) is used exclusively by the Test System for printing screen dumps to a serial printer. The “B” serial port (select code 10) is used exclusively by the Test Software for control of the UUT.

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 Test Set to a serial printer, terminal, or computer.

To connect a serial printer and the UUT simultaneously, use a single RJ-11 to dual RJ-11 adapter (HP p/n 08921-61031). Connect the single end of the adapter to the RJ-11 connector on the rear panel of the Test Set and connect the serial printer and the UUT RJ-11 cables to either of the ports on the dual end.

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 18** before connecting cables to the instruments.

The following **table 18** lists connections for Transmit, Receive, and Ground pins (address 9).

Table 18 **Connections for Transmit, Receive and Ground Pins**

Test Set RJ-11 Serial Port		Terminal/PC 25-Pin RS-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)

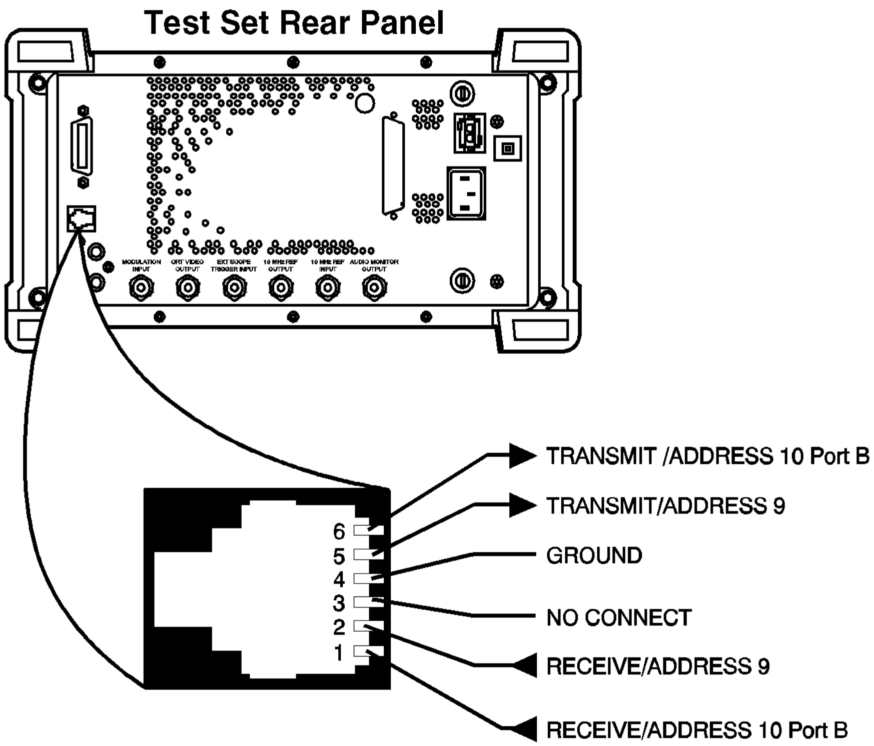


Figure 14 **Test Set RJ-11 Serial Port Connections**

Test Execution Conditions

In some situations, you may wish to change the way the Test 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**.

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 screen. If you select **Printer**, test results will be sent to the screen and to a printer. You must connect and configure a printer if you select **Printer**. See **"Printing" on page 267**.

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 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 select **Continue**, testing will proceed whether a test fails or passes. Tests that fail will be marked with an **F**, but the next test will be automatically run.

If you select **Stop**, and a pass/fail result is **F**, the program will pause. You can then:

- Continue (accept the failure and go on with the next test in the sequence) by pressing k2 (**Continue**).
- Repeat the test that failed by pressing k1 (**Repeat**).

Test Procedure Run Mode (Run Mode)

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

You can have the program pause between each test in the sequence. If you set **Test Procedure Run Mode** 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**).

Another choice while paused between tests is to repeat the test by pressing k1 (**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 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.

Abort

This USER key is provided when the Test Software is set up to stop on a failure in a test. Pressing **`Abort`** will cause the Test Software to immediately cease testing and exit Test Software execution.

Clr Scr

This USER key clears the Test Set screen. If you clear the screen and then continue the program, there may be an interconnect diagram partially displayed. Re-run the program to re-display the entire interconnect diagram.

Continue

This USER key continues the program after it has been paused. See **"Exiting a Program" on page 255**.

Delete Ch

This USER key is used during the editing of items in the Channel Information list. When you press this key, the channel in the displayed list that has its **`Chan#`** highlighted (inverse video) will be deleted. The channels that follow in the sequence will be scrolled up by one.

Delet Stp

This USER key is used during the editing of 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.

Done

Press this USER key if you want to accept the level displayed on the meter and continue with the program, or if you are finished with the present test and wish to move on to the next test in the sequence.

TRU Data

This USER key is displayed at times, while **TEST_34 - GN Laptop Emulator**.

Press USER **`TRU Data`** to display the current settings in the TRU and enter and download new ones. The functions available on this screen are identical to those in **"TEST_01 - TRU Read and Store TRU Settings" on page 128**.

Edit Seqn
Edit Freq
Edit Spec

These keys can be used to quickly access a tests sub-screen. This sub-screen is used to enter one or more tests into a sequence.

These keys are not displayed while the program is running. To display these keys, pause the program by pressing the CANCEL key, then press the TESTS key.

Exit

Press this key if you are finished with the present test and wish to move on the next test in the sequence.

Help

Pressing this key will provide information on how to use the current TEST screen.

Init Card

This key appears on the **`Save/Delete Procedure`** screen. It 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.

Insert Ch

This USER key is used during the entry of items into the Channel Information list. When you press this key, the item in the displayed list that has its **`Chan#`** highlighted (inverse video) will be copied into a new location, immediately after the highlighted one. The items that follow in the sequence will be scrolled down by one.

Insrt Stp

This USER key is used during the entry of 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.

Laptop

This key is provided to give you quick access to the Laptop Emulator screen. The **`Laptop`** USER key is displayed at times when you may want to have control of the transceivers (such as when a test has failed its specification).

Main Menu

This key is used to return to the main TESTS screen. The same result is achieved by pressing TESTS.

Not Set

When a meter is displayed on the Test Set screen, pressing **`Not Set`** will cause the Test Software to exit the adjustment procedure, print a flag on the screen showing the adjustment cannot be made, and continue with the next steps in the program.

Page Up
Page Down

These USER keys move a selection list up and down in the Test Set screen. They are used to quickly display items in the list when some of the items won't fit on the screen.

Print All

This USER key is displayed when the screens to edit the test conditions are displayed. The USER key can be used to print, using the Serial or HP-IB ports, the sequence, test channels, specifications, parameters, and configuration you have set up. The selected Procedure, Library, and date and time are printed at the top of the output. The **Print To** field on the CONFIGURE screen must be set to **Serial** or **HP-IB**, matching the type of printer you are using.

You may want to use this key to produce a printed record of the test setup conditions you have entered.

Prt Full

When a list of Base Station messages are displayed on the Test Set screen, the display can be expanded by pressing this key.

Repeat

This USER key is displayed between tests (if the **Single Step** mode is used) and when a test fails (if the "stop on fail" mode has been chosen). Press k1 (**Repeat**) if you would like to have the same test performed again.

Reset TRU

Pressing this key will cause the Test Software to send a sequence of commands to reset the TRU. This key will cause the TRU to exit the "FS DEBUG" or another operation state and return to the "ROM IDLE" state. Subsequently, the Test Software in the Test Set will return to the part of the program that sets up the TRU for a test.

Retest

Pressing this key exits the adjustment procedure so that a measurement and display of the test can take place. If the re-test does not pass the program will re-display the meter so adjustment can continue.

Run

This USER key starts an IBASIC program that has been loaded into the Test Set memory.

Run Test

This USER key loads and runs the program that results from the Procedure that has been entered into the TESTS screen **Select Procedure Filename:** entry. If the program is already loaded into Test Set memory, it will be started. Changes you have made to the sequence or other TESTS screen entries will be used. If you have selected the **Procedure:** field and changed its contents, the TESTS screen conditions that are saved in the Procedure will be used.

RX Test

This key changes the screen when TEST_24 **-GN Manual Test Mode** is running. Receiver measurements and settings will be displayed.

Sngl Step

This USER key steps the IBASIC program one line at a time. This is different from **Continuous/Single Step** run mode. See "Test Execution Conditions" on page 289.

Start Tst

This USER key is displayed while the TRU setup information is displayed on the Test Set screen. Pressing this key while the TRU is in the “ROM IDLE” mode causes the Test Software to send a terminal break followed by a “SET LT OFF” command to the TRU. Testing will continue if the correct responses are received.

Stop Test

This USER key pauses the Base Station Test Software. It is equivalent to pressing the CANCEL key to pause the Test Software. The program may be subsequently continued by pressing USER (**Continue**).

Tns Off
Tns Quiet
Tns Loud

Audible tones give you feedback during the adjustment procedure. Use these keys to change the volume of the tones.

TX Test

This key changes the screen when TEST_24 **-GN Manual Test Mode** is running. Transmitter measurements and settings will be displayed.

Yes
No

These USER keys are pressed when answering questions displayed on the Test Set screen.

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 Hotline from anywhere in the USA or Canada (1-800-922-8920, 8:30 a.m. - 5:00 p.m. Mountain time) or contact your local sales representative.

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 *Assembly Level Repair* manual or contact your local sales representative.

Base Station Control Difficulties

Check that the RS-232 and RJ-11 receive and transmit lines are properly wired.

- Verify that all instruments are powered up.
- Verify that the RJ-11 cable has six wires and six connections.
- Only the Serial B port on the Test Set can be used for TRU control.
- Verify that the RS-232 cable is connected to the RJ-45 connector on the TRU with the correct pin connections.

See chapter 3, "Making Connections".

To monitor the messages sent to and from the Base Station, **see "Logging" in chapter 6**.

Data-Collection Function Does Not Work

1. Check that you have **DATA C** entered in the **External Devices** (or **Edit Cnfg**) menu.
   a. Press TESTS
   b. Select the **External Devices** screen, from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
   c. Position the cursor to the **Calling Name** field, push the knob and enter:

      DATA C.
2. Check the **Model** field, it should be kept empty since it is not used.
3. Check the **Addr** (address) field to make sure the correct address is entered for where the data is to be stored.
   a. If data is to be stored on an SRAM memory card, enter “**1**” into the **Addr** field.
   b. If data is to be stored on an external computer through the Test Set RS-232 serial port (if available), enter “**9**” into the **Addr** field.
4. Check the **Options** field to make sure it is correctly set up:
   a. **For an SRAM card:**
      Enter **ASCII** for saving data as an ASCII file.
      Enter **BDAT** for saving data as a Binary-Data file.
      As an option, you may enter **REC=xxx**, where “**xxx**” is the number of records for each file. (*The Test Software defaults to 80 records. However, if too small a record size is used, you’ll get an* “**End of file error**” *when the test is run.*)
   b. **For a DOS format SRAM card, you may keep the Options field empty, or you may enter any of the following key words:**
      Enter **ASCII** for saving data as an ASCII file.
      Enter **BDAT** for saving data as a Binary-Data file.
      Enter **REC=xxx** for the file record size, where “**xxx**” is the number of records for each file. (*The Test Software defaults to 80 records. However, DOS systems automatically change record size if it is too small.*)
      Enter a **(dot extension)** of 3 characters or less for the file name. For example, all model ABCD radios tested may be organized to have a “.ABC” file extension.

NOTE: When the test operator is prompted to enter a file name where data is to be stored, the protocol for the mass-storage device being used must be followed.

Hierarchial directory paths are not allowed, and all files are created with “**FORMAT ON**”.

External Switch Doesn’t Switch

- Verify that you have made the correct entries to the TESTS **`External Devices`** screen for the switch that you are using.
- Check the connections to the Test Set DB-37 connector.
- If you are using the Radio Interface Board, verify that the option is installed and properly connected to the external switches.

See **chapter 3, "Making Connections"**.

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. Press ON/OFF to clear register.
4. 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.

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 baud rate, parity, and so forth.
5. Refer to the Test Set *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, check the settings that are used for the tests.

1. Press TESTS.
2. Select **`Execution Cond`** from the **`SET UP TEST SET`** list
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 may alter settings to experiment with the measurement, but the settings must be returned to the 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 *User's Guide*.

Error Messages

Many error messages are coded into the Test Set 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 below, 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 following manuals:

- Test Set *User's Guide*
- Test Set *Programmer's Guide*
- Test Set *Assembly Level Repair Manual*

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 1-800-922-8920 or contact your local sales representative.

Error Message Reference

ADC underdriven. Absolute value of the peak sample is less than 30 dB below FS of the ADC.

The Analog to Digital Converter in the HP 83204A, Option 001 TDMA Dual-Mode Cellular Adapter must have sufficient level applied.

- Check the level of the RF signal being applied to the Test Set.
  1. Press DUPLEX.
  2. Read the value on the power meter.
  3. Compare this value with the PA output pass/fail limit.

The test will continue with this error present and the results will be displayed. However, performance may be degraded.

ADC overdriven. Absolute value of the peak sample is at the ADC full scale.

The Analog to Digital Converter in the HP 83204A, Option 001 TDMA Dual-Mode Cellular Adapter must not be overdriven. This message may be displayed if the transmitter is not being set to the correct power levels.

- Check the level of the RF signal being applied to the Test Set.

1. Press DUPLEX.
2. Read the value on the power meter.
3. Compare this value with the PA output pass/fail limit.

The test will continue with this error present and the results will be displayed. However, performance may be degraded. The Test Set was unable to use the synchronization word sent.

An error free sync word was not found. The SyncLoc result is not valid.

- The digital mode Base Station equipment may not be functioning properly.

  1. Run the test on another TRU and see if this message occurs again.

If the message does not occur, it is likely that the Base Station equipment is not functioning properly.

If the message does occur again, there may be a Test Software problem. Call (1-800-922-8920).

- The level of the RF signal into the Test Set may be too low.

  1. Press DUPLEX.

  2. Read the value on the power meter.

  3. Compare this value with the PA output pass/fail limit.

Channel error. Range is 1 to 799 and 991 to 1023. Change channel number in the Channel Information (or Edit Frequencies) screen. Channel entries must be in this specified range.

- Enter channel numbers into the **`RX Chan Info`** field on the Channel Information (or Edit Frequencies). screen.
- The **`TX Chan Info`** field for each of the **`Chan #`**s is used to indicate the TRU number to be tested.
- The last **`RX Freq`** entry must be **`-1`** to terminate the channel list.

Data collection address cannot be set to 10. Program stopped.

The second serial port in the Test Set has an address of 10. It is used for TRU control. The Serial port, having an address of 9, can be used for data collection. If you are collecting data to an HP-IB device, you have to enter all three digits of the address. For additional information, **see "Data Collection (Saving and Retrieving Test Results)" in chapter 6**.

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 be over-written. Once a file is over-written, it is unretrievable. There is no back-up.

Entry (TRU message) is out of range.

This error message is displayed if the message or values sent from the TRU to the Test Set is not within certain ranges.

- Check the firmware revision of the TRU, and determine if it is supported by the Test Software (call 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 receive valid files from a memory card.

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

Error in ANT switch number. Program stopped.

This message will appear if the Test Software has tried to select an ANT switch number outside the range of 1 to 6. If this message appears, call (1-800-922-8920).

Error in channel. Re-enter in RX Chan Info field.

The channels that are tested must be entered into the **RX Chan Info** field on the Channel Information (or Edit Frequencies) screen. This field is the lower field in the second column on the screen. Entry range is 1 to 799 and 991 to 1023. The **TX Chan Info** field is used to indicate the number of the TRU to be tested.

Error in data collection information on cnfg screen.

This message is displayed if the file type or record number is not properly entered into the External Devices (or Edit Configuration) screen.

To access the **External Devices** screen:

1. Press TESTS.
2. Select **External Devices** from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Verify that the entries are correct.
   a. **Data C** should be entered in the **Calling Name** field.
   b. Check the entry in the **Addr** field. See **table 9 on page 242** in **chapter 6, "Reference (Alphabetical)"** for the appropriate entries.

Error in PA switch number. Program stopped.

This message will appear if the Test Software has tried to select an PA switch number outside the range of 1 to 8. If this message appears, call (1-800-922-8920).

HP-IB Command not accepted. Option not installed.

This message may be displayed when the Test Software tries to control a non-existent Radio Interface Board or non-existent other Test Set option.

- Check the Test Set rear panel for the Radio Interface connector.
  - If no Radio Interface connector is present, your Test Set does not have this option installed.
  - If a Radio Interface connector is present, check the LIST_OPTS program to verify that it is working properly.
  - If RADIO INTERFACE is not listed on the screen, the radio interface board may not be working properly.
  - If RADIO INTERFACE is listed on the screen and this error occurs, there may be an error in the Test Software or Test Set firmware. Call 1-800-922-8920.

To check which options are installed in the Test Set:

CAUTION: Loading this program into the Test Set memory will erase any other programs and Procedures you have loaded. If you have not already done so, save your setups to a Procedure on an SRAM card before loading the “LIST_OPTS” program. See **"Procedures" on page 276**.

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 **LIST_OPTS**.
6. Press k1 (**Run Test**) to display the installed options.
7. Check if RADIO INTERFACE is listed.

Incorrect PA Switch Model in config scr, prog stopped.

The Test Software supports the use of the Test Set radio interface card to control an external PA switch. Check the entries on the External Devices (or Edit Configuration) screen. To access the **External Devices** screen:

1. Press TESTS.
2. Select **External Devices** from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Verify that the entry in the **Model** field is correct. See **table 9, "Data Collection and Logging Configuration" on page 242** for appropriate entries.

Incorrect RF Switch Model in config scr, prog stopped.

The Test Software supports the use of the Test Set radio interface card, to control an external antenna switch, or the HP 3488A Switch/Control Unit. Check the entries on the External Devices (or Edit Configuration) screen. To access the **External Devices** screen:

1. Press TESTS.
2. Select **External Devices** from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Verify that the entry in the **Model** field is correct. See **table 9, "Data Collection and Logging Configuration" on page 242**, for appropriate entries.

No trigger or clock is present.

The Test Set was unable to find the data clock and use it in subsequent data recovery.

- The RF level into the Test Set may be too low. Check the level of the RF signal being applied to the Test Set.
  1. Press DUPLEX.
  2. Read the value on the power meter.
  3. Compare this value with the PA output pass/fail limit.
- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.
  - If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.

If the error does not recur, the Base Station may not be functioning properly.

Parameter estimator did not converge.

The Test Set was unable to terminate the entry of a signal into the DSP board in the HP 83204A,Option 001. Test results are not displayed.

- The RF level into the Test Set may be too low. Check the level of the RF signal being applied to the Test Set.

  1. Press DUPLEX.
  2. Read the value on the power meter.
  3. Compare this value with the PA output pass/fail limit.

- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.

  1. If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.
  2. If the error does not recur, the Base Station may not be functioning properly, or the frequency or other characteristic of the digital mode signal may be out of specification.

Printer address cannot be set to 10.

The second Test Set serial port, Serial B, has an address of 10. It is used for TRU control. 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" on page 267**.

Status = (Status) returned by the DSP

This message is displayed when the HP 11807B Test Software cannot recognize a status message sent from the HP 83204A, Option 001 TDMA Dual-Mode Cellular Adapter to the Test Set. If you suspect that the status message is a symptom of a problem you are having please record the status displayed in the message and call (1-800-922-8920).

Sync word began on the 2nd bit of the symbol.

The synchronization word in the transmitted signal was not properly timed when it was measured by the Test Set.

The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.

- If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.
- If the error does not recur, the Base Station may not be functioning properly.

The test will continue with this error present and results will be displayed. However, the performance may be degraded.

Sync word contained errors or was not found.

The synchronization word in the transmitted signal did not have the correct bits in it when it was measured by the Test Set.

- The RF level into the Test Set may be too low. Check the level of the RF signal being applied to the Test Set.
  1. Press DUPLEX.
  2. Read the value on the power meter.
  3. Compare this value with the PA output pass/fail limit.
- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.
  1. If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.
  2. If the error does not recur, the Base Station may not be functioning properly.

The test will continue with this error present and results will be displayed. However, performance may be degraded.

Sync word was too soon in the burst.

The synchronization word in the transmitted signal did not have the correct timing when it was measured by the Test Set.

- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.
  - If the error persists, there may be a problem with the Test Set. Call at 1-800-922-8920.
  - If the error does not recur, the Base Station may not be functioning properly.

Test results are not displayed.

Sync word was too late in the burst.

The synchronization word in the transmitted signal did not have the correct timing when it was measured by the Test Set.

- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.
  - If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.
  - If the error does not recur, the Base Station may not be functioning properly.
  - Verify that the digital mode Base Station equipment is functioning properly.

Test results are not displayed.

Synchronization to received data did not occur.

The Test Set was unable to use the synchronization word to recover the data sent.

- The RF level into the Test Set may be too low. Check the level of the RF signal being applied to the Test Set.

  1. Press DUPLEX.
  2. Read the value on the power meter.
  3. Compare this value with the PA output pass/fail limit.

- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.

  1. If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.
  2. If the error does not recur, the Base Station may not be functioning properly.

The HP 8921A must be configured in Control Mode. No other controllers may be on the HP-IB bus. Do you want to put the HP 8921A in Control Mode? Select desired softkey.

The Test Set can be set to operate in the HP-IB **`Control`** mode or the **`Talk&Lstn`** mode, using the I/O CONFIGURE screen. For this application, it must be set to **`Control`** mode.

Press the USER KEY (**`Yes`**) to automatically change the entry on the I/O CONFIGURE screen to **`Control`** mode.

The HP 3488 switch is not supported for PA switch. Change IBASIC Edit Configuration Table. Program stopped.

If you are automatically switching the PA outputs into the RF IN/OUT connector you must use the Radio Interface Board driving an external Switch Matrix. The HP 3488A Switch Matrix can be used only to switch the receiver shelf inputs or the RMC (or Duplexer) inputs (for RXA and RXB offset TESTs only) to the Test Set DUPLEX OUT connector.

The memory of the RX DSP board was exceeded.

The Test Set was unable to terminate the entry of a signal into the DSP board in the HP 83204A, Option 001. Test results are not displayed.

- The RF level into the Test Set may be too low. Check the level of the RF signal being applied to the Test Set.
  1. Press DUPLEX.
  2. Read the value on the power meter.
  3. Compare this value with the PA output pass/fail limit.
- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.
  1. If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.
  2. If the error does not recur, the Base Station may not be functioning properly.

The user selected incompatible pass parameters in the analyzer fields.

The TDMA test screen contains values that the HP 83204A, Option 001 cannot recognize.

- You may get this message if you exited the program and changed values on that screen.
- If this message appears as you are running the Test Software and you had not exited the program, please call 1- 800-922-8920.

This software will not run with firmware revision less than A.15.00 presently installed in the Test Set. Consult software users manual for correct firmware revision.

To determine the revision of the firmware:

- Press CANCEL or shift CANCEL to pause the program.
- Press SHIFT CONFIG to display the CONFIGURE screen.
- View the revision number of the firmware in the upper right corner of the display.

Contact HP (1-800-922-8920) if you do not have the necessary revision. Firmware is installed in the Test Set by removing the instrument cover and replacing the EPROMS in the controller section, and in some cases, the EPROM on the signaling board.

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 that the HP-IB connectors are attached properly and are in working order.
- Verify that the HP-IB binary address switches are set properly.
- Verify entries made to the External Devices (or Edit Configuration) screen **Addr** field match the address on the HP-IB address switch, and that it is an allowable address (see **"Configuration" on page 241**).

Timeout from HP 3488 at address (Address). Retry?

- Verify that the HP 3488 address switch is set properly.
- Verify entries made to the External Devices (or Edit Configuration) screen **Addr** field match the address on the 3488 address switch, and that it is an allowable address (see **"Configuration" on page 241**).
- Verify that the HP-IB binary address switches are set properly.

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

- Verify that the HP 3488 address switch is set properly.
- Verify entries made to the External Devices (or Edit Configuration) screen **Addr** field match the address on the 3488 address switch, and that it is an allowable address (see **"Configuration" on page 241**).
- Verify that the HP-IB binary address switches are set properly.

Timeout on Logger @ (address)

If the Test Software cannot log a TRU message within ten seconds, the program displays this error message.

- Check the entries in the External Devices (or Edit Configuration) screen.
- If you are using an external device, check the cables, connections and address.

Weak clock. Difficult to find data clock phase.

The Test Set was unable to recover the data clock and use it in subsequent data recovery.

- The RF level into the Test Set may be too low. Check the level of the RF signal being applied to the Test Set.
  1. Press DUPLEX.
  2. Read the value on the power meter.
  3. Compare this value with the PA output pass/fail limit.
- The digital mode Base Station equipment may not be functioning properly. If possible, run the test on another transceiver that you know is working.
  1. If the error persists, there may be a problem with the Test Set. Call 1-800-922-8920.
  2. If the error does not recur, the Base Station may not be functioning properly.

The test will continue with this error present and results will be displayed. However, the performance may be degraded.

A

Using the HP 3488A Switch Matrix

THE HP 3488A CANNOT SWITCH THE PA OUTPUTS

The HP 3488A Switch Matrix can be used to automatically switch the receiver shelf inputs or the Receiver Multi Coupler (or Duplexer) inputs to the Test Set DUPLEX OUT connector. The high power PA outputs cannot be selected with the HP 3488A switches. If you want to automatically switch these outputs to the Test Set RF IN/OUT connector, use the Radio Interface Board and an 8-way external switch.

If you choose to use an HP 3488A Switch Matrix to automatically switch input ports to the Test Set DUPLEX OUT connector, two Option 15/HP 44476A Microwave switch units must be installed. Each Microwave Switch has three switch units in it.

Five switches are used to select which of the receiver shelf or RMC (or Duplexer) ports are connected to the DUPLEX OUT of the Test Set. Short RF jumper cables must be installed between the switches.

Connect the switches as described in **figure 15** . The first number in the switch identifier refers to the rear-panel switch row that it is located in. The last number refers to the switch column.

The External Devices (or Edit Configuration) screen must contain entries that reflect the use of the HP 3488A. See **"Configuration" in chapter 6** for the entries you must make.

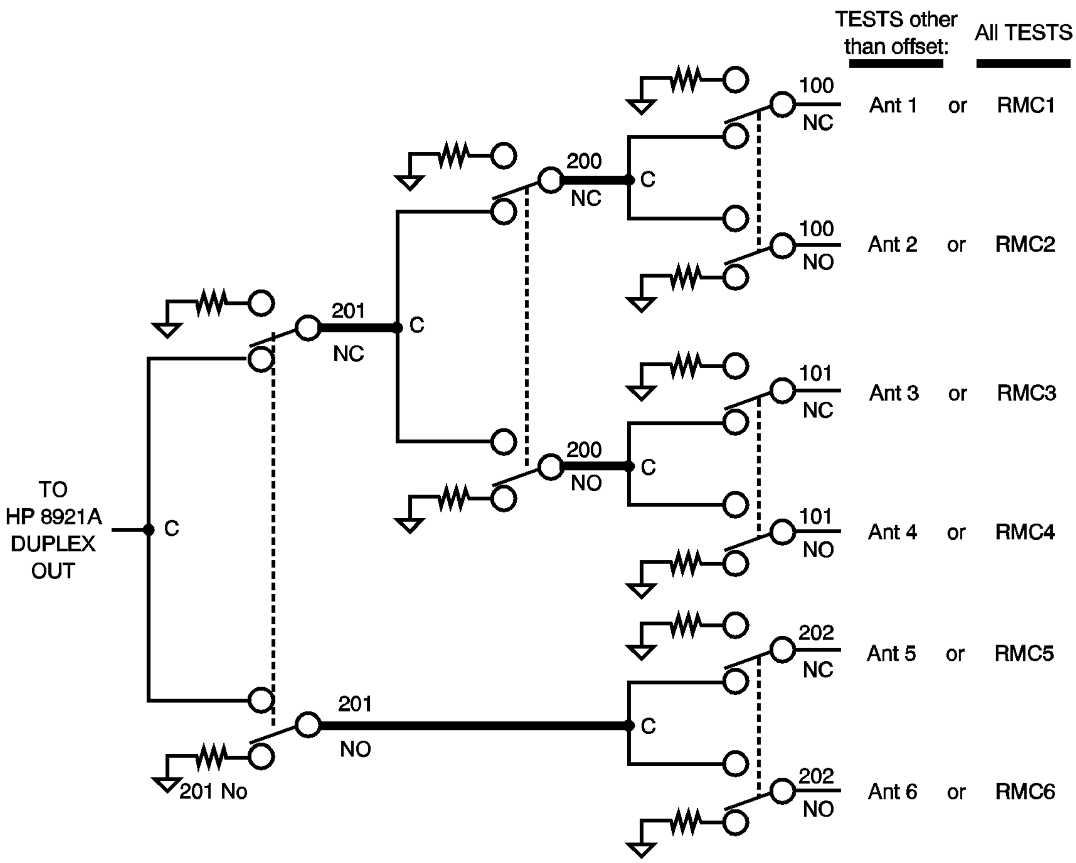


Figure 15 **HP 3488A Connections for ANT Switch**

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 towards, and then is outside of certain cutoff frequencies. In the Test Set's, 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's 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's screen used to indicate the field/function currently being accessed.

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

Disp Loc A menu function which presents an assembly diagram that displays location of the adjustable component.

DPA Dual-channel Power Amplifier.

dvcc Digital Verification Color Code - A code in TDMA signal, analogous to SAT, that is used to identify co-channels of different cell sites.

`Edit Cnfg` (configuration) Title of an Test Set's 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 "TRU Parameter Descriptions" on page 211**.

`Edit Seqn` The Edit Seqn feature 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 pass/fail limits. **See "Pass/Fail Limit (Specification) Descriptions" on page 229**.

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

EVM Error Vector Magnitude - A standard value that is used to determine the modulation accuracy of a TDMA signal.

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 HP 8921A.

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 Test Set's firmware above revision A.15.00.

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's 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 Set's built-in controller. The IBASIC software is downloaded from the HP 11807B OTP CARD into the Test Set's RAM. This software is then used to control the Test Set during autotesting the base station.

initialize A card or disk must be formatted prior to storing data.

key (USER keys) Keys refer to any of the push buttons on the front panel of the HP 8921A. 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 Set's 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, pass/fail limits, 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 providing a value to be compared against pass/fail limits HI/LO values to verify the performance of the base station.

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's 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's screen is reserved for messages and prompts. Messages give an indication of the status of the Test Set, for example, **System initialization**.

MPA Modulating Power Amplifier.

MCPA Multi-channel Power Amplifier.

OTP One Time Programmable (OTP) refers to a CARD on which code or date may only be stored once; similar to ROM. The HP 11807B software is shipped on an OTP memory card.

parameters Entries you make for calibration data, cell site characteristics, or test customization. They give you flexibility in the way you use the HP 11807B 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 in the Test Set 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's 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 mobile station and is used to help determine RF path integrity.

save Save and store are used synonymously and refer to putting data or software on some memory device, for example, CARD, RAM, etc.

SCLPA Single-Channel Linear Power Amplifier.

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.15.00. **See "Pass/Fail Limit (Specification) Descriptions" on page 229**. 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.

SSI Signal Strength Indicator - SSI is synonymous with Received Signal Strength Indicator (RSSI).

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

store Store and save are used synonymously and refer to putting data or software on some memory device, for example, CARD, RAM, and so forth.

TDMA Time Division Multiple Access - A method used to reuse a frequency by allocating the channel to a number of digital traffic channels sequentially in time.

`Test Function` A field, in the lower left corner of the tests screen that provides 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 base station. 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’s 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’s 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 inserted in the inverse video fields of the pass/fail limits or parameters. Units of measure (dB, inches, volts, watts, etc.) are contained in the pass/fail limits and parameters.

VSWR Voltage Standing Wave Ratio - A ratio that quantifies the level of reflected power that results from the application of forward power to a transmission line. A VSWR of exists on a transmission line terminated in its characteristic impedance.

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