Nortel (Northern Telecom) P-Series Cell Site Test Software

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

Software Revision B.01.20 and later

HP Part No. 11807-90151
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Rev B

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U.S.A.

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Getting Started with FW Above Revision A.14.00

What You Will Test

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

- **HP 8921A Test Sets with firmware revision above A.14.00**

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.

If you have an HP 8921A Test Set with firmware revision below A.14.00, refer to **chapter 2, "Getting Started with FW Below Revision A.14.00"**. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired.

Getting Started will quickly acquaint you with the operation of the HP 8921A or the HP 8921D Test Set 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
- Perform RX Quick Tests
- Perform TX Quick Tests
- Perform TX Power Level and Adjustment Test

After becoming acquainted with the Test Set and Test Software, you may need to customize the Test Software with the appropriate parameters, pass/fail limits, and a testing order. This is explained in **chapter 5, "Using the Test Software with FW Above Revision A.14.00"**.

What Equipment is Needed

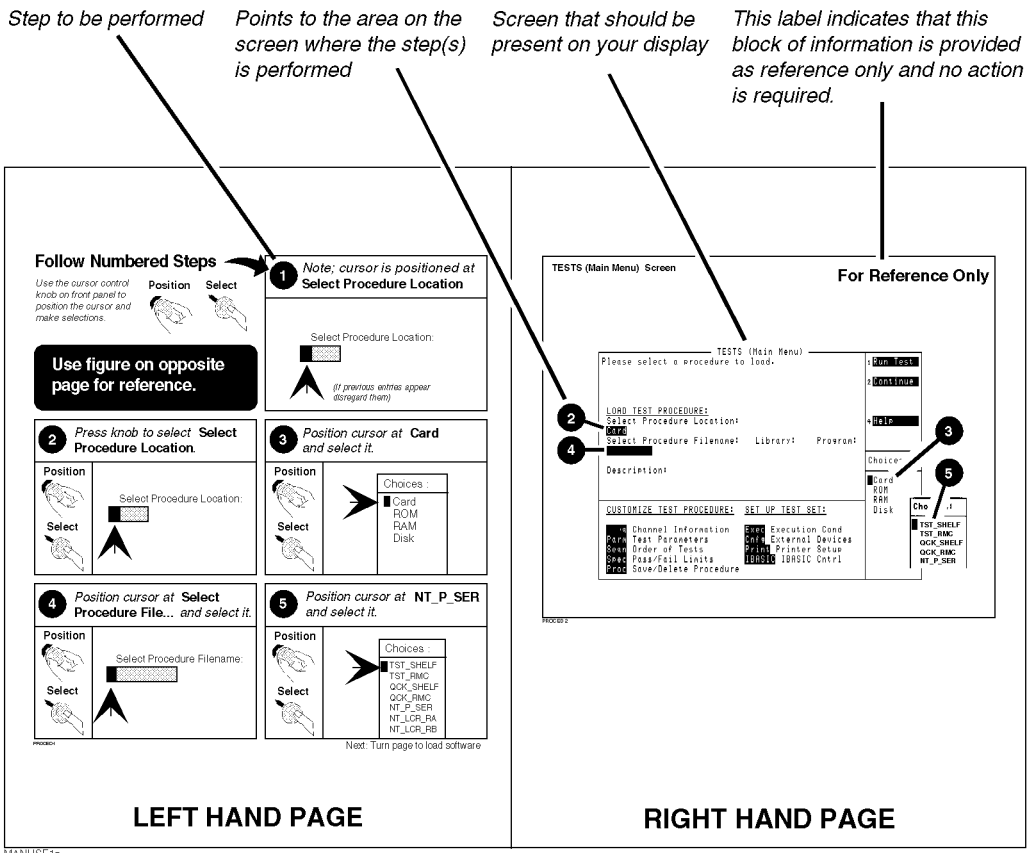
You will need the following in order to complete the testing in Getting Started. Additional cabling is needed for other tests, as described in **chapter 4, "Making Connections"**.

- HP 11807B Option 044 P-Series Test Software card
- HP 8921A or HP 8921D Test Set
- A P-Series transceiver
- BNC to Single Banana Adaptor (2)
- Dual Banana to BNC Adaptor
- Type N(m) to N(m) cable (10 ft)
- BNC (m) to BNC (m) cable (10 ft)
- BNC to Bantam 309 cable
- RJ11(m) to RJ11(m) 6-wire cable
- RJ11 (f) to DB25 (m) adapter
- DB25 to Bantam 309 cable

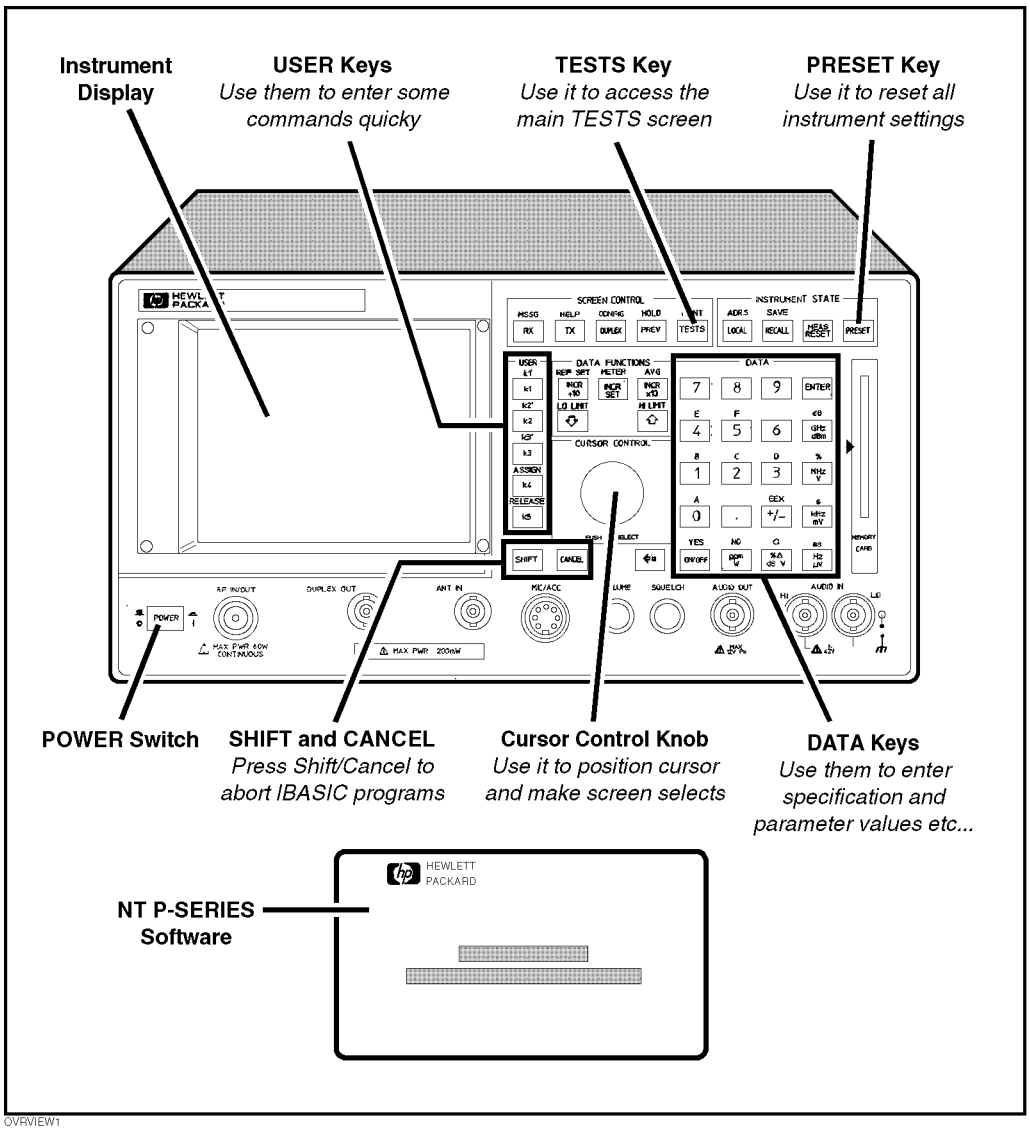
How to Use This Getting Started Guide

HOW TO USE THIS MANUAL

Most of the instructions in this manual are presented as two page task modules. They are designed so that a logical sequence of steps can be performed without the need to turn the page.On many of the modules you need only perform 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.

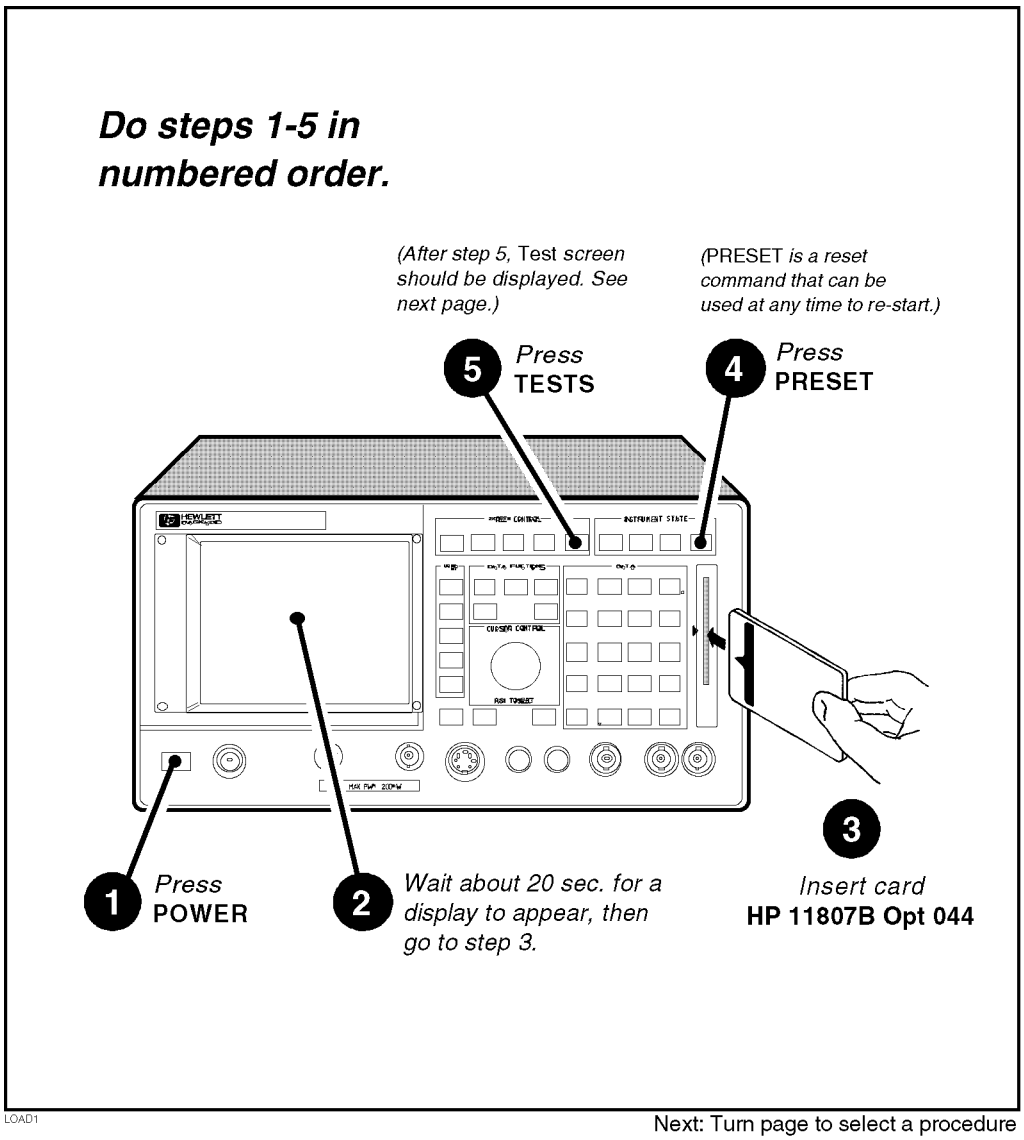


Test Set Overview



OVERVIEW1

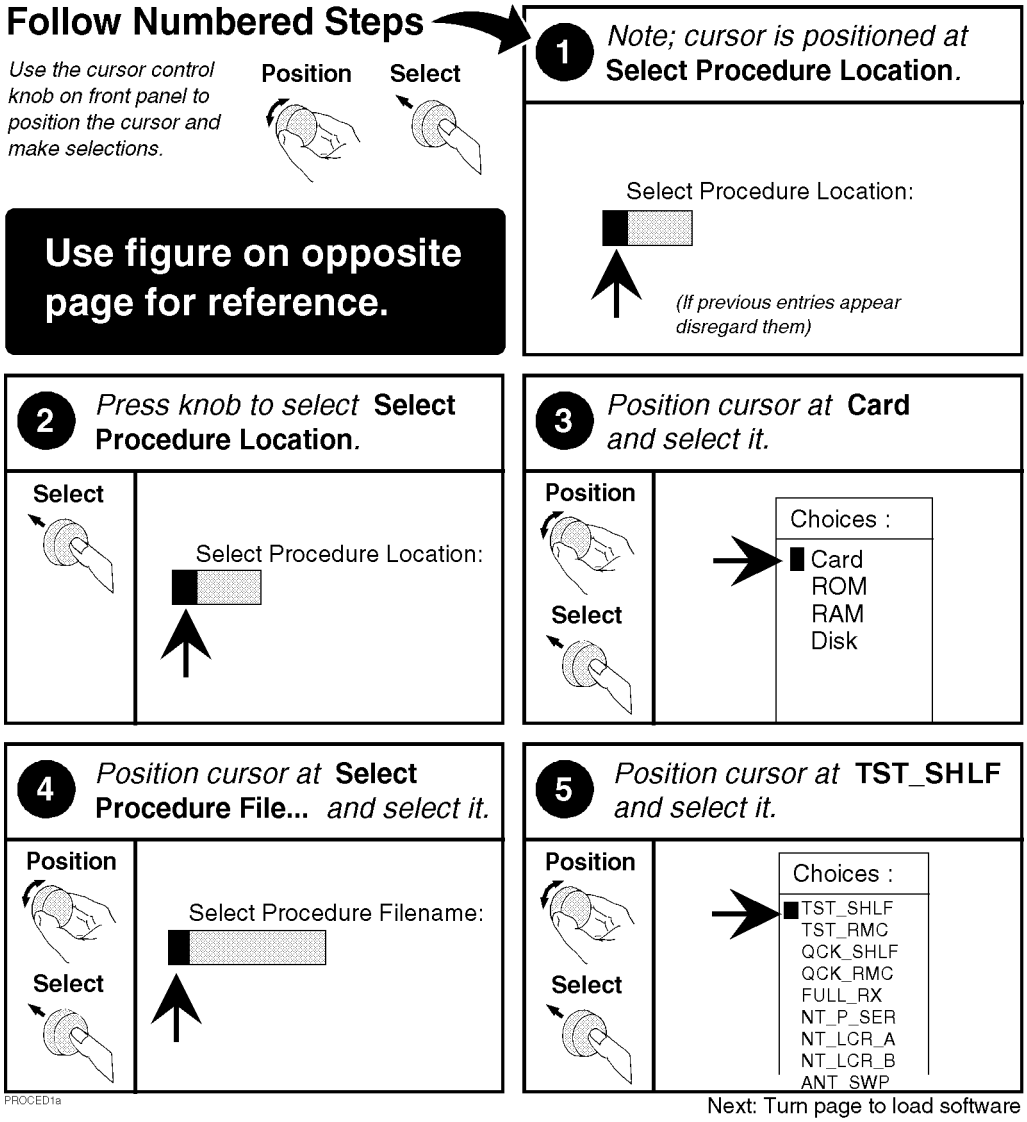
Load the Test Software



LOAD1

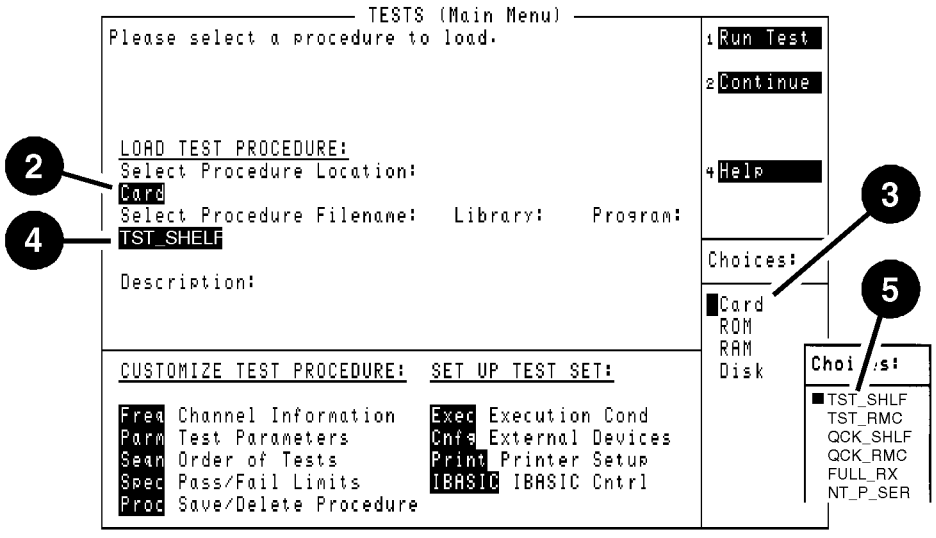
Next: Turn page to select a procedure

Selecting a Procedure



Next: Turn page to load software

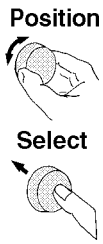
TESTS (Main Menu) Screen **For Reference Only**

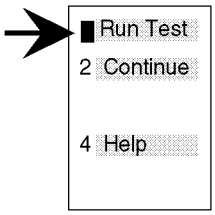


PROCED 2a

Measuring and Storing Cable Loss

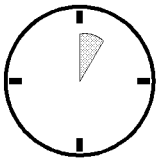
1 *Position cursor at* **Run Test** *and select it.*



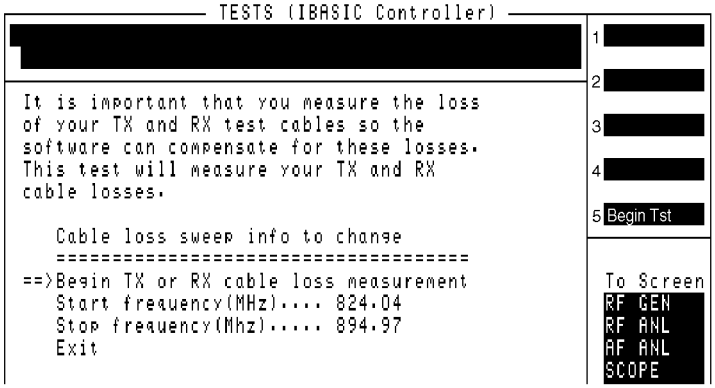


2 *Wait for software to load, then begin set-up at step 3.*

NT P-SERIES *software takes 3 min. to load.*



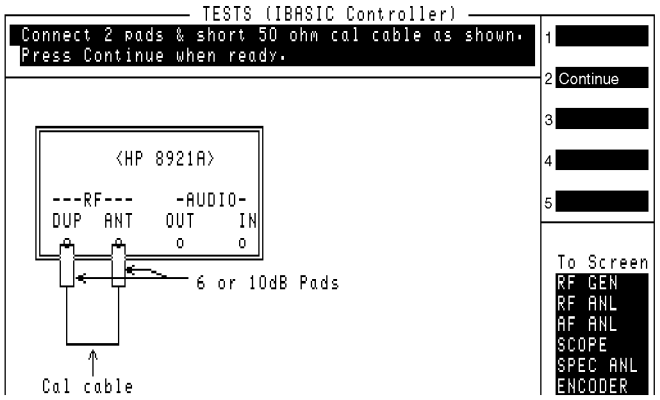
3 ***a)****When the cable loss screen appears, read the displayed information.*
b)*Press the* **Begin Tst** *user key (k5).*



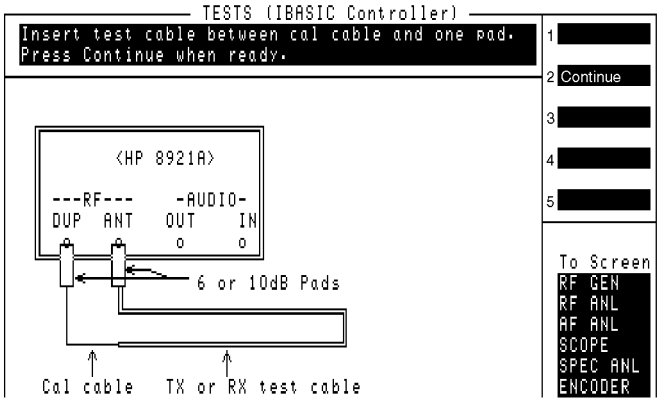
For more information regarding cable loss test screens, see Cable Loss Test Section in Chapter 4.

RUN1a

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



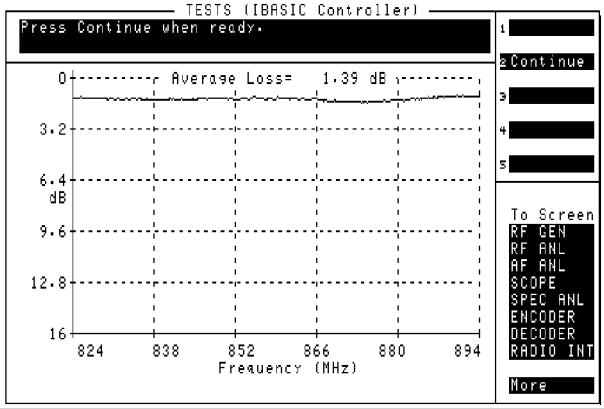
5 ***a)*** *Connect a TX cable as shown on the screen.*
b) *Press the* **Continue** *user key (k2).*



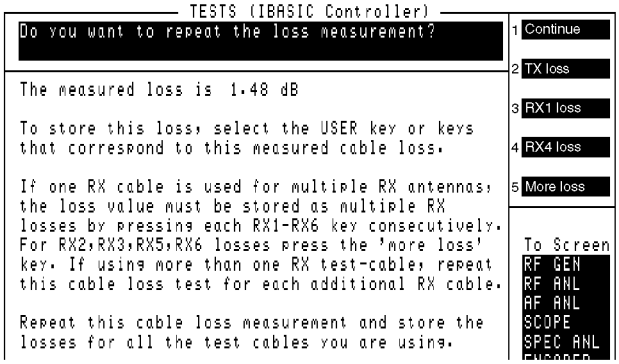
DRU1-1

Next: Turn page to continue set up

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

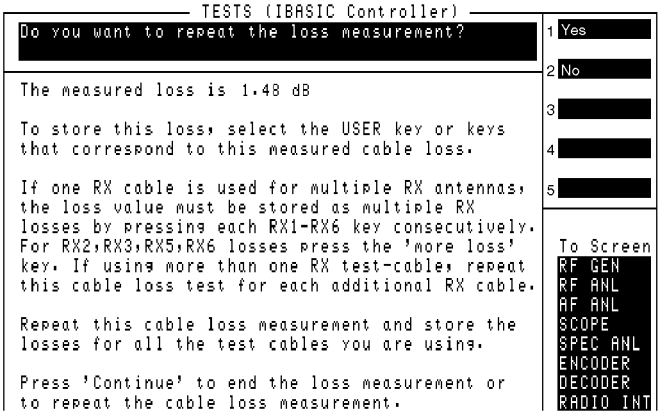


7 ***a)*** *Read the instructions displayed on the screen.*
b) *Press the* **TX loss** *user key (k2).*
c) *Press the* **Continue** *user key (k1).*

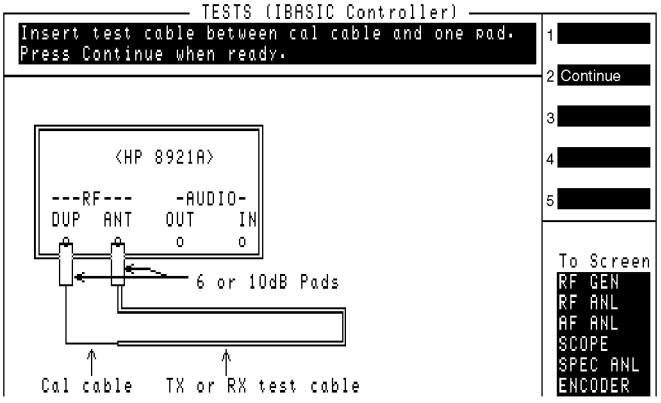


DRU1-2

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



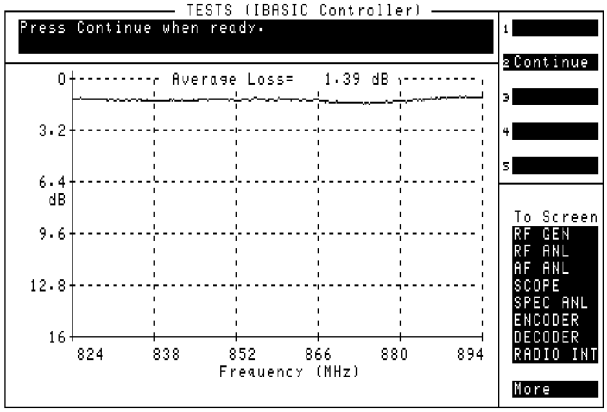
9 ***a)*** *Connect an RX cable as shown on the screen.*
b) *Press the* **Continue** *user key (k2).*



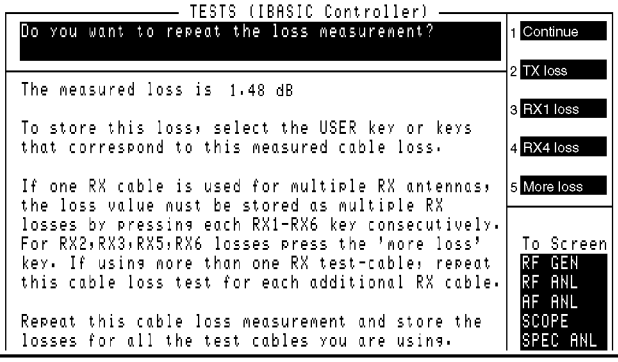
DRU1-3

Next: Turn page to continue set up

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



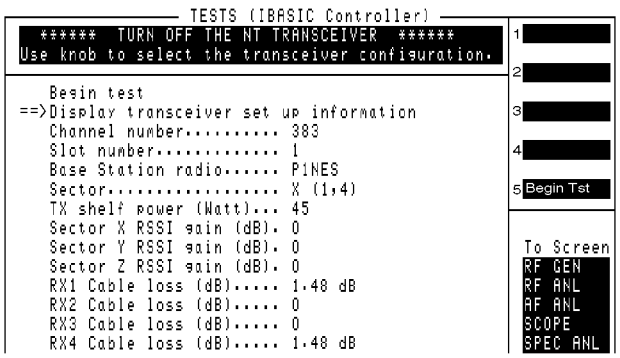
11 ***a)*** *Press the* **RX1 loss** *user key (k3).*
b) *Press the* **RX4 loss** *user key (k4).*
c) *Press the* **Continue** *user key (k1).*
d) *Press the* **No** *user key (k2).*



DRU1-4

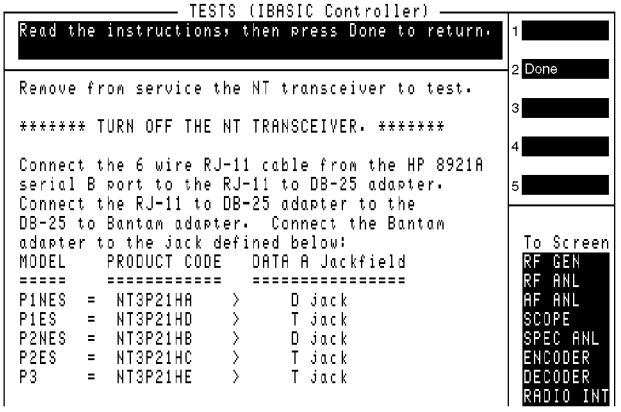
Begin Testing

1 *Position arrow at* **Display transceiver set up information** *and and select it.*



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

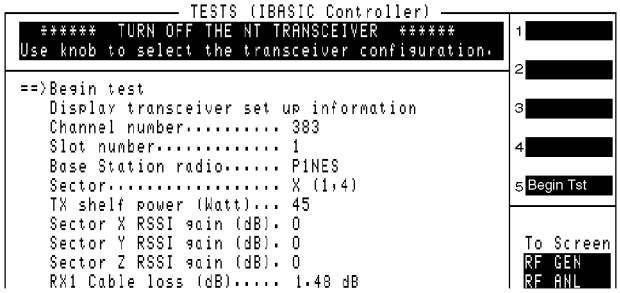
(See diagram at end of chapter.)



DRU1-5

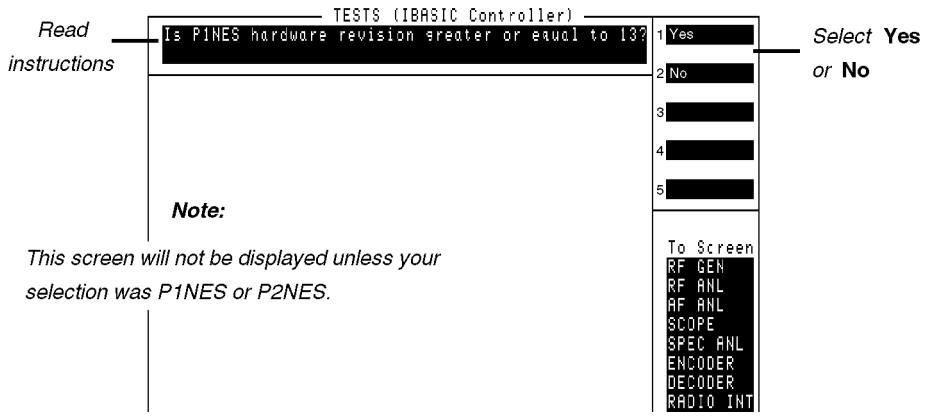
Next: Turn page to continue set u

3 ***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).*



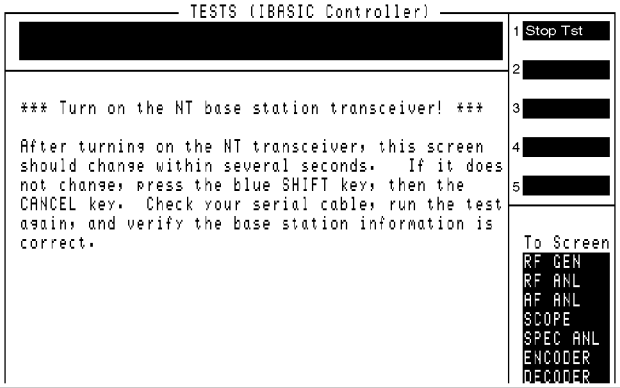
For more information regarding cable loss test screens, see Cable Loss Test Section in Chapter 4.

4 *If* **P1NES** *or* **P2NES** *are selected above, follow the instructions displayed on your screen, otherwise go to step 5.*



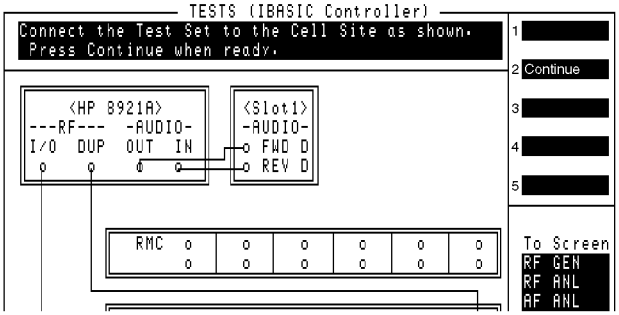
DRU1-6

5 *Follow the instructions displayed on the screen.*



6 ***a)*** *Connect cables as shown on your screen.*
b) *Press the* **Continue** *user key (k2).*

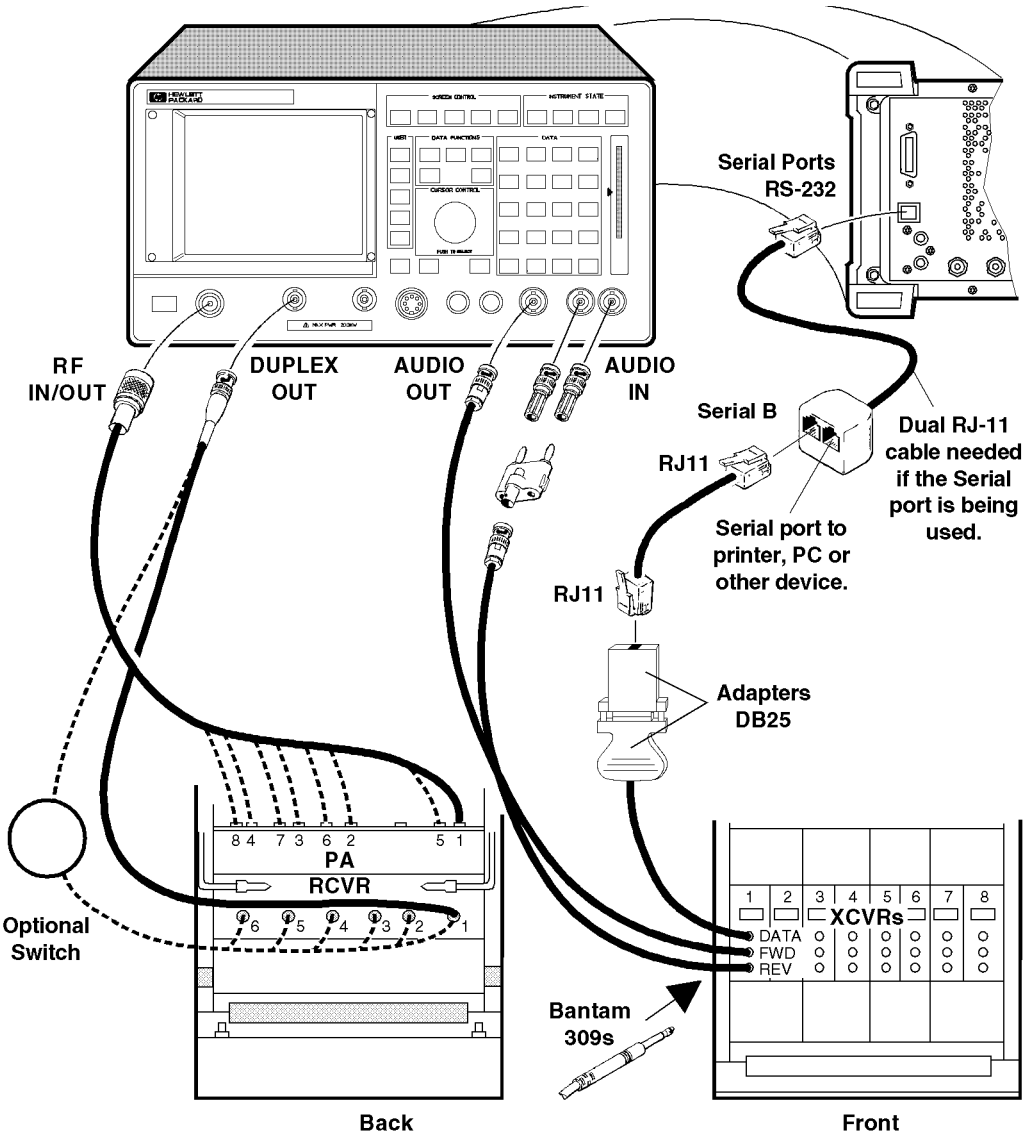
(See connections on next page.)



Actual testing will begin now. For further help with testing, follow the instructions displayed on the test set's screen.

DRU1-7

Make Connections



Test Results

The tests in the test procedure will now run consecutively. Results from these tests will scroll down the screen on your Test Set. Each test will display the test condition, measured value, and a pass/fail indication. Some of the test results may indicate failures (which are not necessarily correct) for this trial run if the Test Software was not customized for your Base Station. Proceed to **chapter 3, "Product Description"** for information on what is contained in this package, what is needed, how to use this manual, and where to get additional help.

2

Getting Started with FW Below Revision A.14.00

What You Will Test

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

- **HP 8921A Test Sets with firmware revision below A.14.00**

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.

If you have an HP 8921A Test Set with firmware revision above A.14.00, refer to **chapter 1, "Getting Started with FW Above Revision A.14.00"**. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired.

Getting Started will quickly acquaint you with the operation of the HP 8921A or the HP 8921D Test Set 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
- Perform RX Quick Tests
- Perform TX Quick Tests
- Perform TX Power Level and Adjustment Test

After becoming acquainted with the Test Set and Test Software, you may wish to customize the software with the appropriate parameters, pass/fail limits, and test sequence. This is explained in **chapter 6, "Using the Test Software with FW Below Revision A.14.00"**.

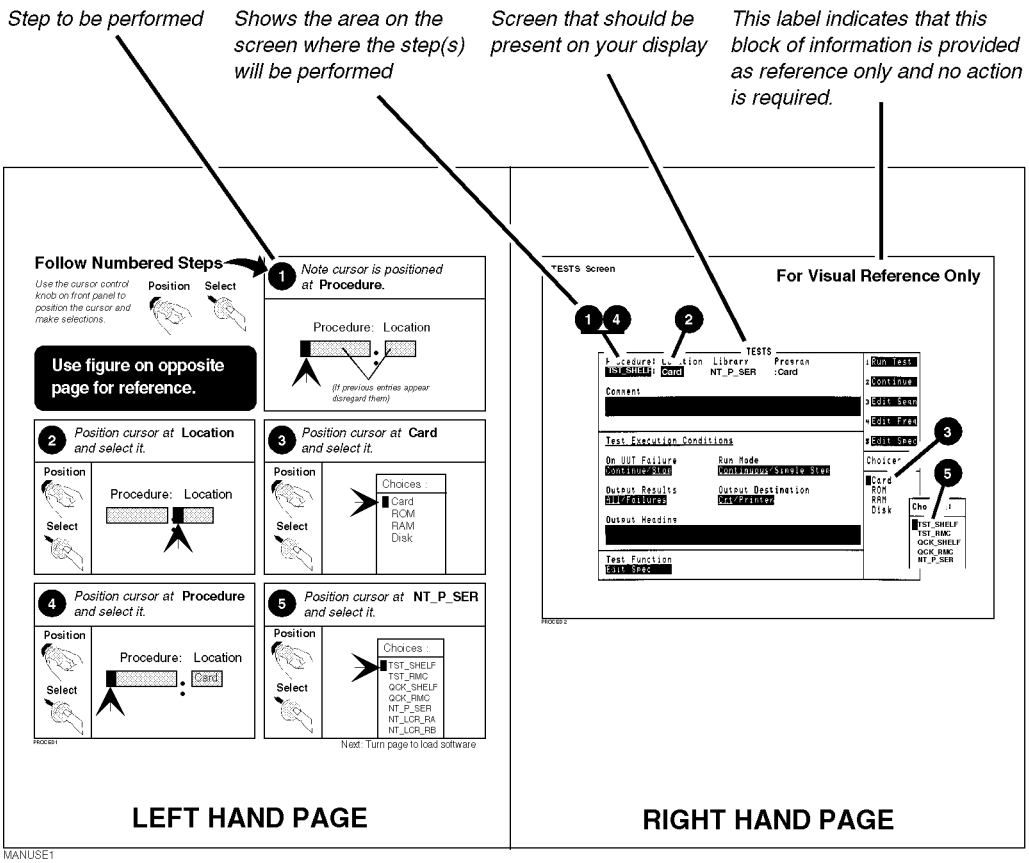
What Equipment is Needed

You will need the following in order to complete the testing in Getting Started. Additional cabling is needed for other tests, as described in **chapter 4, "Making Connections"**.

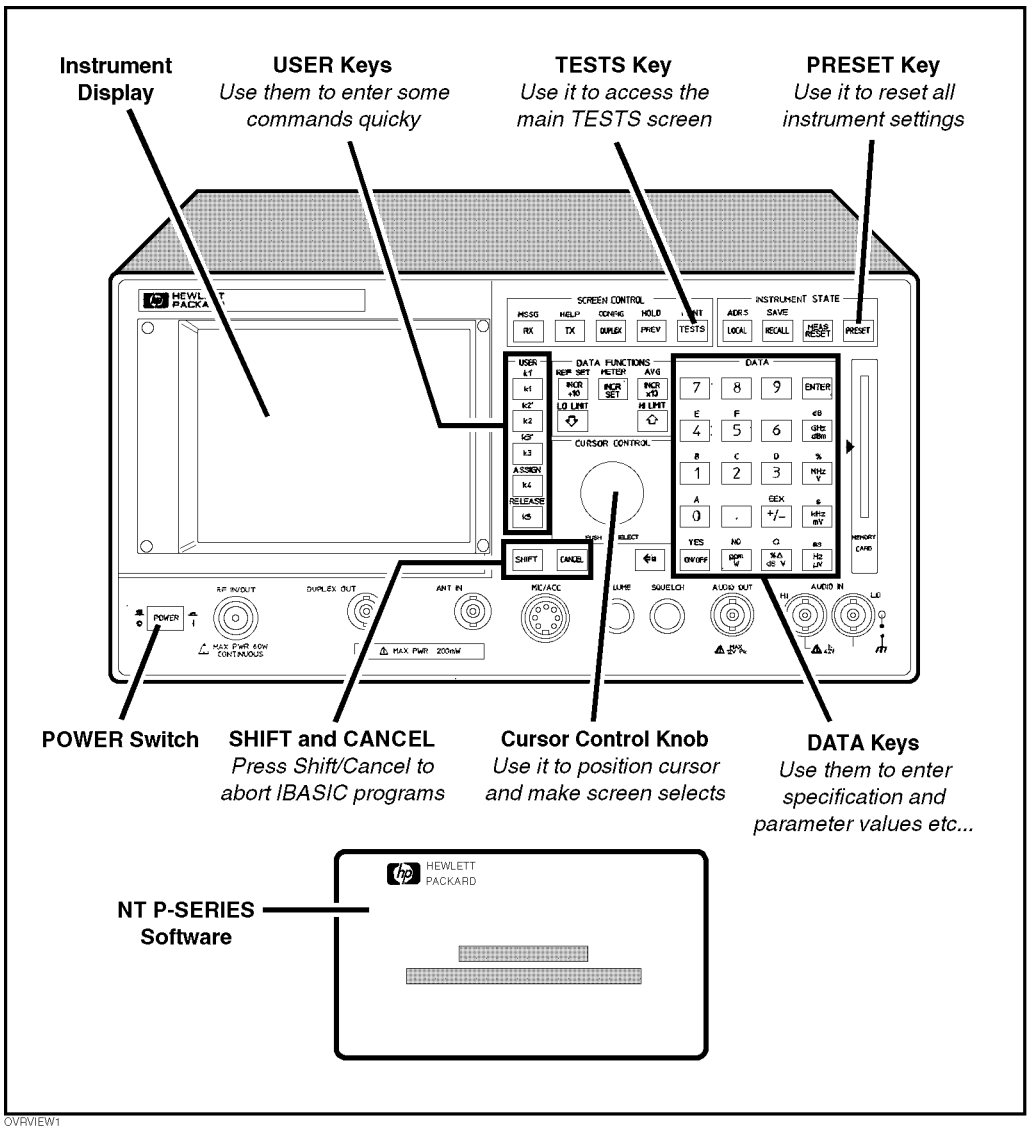
- HP 11807B Option 044 P-Series Test Software card
- HP 8921A or HP 8921D Test Set
- A P-Series transceiver
- BNC to Single Banana Adaptor (2)
- Dual Banana to BNC Adaptor
- Type N(m) to N(m) cable (10 ft)
- BNC (m) to BNC (m) cable (10 ft)
- BNC to Bantam 309 cable
- RJ11(m) to RJ11(m) 6-wire cable
- RJ11 (f) to DB25 (m) adapter
- DB25 to Bantam 309 cable

How to Use This Getting Started Guide

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

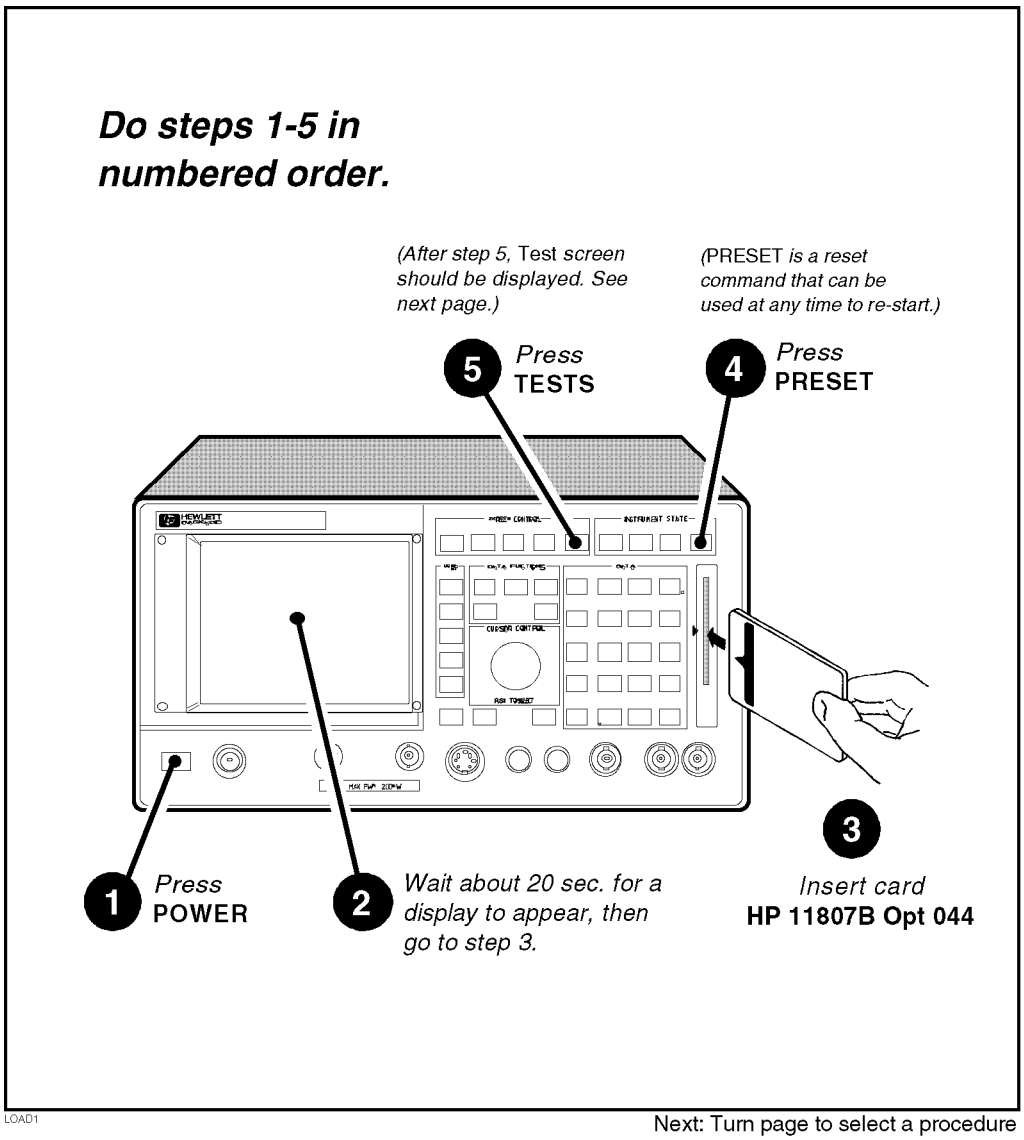


Test Set Overview



OVRVIEW1

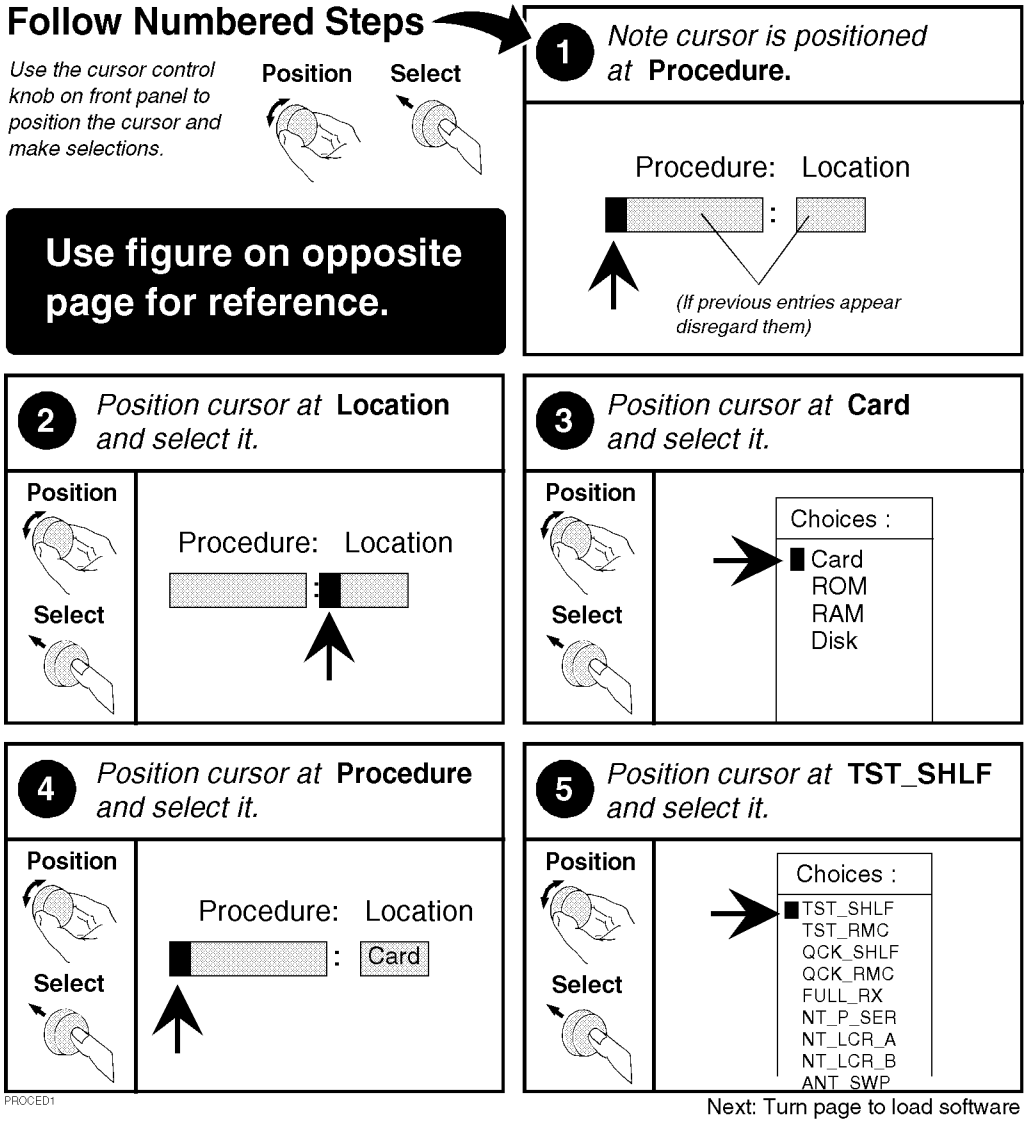
Load the Test Software



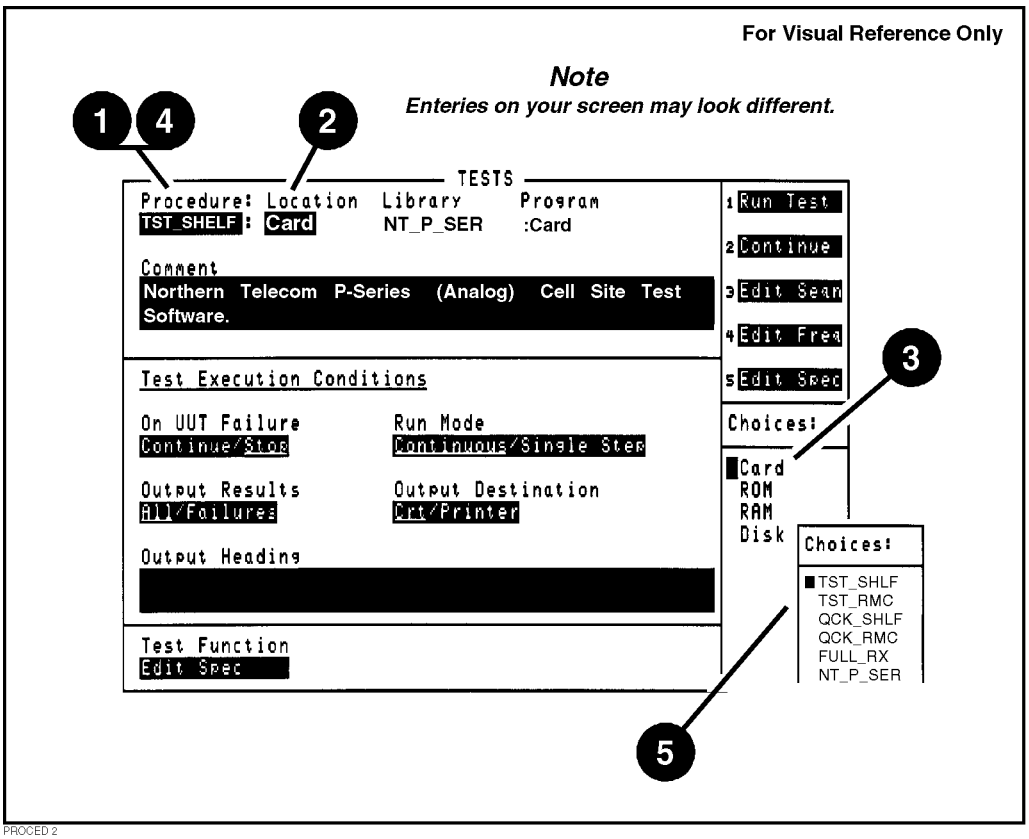
LOAD1

Next: Turn page to select a procedure

Selecting a Procedure

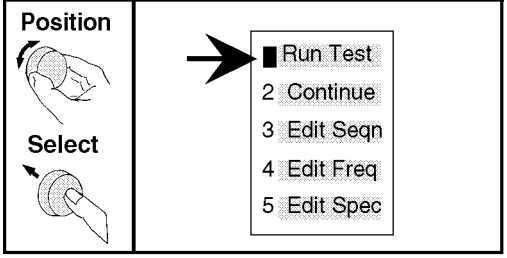


Next: Turn page to load software


For Visual Reference Only
Note
Enteries on your screen may look different.
1
4
2
3
5
TESTS
Procedure: Location Library Program
TST_SHELF : Card NT_P_SER :Card
Comment
Northern Telecom P-Series (Analog) Cell Site Test Software.
Test Execution Conditions
On UUT Failure
Continue/Stop
Run Mode
Continuous/Single Step
Output Results
All/Failures
Output Destination
Crt/Printer
Output Heading
Test Function
Edit Spec
1 Run Test
2 Continue
3 Edit Scan
4 Edit Freq
5 Edit Spec
Choices:
Card
ROM
RAM
Disk
Choices:
TST_SHLF
TST_RMC
QCK_SHLF
QCK_RMC
FULL_RX
NT_P_SER
PROCED 2

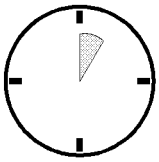
Measuring and Storing Cable Loss

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

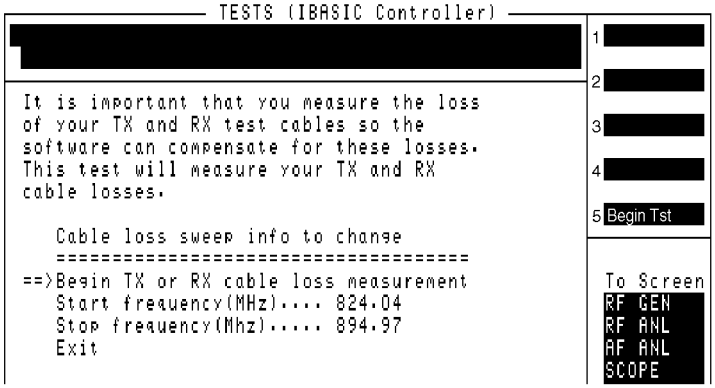


2 *Wait for software to load, then begin set-up at step 3.*

NT P-SERIES *software takes 3 min. to load.*



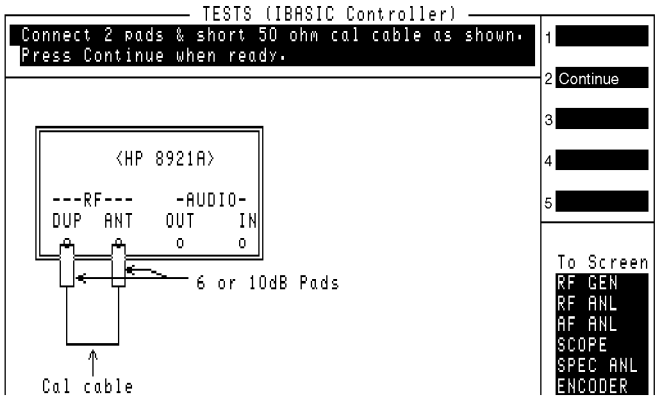
3 ***a)****When the cable loss screen appears, read the displayed information.*
b)*Press the* **Begin Tst** *user key (k5).*



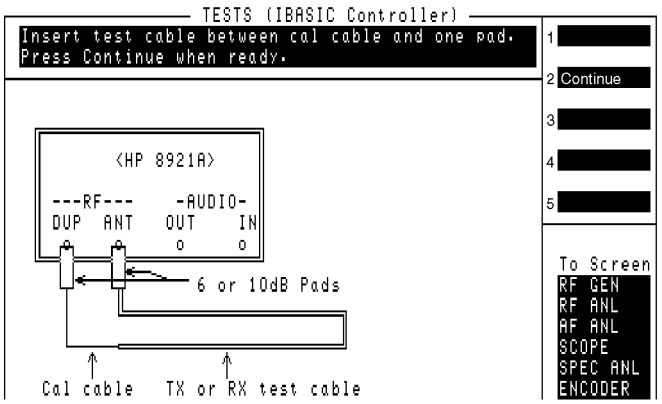
For more information regarding cable loss test screens, see Cable Loss Test Section in Chapter 4.

RUN1

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



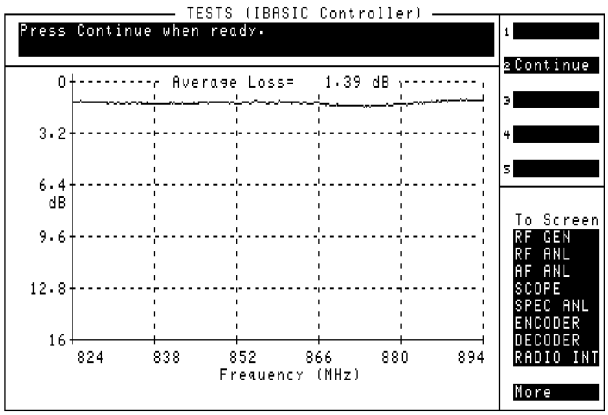
5 ***a)*** *Connect a TX cable as shown on the screen.*
b) *Press the* **Continue** *user key (k2).*



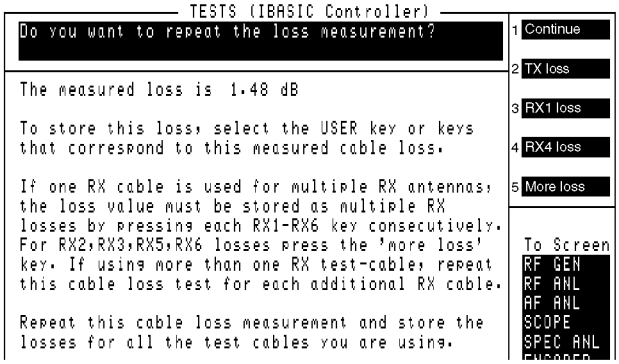
DRU1-1

Next: Turn page to continue set up

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

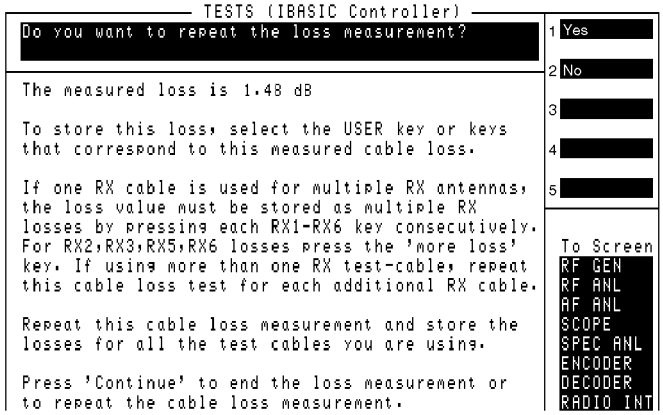


7 ***a)*** *Read the instructions displayed on the screen.*
b) *Press the* **TX loss** *user key (k2).*
c) *Press the* **Continue** *user key (k1).*

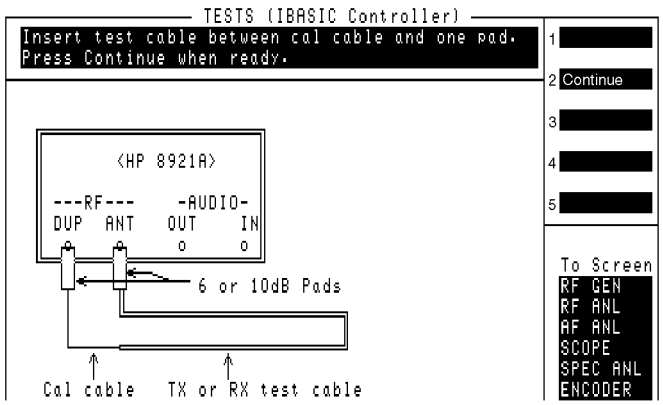


DRU1-2

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



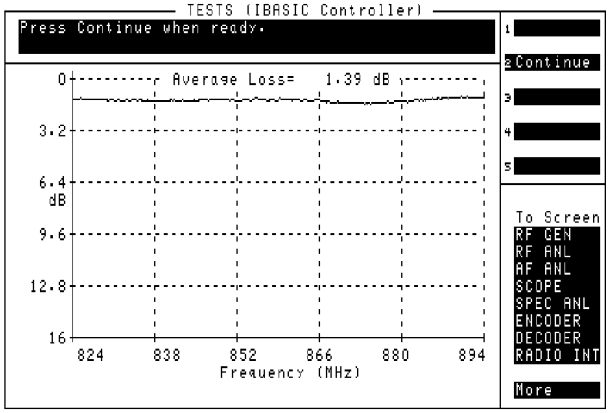
9 ***a)*** *Connect an RX cable as shown on the screen.*
b) *Press the* **Continue** *user key (k2).*



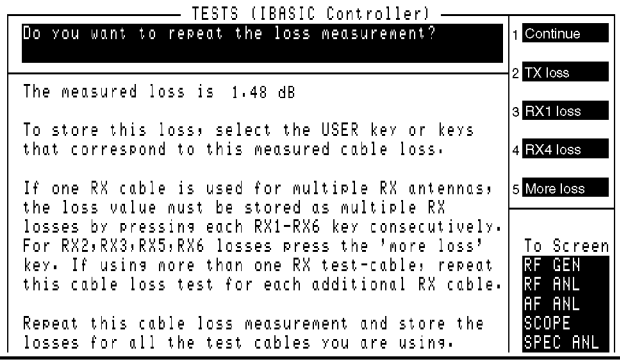
DRU1-3

Next: Turn page to continue set up

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



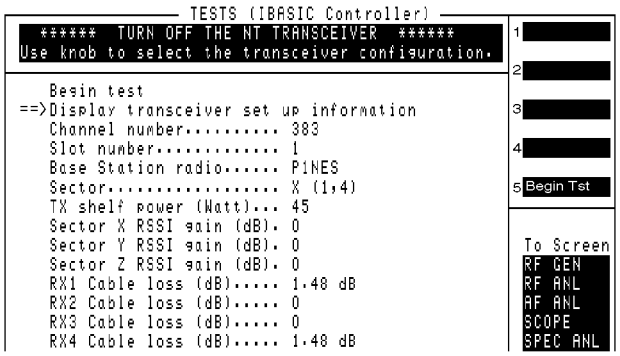
11 ***a)*** *Press the* **RX1 loss** *user key (k3).*
b) *Press the* **RX4 loss** *user key (k4).*
c) *Press the* **Continue** *user key (k1).*
d) *Press the* **No** *user key (k2).*



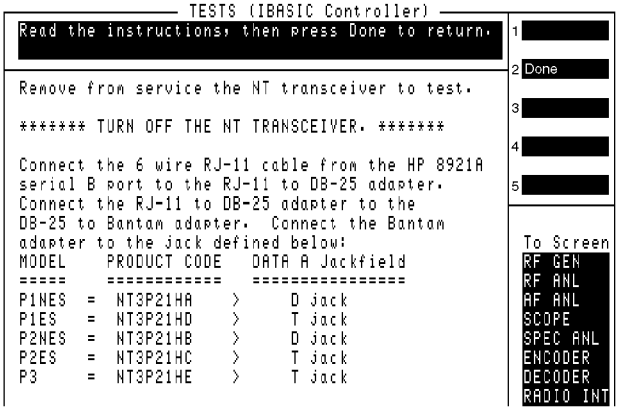
DRU1-4

Begin Testing

1 *Position arrow at* **Display transceiver set up information** *and and select it.*



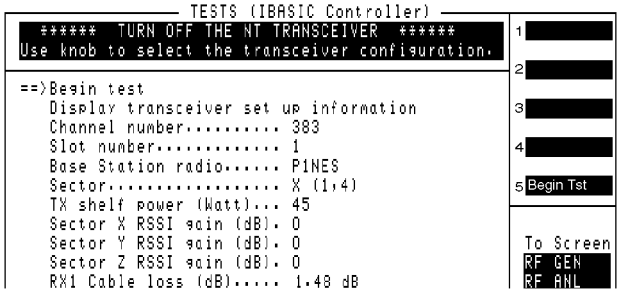
2 ***a)*** *Follow the instructions displayed on the screen.* *(See diagram at end of chapter.)*
b) *Press the* **Done** *user key (k2).*



DRU1-5

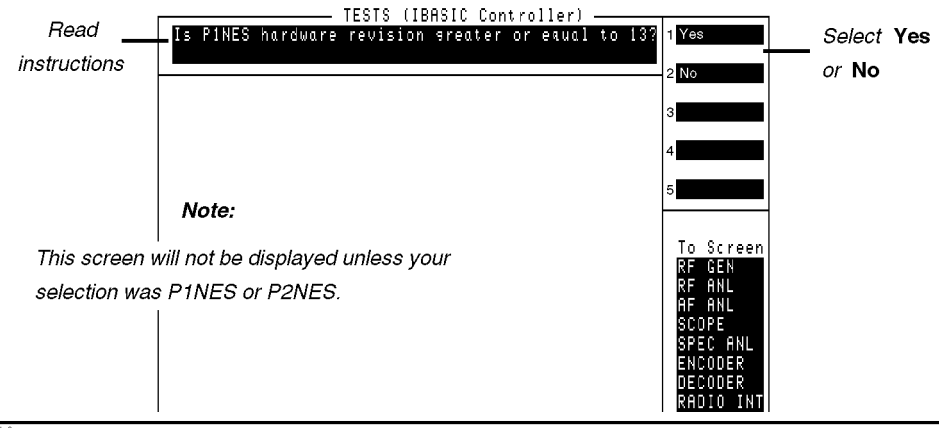
Next: Turn page to continue set u

3 ***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).*



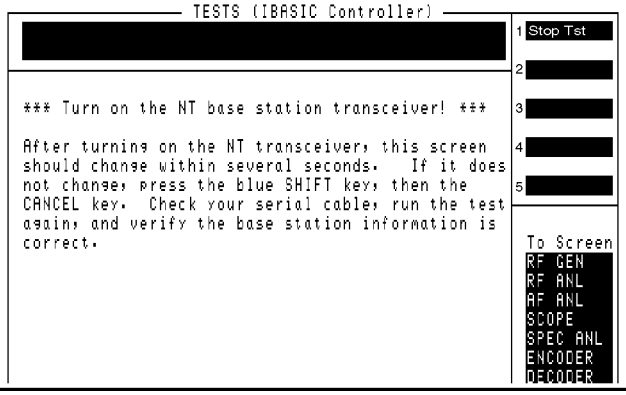
For more information regarding cable loss test screens, see Cable Loss Test Section in Chapter 4.

4 *If* **P1NES** *or* **P2NES** *are selected above, follow the instructions displayed on your screen, otherwise go to step 5.*



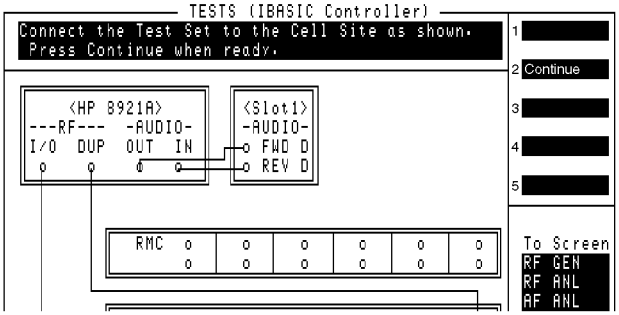
DRU1-6

5 *Follow the instructions displayed on the screen.*



6 ***a)*** *Connect cables as shown on your screen.*
b) *Press the* **Continue** *user key (k2).*

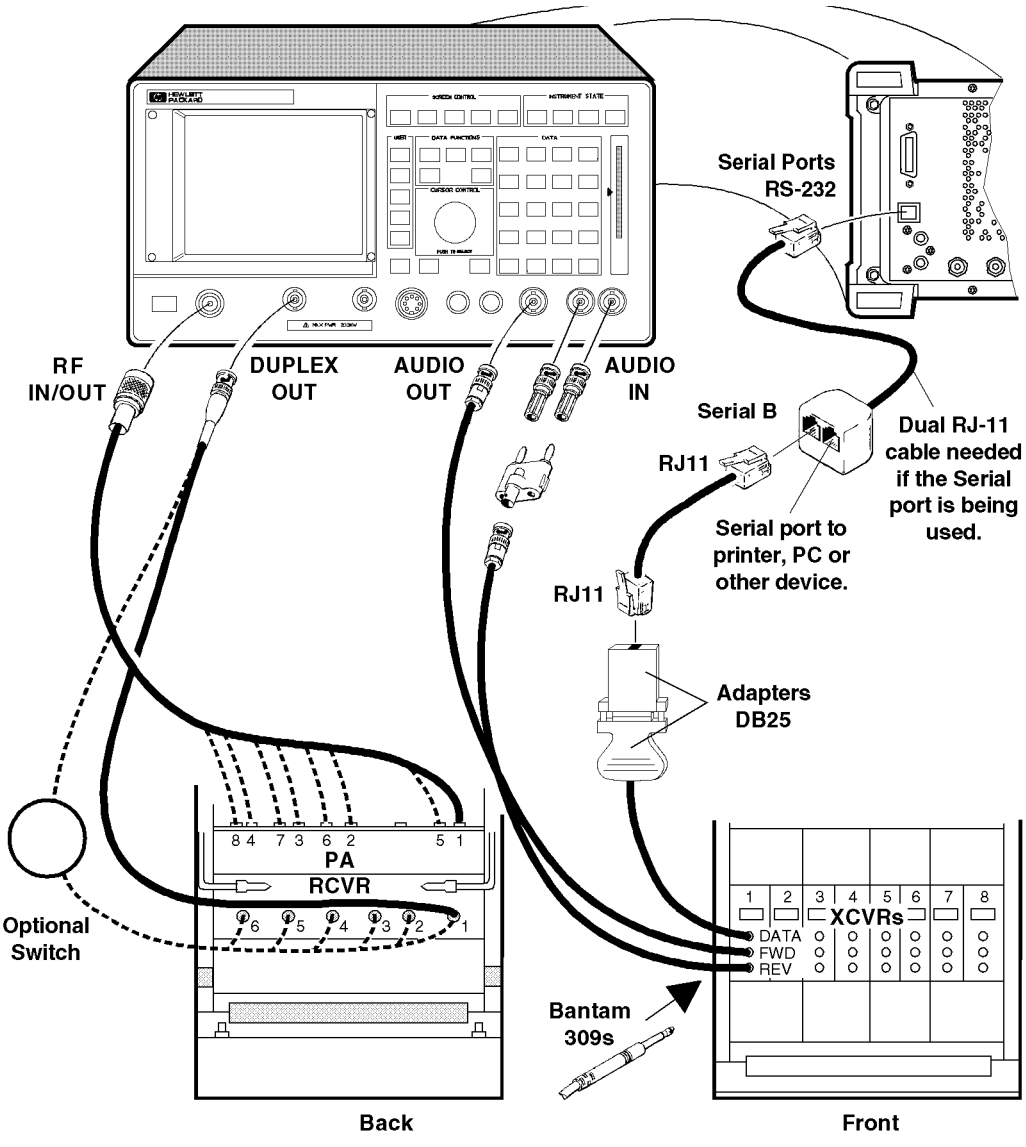
(See connections on next page.)



Actual testing will begin now. For further help with testing, follow the instructions displayed on the test set's screen.

DRU1-7

Make Connections



Test Results

The tests in the test plan will now run consecutively. Results from these tests will scroll down the screen on your Test Set. Each test will display the test condition, measured value, and a pass/fail indication. Some of the test results may indicate failures (which are not necessarily correct) for this trial run if the software was not customized for your Base Station. Proceed to **chapter 3, "Product Description"**or an information on what is contained in this package, what is needed, how to use this manual, and where to get additional help.

3

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 Test Software can be used for the installation, maintenance, and/or repair of:

Table 1 Nortel Analog "P-Series" Base Stations

Model Number	Product Code
P1NES	HT3P21HA
P1ES	HT3P21HD
P2NES	HT3P21HB
P2ES	HT3P21HC
P3	HT3P21HE

Items Supplied in the Test Software Package

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

- 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 11807B Option 044 TRU/DRU Test Software card
  Part Number: HP 11807-10017
- HP 11807B Option 044 DRU/TRU Test User's Guide
  Part Number: HP 11807-90150
- HP 11807A Option 100 RF Tools Software card
  Part Number: HP 11807-10100
- HP 11807A Option 100 RF Tools Software 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 Card Storage Space," in chapter 8, on page 266** for the initialization procedure.
  Part Number: HP 85702A
- Software licensing agreement

Equipment Required

- HP 8921A Cell Site Test Set.
- HP 8921A firmware revision A.08.00 or above (although A.09.07 is recommended)
- Accessories:
  - HP 83202A Option 044 Base Station Connection Kit part number HP 83202 Opt 044
  - 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 (HP 8921A Option 020).

Nortel P-Series Test Software Functions:

Using the HP 11807B Option 044 P-Series Test Software, you can test:

- RT Audio Loopback
- RXA and RXB SINAD Sensitivity
- RXA and RXB RSSI Linearity
- RXA and RXB SAT Detection
- RXA and RXB ST Detection
- RXA and RXB Audio Level and Adjustment
- RXA and RXB RSSI Offset and Path Gain
- TX Power Level and Adjustment
- TX Frequency Error
- TX Voice Modulation Limiting
- TX Voice Modulation and Adjustment
- TX Residual FM
- TX Wideband Modulation
- TX SAT Modulation
- Laptop Emulator
- Manual Switch Control
- Swept Return Loss
- Discrete Return Loss
- Cable Fault
- Cable Loss
- Data Collection File Transfer

For a full list of Tests and descriptions, **see "Test Descriptions," in chapter 7, on page 169**.

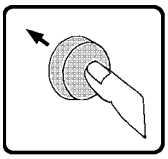
Test Software Features

The following features simplify testing:

- Base Station control commands are automatically sent from the Test Set via the RS-232 interface. Responses from the Base Station are received and used by the Test Software.
- System interconnects are shown graphically 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, 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, pass/fail limits, 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 Test Mode 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 (return loss).

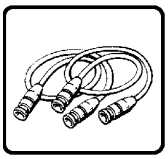
Finding Information

This manual describes the setup and use of the HP 11807B Test Software with the HP 8921A Test Set. The book is arranged in self-contained chapters to meet the following objectives:



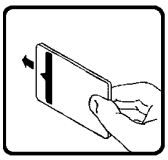
GETTING STARTED-CHAPTER 1

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



CONNECTIONS-CHAPTER 4

- Instructions for cabling test set.



USING THE SOFTWARE-CHAPTER 5

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

TEST DESCRIPTIONS-CHAPTER 7

Definitions, special conditions and restrictions for:

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

REFERENCE-CHAPTER 8

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

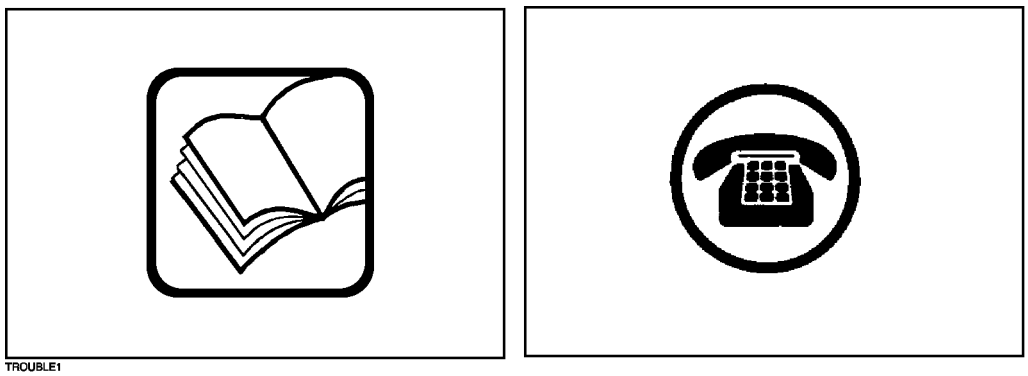
MANUAL1

PROBLEM SOLVING-CHAPTER 9

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

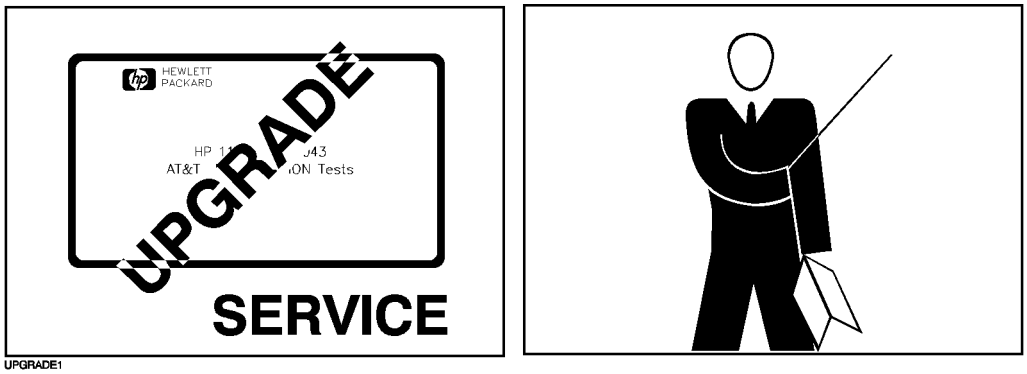
Additional Services Available

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



TROUBLE1

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



UPGRADE1

4

Making Connections

This chapter describes how to:

- make connections to the P-Series transceiver.
- calibrate test cables.

Equipment Required

The following equipment is required for testing:

- P-Series transceiver to test
- HP 8921A Cell Site Test Set (with appropriate firmware revision, described below)
- Cables and Connectors (described below)

Test Set Firmware

The HP 8921A Test Set firmware revision number must be A.08.00 or higher (although A.09.07 is recommended). 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 Nortel Accessory Kit (part number HP 83202 Opt 044) or separately through a local vendor.

CAUTION: DAMAGE TO EQUIPMENT

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

Table 2 Cables/Adapters Contained in Accessory Kit

Description	Purpose	Quantity	Part Number
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
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
RJ11(m) to RJ11(m) 6-wire cable, 25 ft	Connects to dual port splitter and to RJ11 to DB25 adapter	1	08921-61015
RJ11(f) to DB25(m) Adapter	Provides control capability for Nortel P-Series 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
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 Nortel 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
BNC(m) to BNC(m) cable, 1 ft	SWR bridge source input/ reflected out to Test Set DUPLEX OUT and ANT IN	2	08120-1838
6 dB Pad, BNC(f) to BNC(m)	SWR bridge and cable loss matching to Test Set matching	2	0955-0698

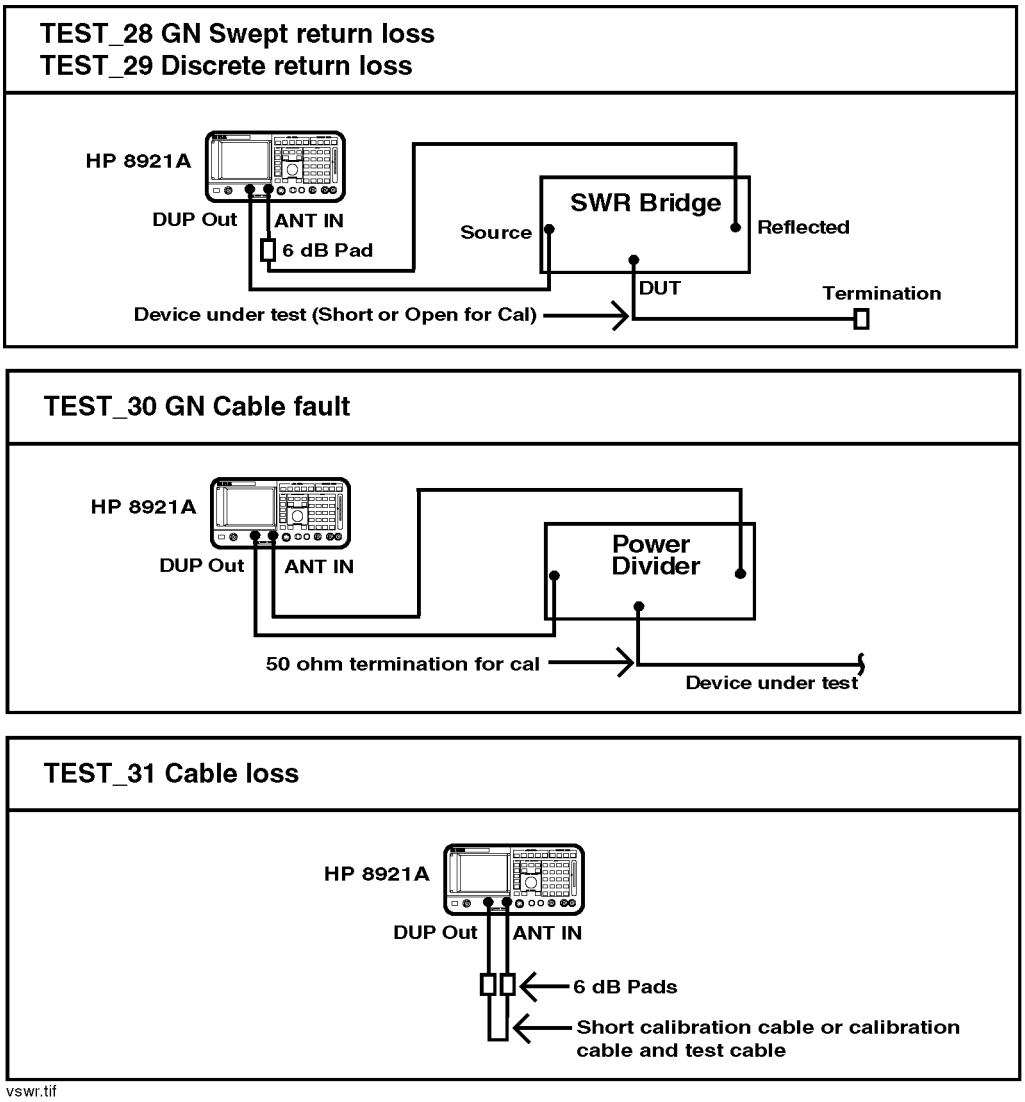
Additional Cables and Connectors Required

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

Table 3 Additional Cables/Adapters Required

Description	Purpose	Quantity	Part Number
SWR bridge Type N(m)	For all VSWR measurements	1	Eagle[1] RLB150N3B or equivalent
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 Ω termination connector type as required	Termination for cable-under-test	1	None
Resistive power splitter 1 GHz, BNC(f), 3 dB	For cable fault locations	1	0955-0733

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



vswr.tif

Figure 1 **VSWR, Cable Fault, and Cable Loss Measurement Connections**

P-Series Equipment Connections

Many arrangements of test equipment and P-Series equipment are possible. In this manual, two of these possibilities are presented:

- Performing Transmitter tests at the PA shelf and Receiver tests at the Receive 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 **"Using the HP 3488A Switch Matrix" on page 327** if you are using an HP 3488A Switch Matrix. **Figure 2 on page 77** 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.

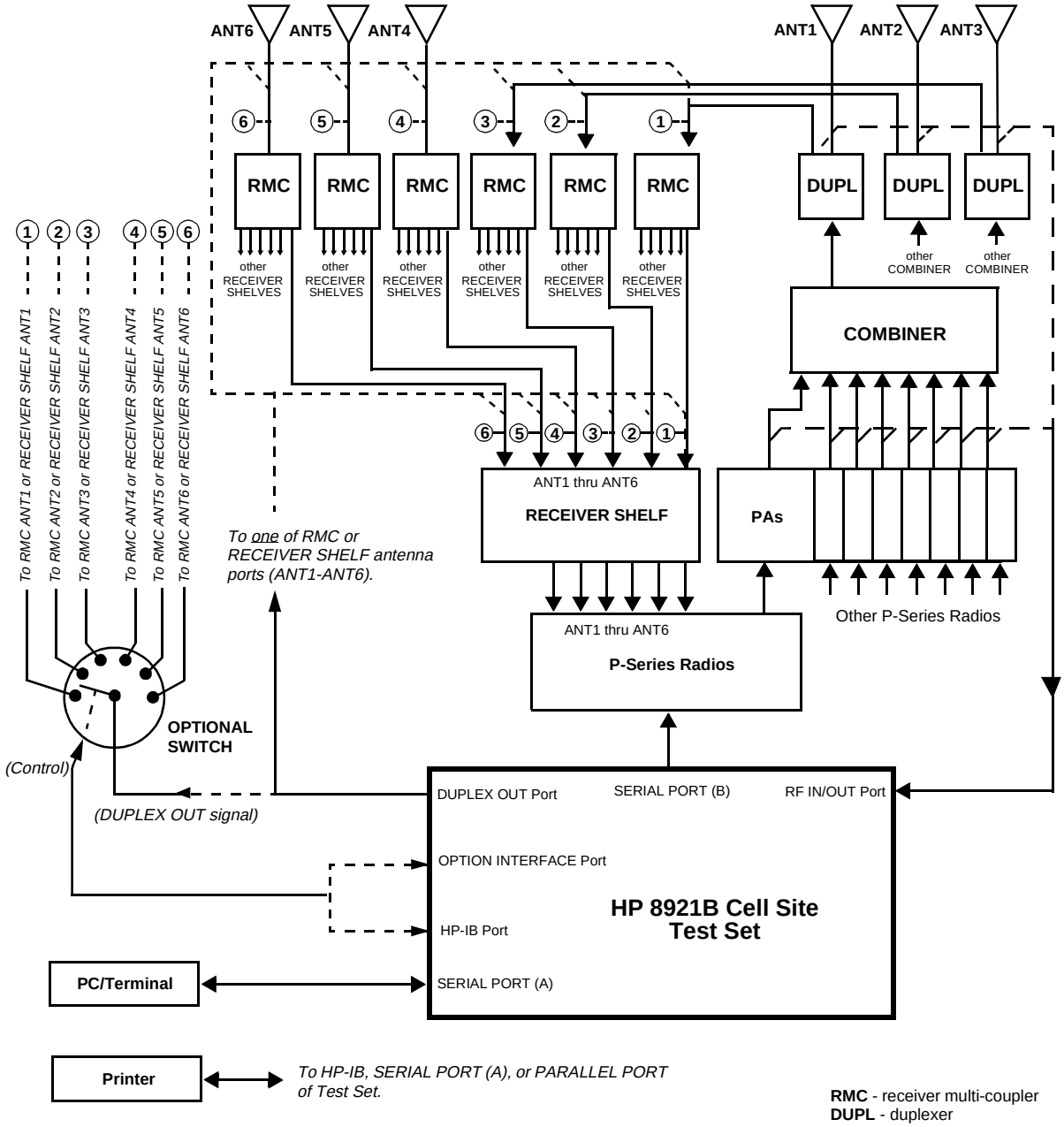


Figure 2 **P-Series - Overall System Block Diagram**

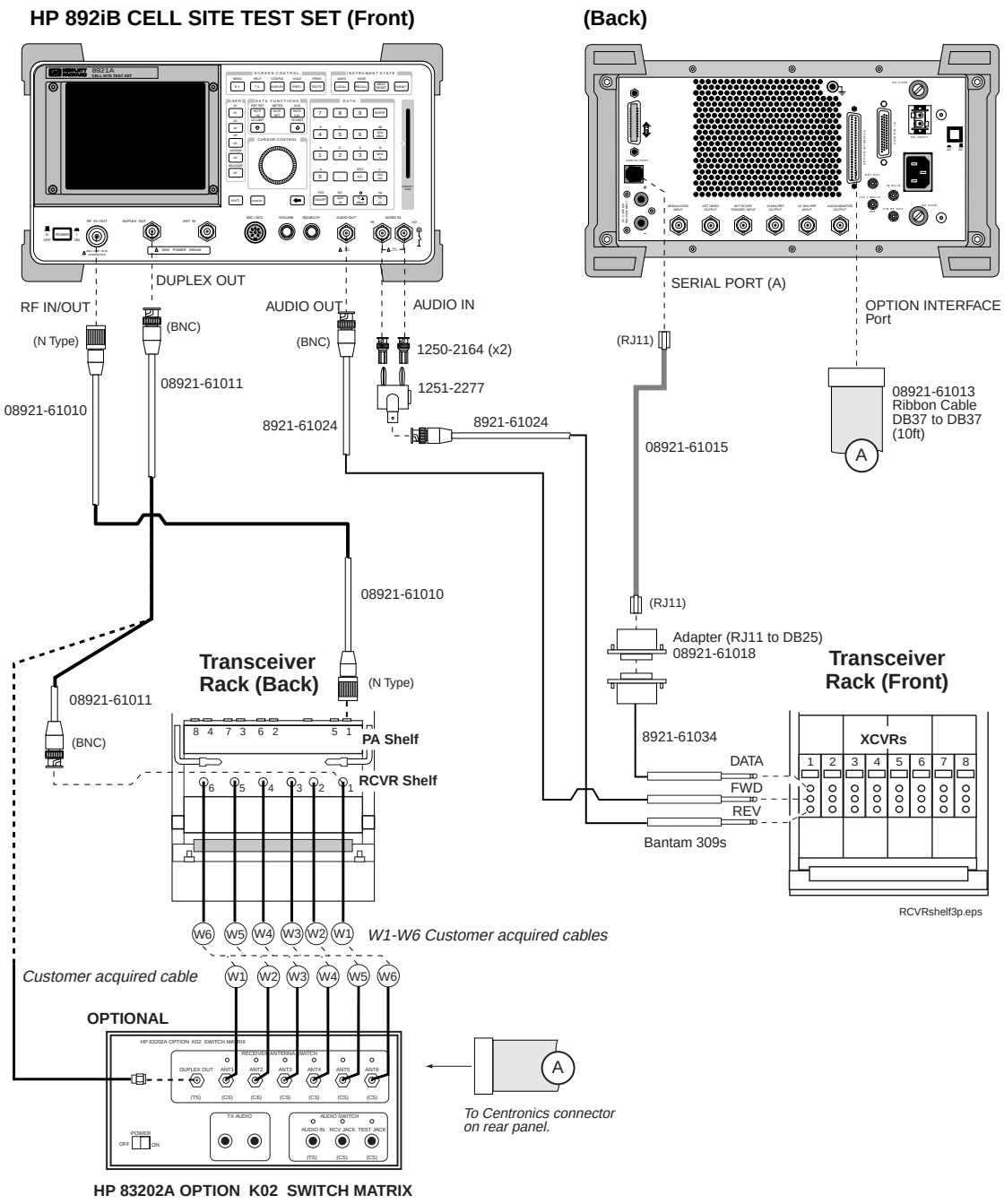


Figure 3 **Test Set - P-Series Connections at Receiver Shelf and PS Shelf**

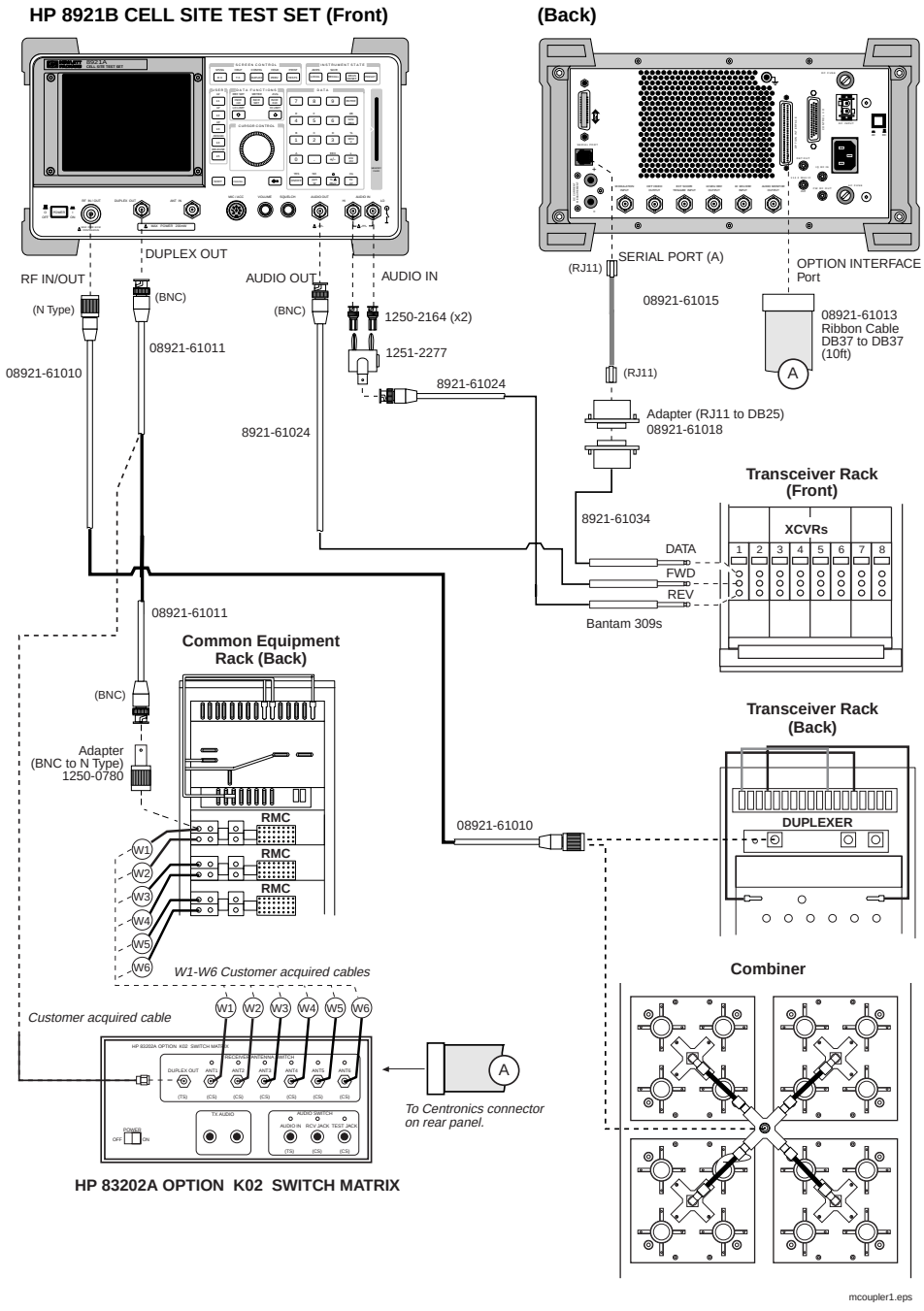


Figure 4 **P-Series Connections at Receiver Multicoupler Output and Duplexer Output**

Receiver RF Connections

See **figure 3** and **figure 4** for a depiction 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 Switch" on page 86** for information on using the switch. See **"Radio Interface Board Connections" on page 86** for details of the connection of the Radio Interface Board to the Switch Matrix. **See "Configuration" in chapter 8, "Reference (Alphabetical)."** for information on how to make the Test Software control the switch.

CAUTION: DAMAGE TO THE DUPLEX OUT PORT

The application of RF power greater than 200 mW (+23 dBm) can damage the Test Set DUPLEX OUT port. 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** and **figure 4** for a depiction of these connections.

The PA outputs are connected one at a time 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 with an 8-way switch. See **"Radio Interface Board Connections" on page 86** for details of connections between the Switch Matrix and Radio Interface Board. **See "Configuration," in chapter 8, on page 245** for the required entries to the **`External Devices`** screen.

Audio Connections

The transceiver FWD Jack or audio input is connected to the Test Set AUDIO OUT. A Bantam 309 to BNC cable is required to make the connection. The Bantam tip must be connected to the Test Set AUDIO OUT BNC center conductor and the Bantam ring must be connected to the Test Set AUDIO OUT BNC outer conductor.

The transceiver REV Jack or audio output is connected to the Test Set AUDIO INPUT. The Test Set AUDIO INPUT has a 600 ohm impedance between the HI and LO input connectors. This load is required to obtain proper REV power readings. Therefore, the transceiver REV bantam connector tip must be connected to the Test Set AUDIO IN HI BNC center conductor and the REV bantam connector ring must be connected to the Test Set AUDIO INPUT LO BNC center conductor.

NOTE: If you are using the connectors supplied in the Accessory Kit, you must connect the BNC to Bantam 309 cable to the Dual Banana to BNC Adapter, and to the two BNC to Single Banana Adapters. See **figure 3** and **figure 4** .

Connection for RS-232 Control of the P-Series

The HP 11807B Option 044 Test Software automatically controls the transceiver through the transceiver DATA Bantam Jack front panel connector. Other connections to the transceiver are not supported.

The Test Set has a rear-panel RJ-11 connector for serial communication. See **figure 6 on page 83**. The connector includes two serial ports, Serial A port and Serial B port. The Serial B port is used for transceiver control and messaging.

Connections between the transceiver DATA Bantam Jack and a DB-25 connector are shown in **figure 5 on page 82**. **Table 4** shows the wiring between the Test Set serial RJ-11 connector to a DB25 connector to the transceiver Bantam connector.

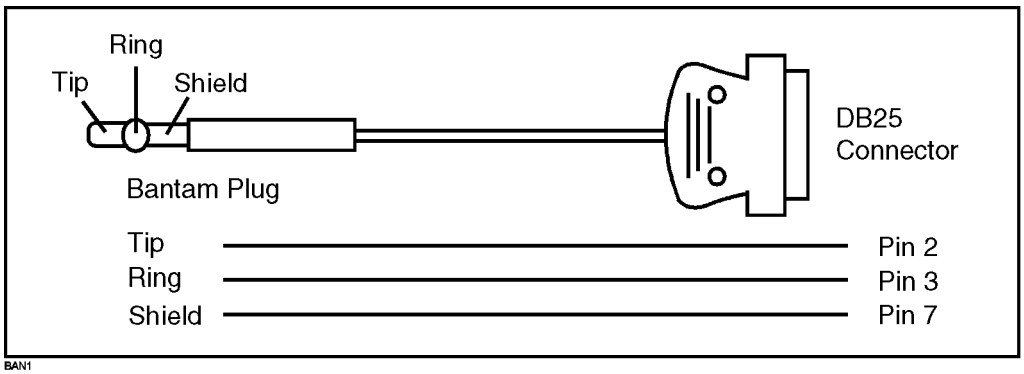


Figure 5 **Connections Between DATA Bantam Jack to a DB-25 Connector**

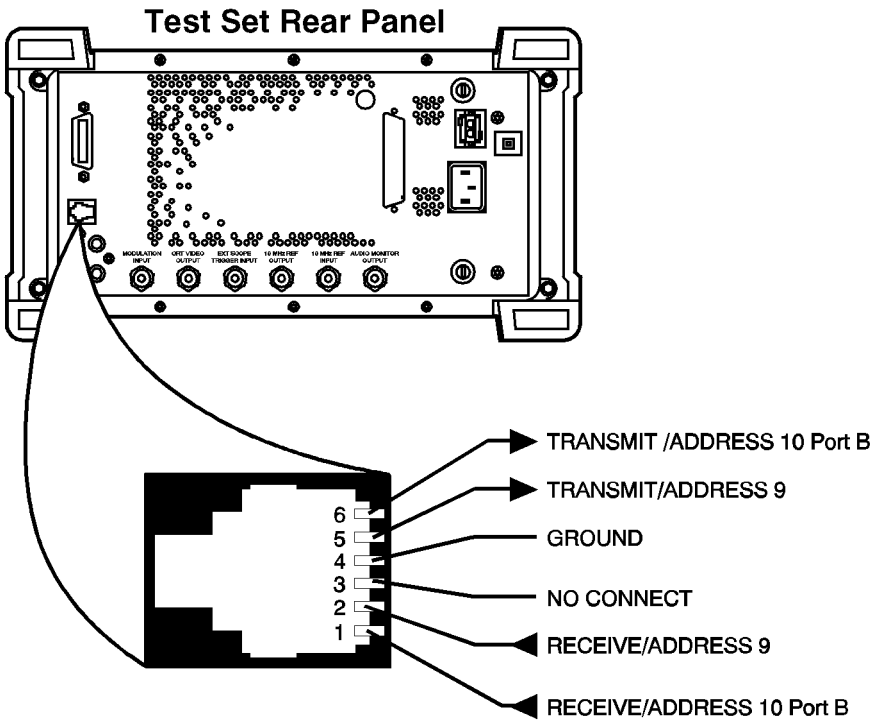


Figure 6 **Test Set RJ-11 Serial Port Connections**

NOTE: CHECK THE RJ-11 WIRING RJ-11 cables and adapters may be wired in several ways. Verify the end-to-end connections between the Test Set RJ-11 connector and the Bantam transceiver connector.

The connections between the Test Set RJ-11 connector and the DATA Bantam Jack connector are listed in the following table:

Table 4 Connections for transceiver Control

Item	Test Set	DB-25	P-Series DATA Bantam Jack
Test Set Receive B data	RJ-11 Pin 1	DB-25 pin 3	Bantam Ring
Ground	RJ-11 Pin 4	DB-25 pin 7	Bantam Shield
Test Set Transmit B data	RJ-11 Pin 6	DB-25 pin 2	Bantam Tip

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.

Serial Port and Printer Connections

Serial Port Connections for Data Collection

The HP 11807B Option 044 Test Software has the capability to upload 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 from the Test Set Serial port.

The following pins are used by the Serial A port:

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

See **figure 5 on page 82**. 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 can be connected to the Test Set rear-panel HP-IB connector.

A serial printer can be attached to the Serial port. See **figure 5 on page 82**. 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

See "Printing," in chapter 8, on page 272 for information on how to set up the Test Set.

Radio Interface Board Connections

Automatic Selection Using Switch

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 5 on page 87** and **table 6 on page 87** for Radio Interface Board pinout information. Also **see "Configuration," in chapter 8, on page 245** for information on configuring the Test Set to perform automatic switching. See **Appendix A, "Using the HP 3488A Switch Matrix" on page 327**.

CAUTION: DAMAGE TO THE RADIO INTERFACE BOARD

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," in chapter 8, on page 245** or key word entries.

Also, the switches may be controlled manually. See **P-Series TEST_27 - GN Manual Switch Control**.

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

Table 5 **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 6 **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 have 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 may 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 the losses through the cables and Switch Matrix connecting the transceiver and the Test Set. It is important therefore that the appropriate calibration factors be used. *TEST_31 GN Measure 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 **"P-Series TEST_31 - GN Measure Cable Loss" on page 222**.

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_27* to control the Switch Matrix, followed by *TEST_31* to measure cable loss. Repeat these two tests for each switch position (see **chapter 5**). You must still store the measured values for each cable as *RX1 cable loss* through *RX6 cable loss* and *TX cable loss.*

5

Using the Test Software with FW Above Revision A.14.00

Firmware Enhancements

NOTE:

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

- **HP 8921A Test Sets with firmware revision above A.14.00**

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.

If you have an HP 8921A Test Set with firmware revision below A.14.00, refer to **chapter 6, "Using the Test Software with FW Below Revision A.14.00," on page 119**. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired.

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 includes two methods for 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.

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:

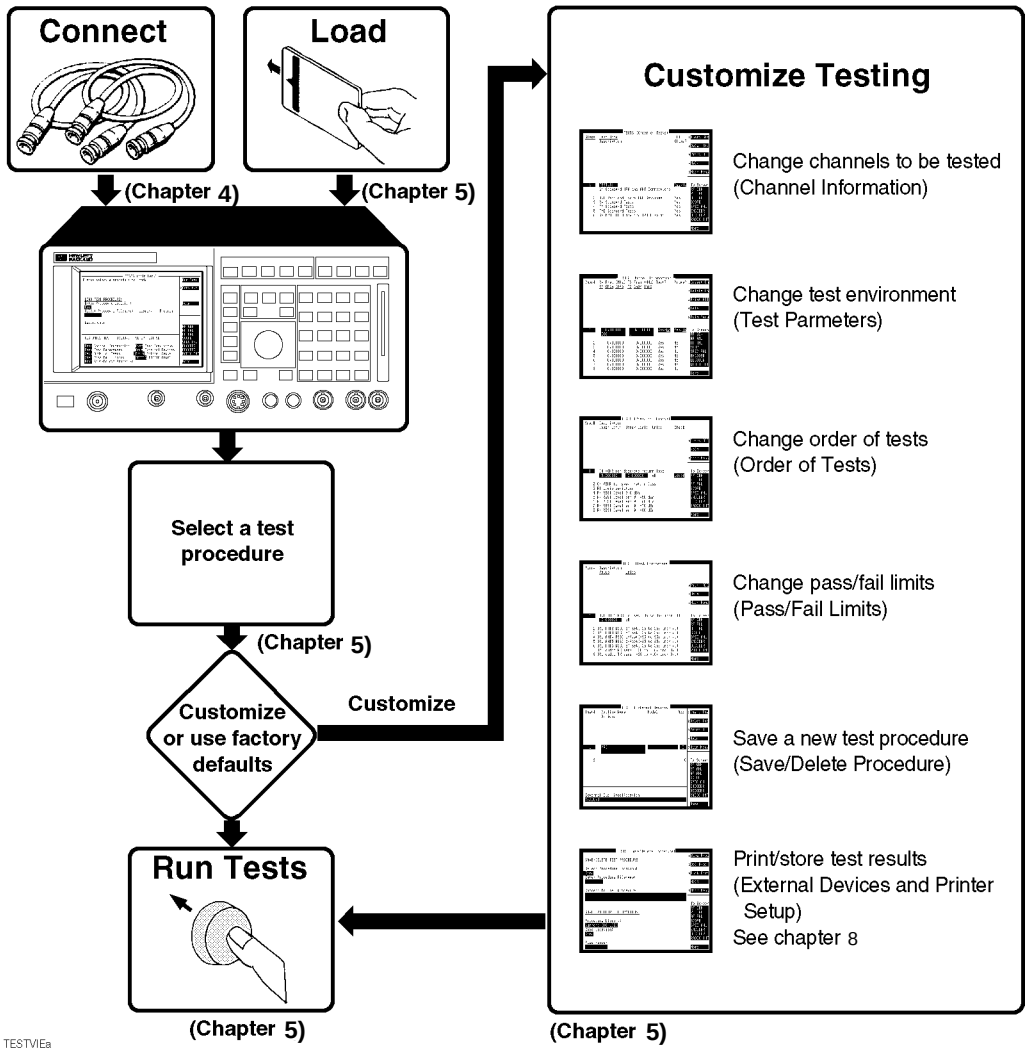
- Specify which channels to test, and enter frequency information (Channel Information)
  - You might wish to test one, some, or all of the radios on the shelf.
- Select which tests to run (Order of Tests)
  - You might wish to run all, some, or just one of the tests.
- Change the pass/fail limits for specific measurements (Pass/Fail Limits)
  - You might wish to use tighter or looser pass/fail limits 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 the 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 4)
(Chapter 5)
Select a test procedure
(Chapter 5)
Customize or use factory defaults
Customize
Run Tests
(Chapter 5)
TESTVIEa
Customize Testing
Change channels to be tested (Channel Information)
Change test environment (Test Parmeters)
Change order of tests (Order of Tests)
Change pass/fail limits (Pass/Fail Limits)
Save a new test procedure (Save/Delete Procedure)
Print/store test results (External Devices and Printer Setup)
See chapter 8
(Chapter 5)

Running Tests

Before you load the Test Software and run tests, you should have made the appropriate hardware connections. **See chapter 4, "Making Connections"** if you have not done so already.

The Test Software may be run with the factory default settings, or it may be customized to your specific requirements (see **"Customizing Testing" on page 99**).

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

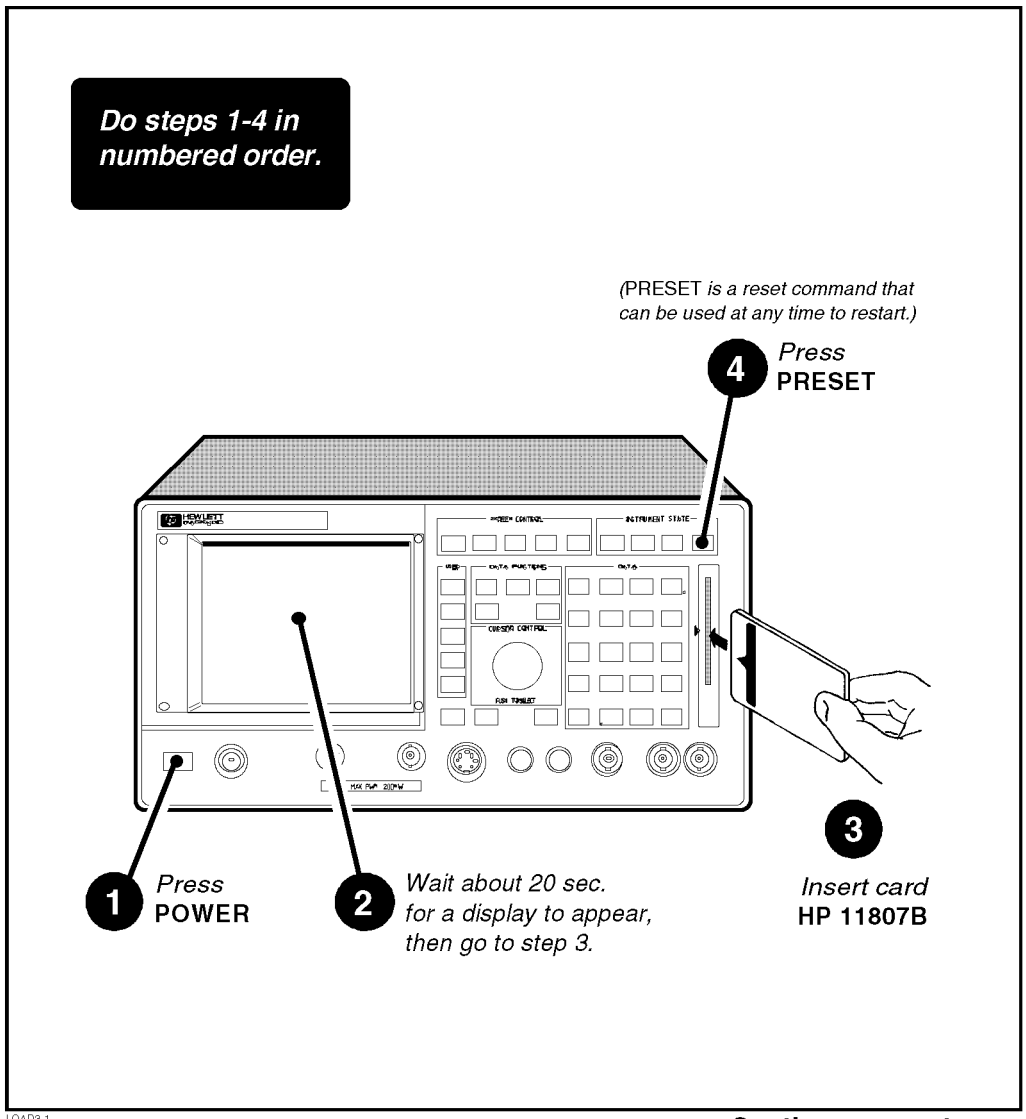
- Pressing CANCEL will pause the current test.
- Pressing k2 (**`Continue`**) will continue the test.

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 to be loaded at that time.

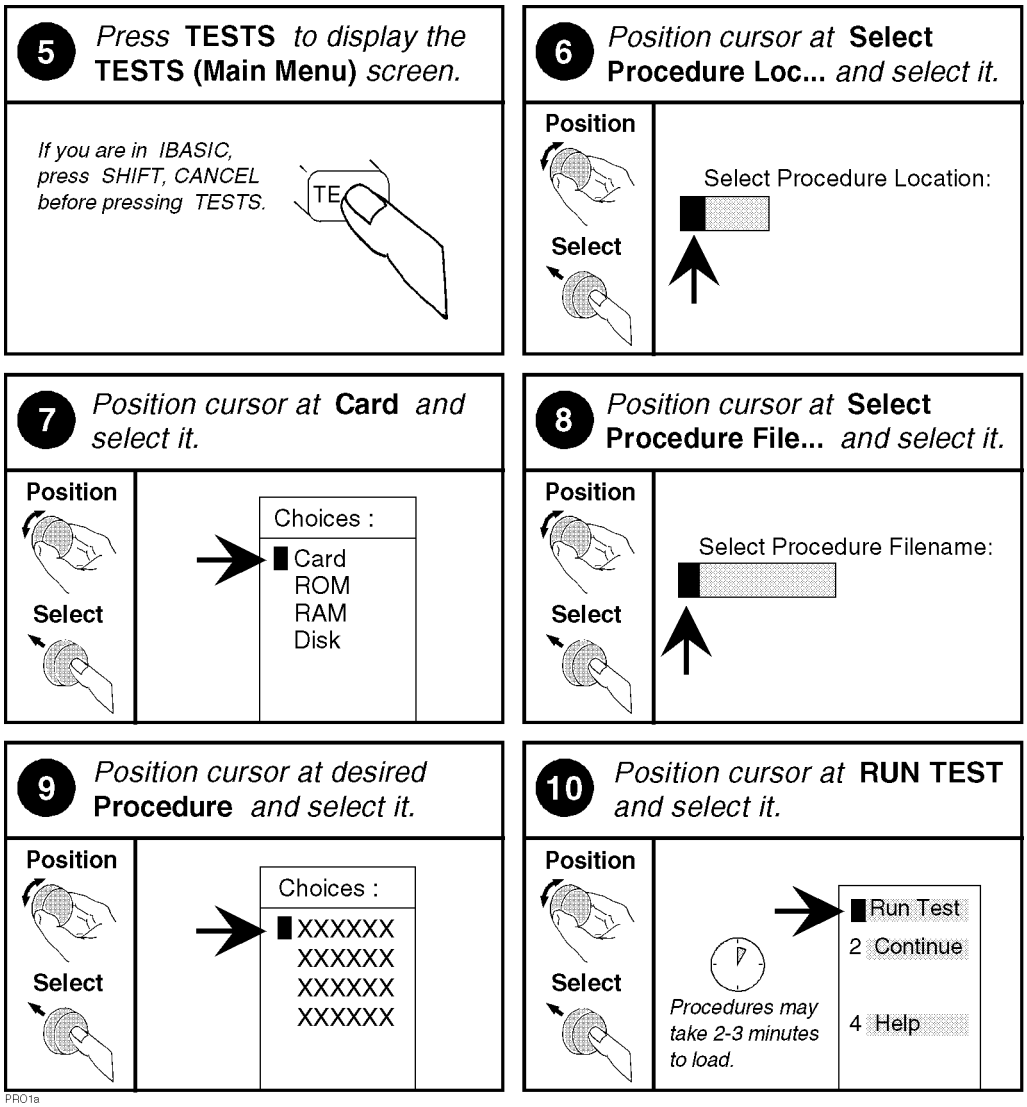
The Test Software memory card can be removed after the program is loaded into the Test Set memory. The program will remain in memory after a power-down/ power-up cycle unless it is manually deleted or a new program is loaded.

Starting Up



LOAD3-1

Continue on next page


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

Customizing Testing

Because of the diversity of individual testing 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 an SRAM card so that you may skip these steps in the future. See **"Saving a Test Procedure" on page 112**.

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.

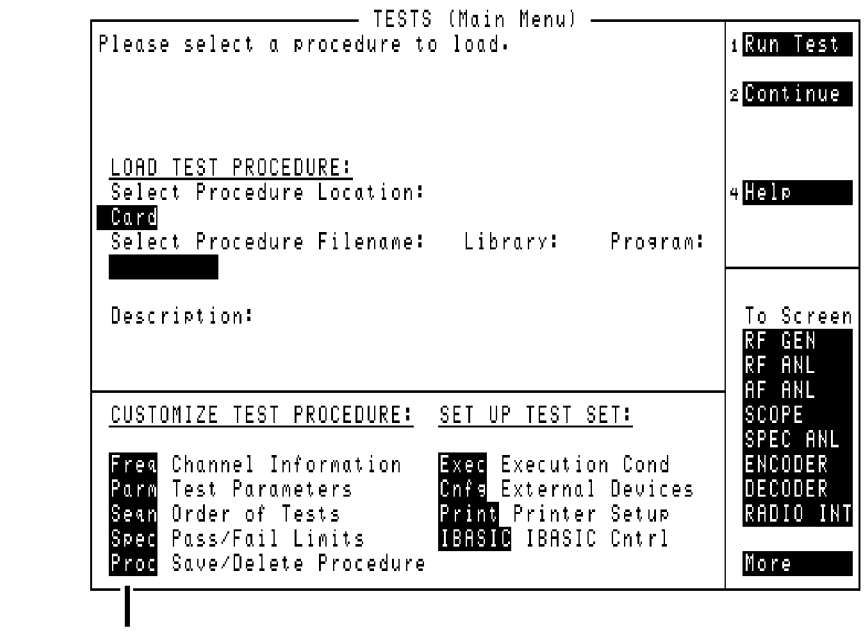
NOTE: The External Devices, Printer Setup, and IBASIC Controller screens will not be explained in this customizing section.

- 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)," in chapter 8, on page 251** and **"Logging" on page 262**.
- The Printer Setup screen is used to print the test results. **See "Printing," in chapter 8, on page 272**.
- 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 should acquire the following manuals:
  - HP 8921A,D Test Sets
  - *HP Instrument Basic User's Handbook*
    Part Number: HP E2083-90000
  - *HP 8921 Programmer's Guide*
    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** field of choice. Press TESTS on the Test Set front panel to access the TESTS (Main Menu) screen.

TESTS (Main Menu) Screen



Selecting a Test Function opens a Customization Screen.

CUSTOM1a

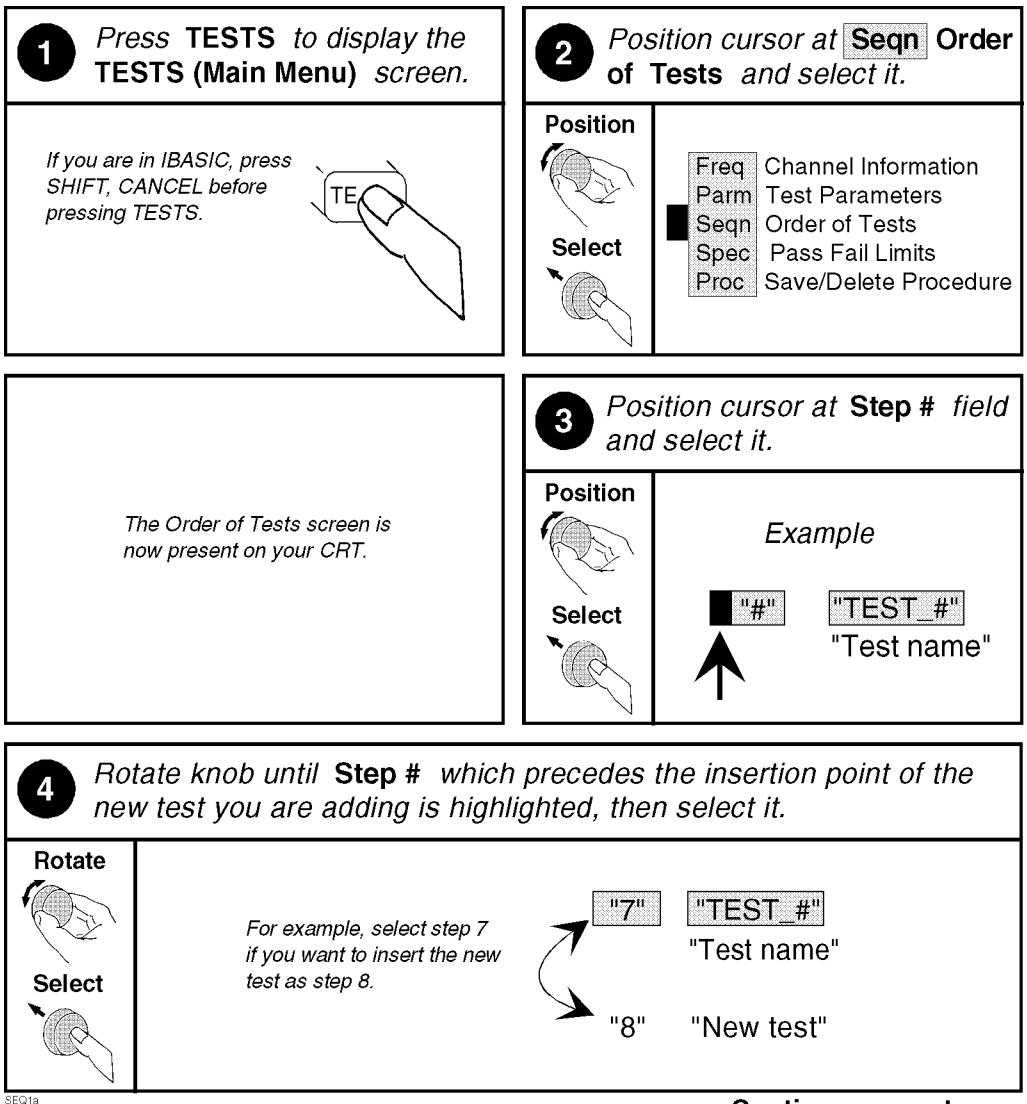
Changing the Order of Tests

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 112**.

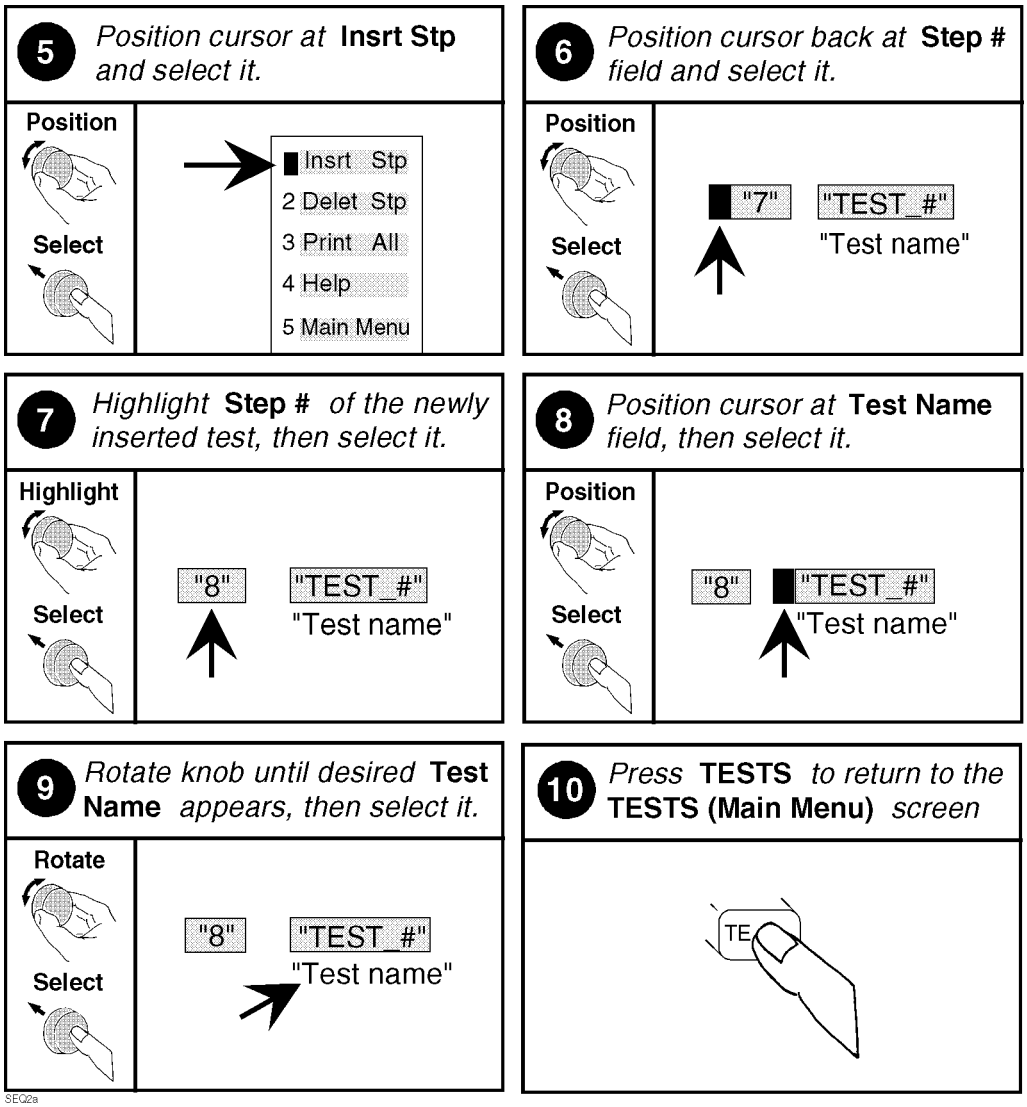
Defining the order of tests is accomplished by inserting or deleting tests from the list of tests that come with the Test Software package. **See "Test Descriptions," in chapter 7, on page 169**, for descriptions of tests included in this package.

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



Continue on next page


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

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 wish 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.

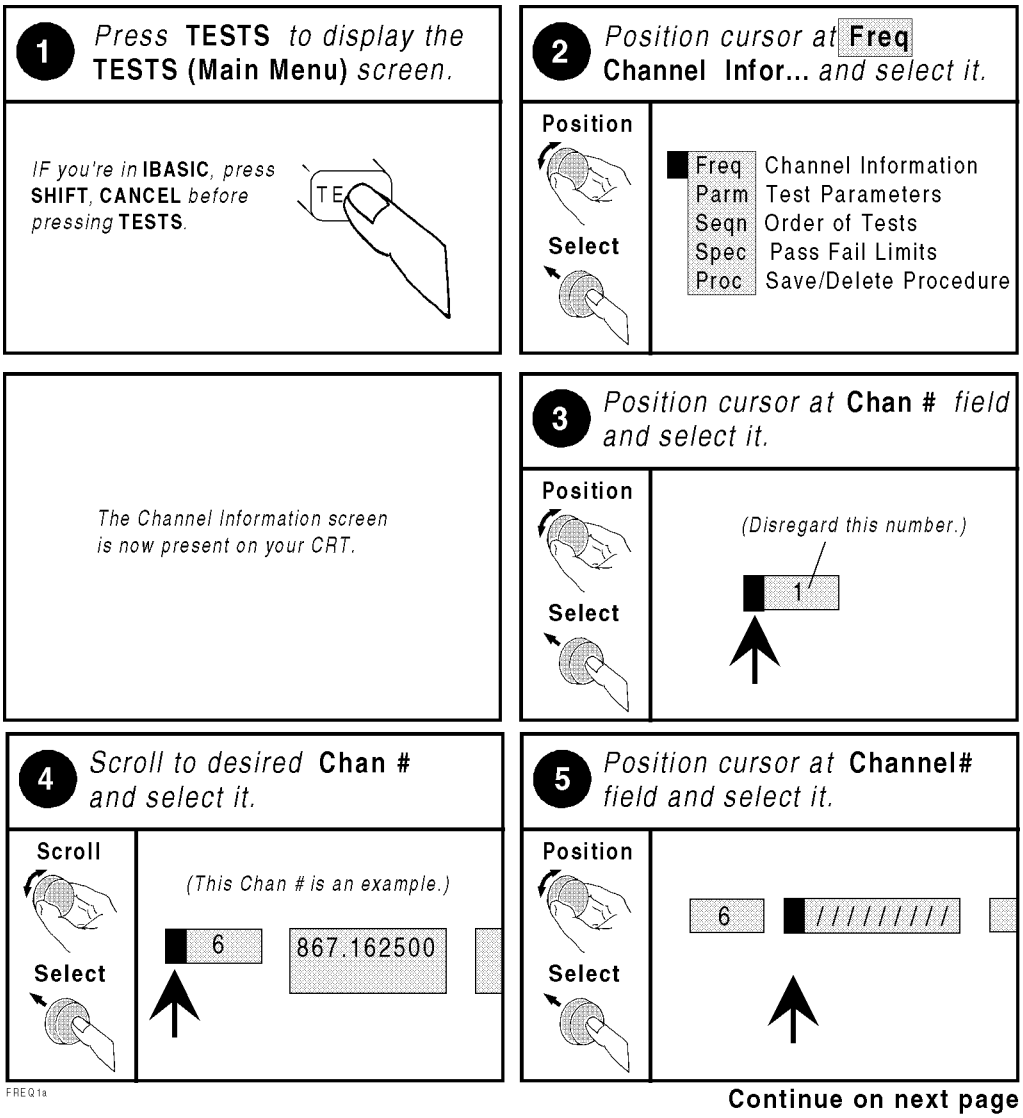
To Use the Channel Information Screen

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:

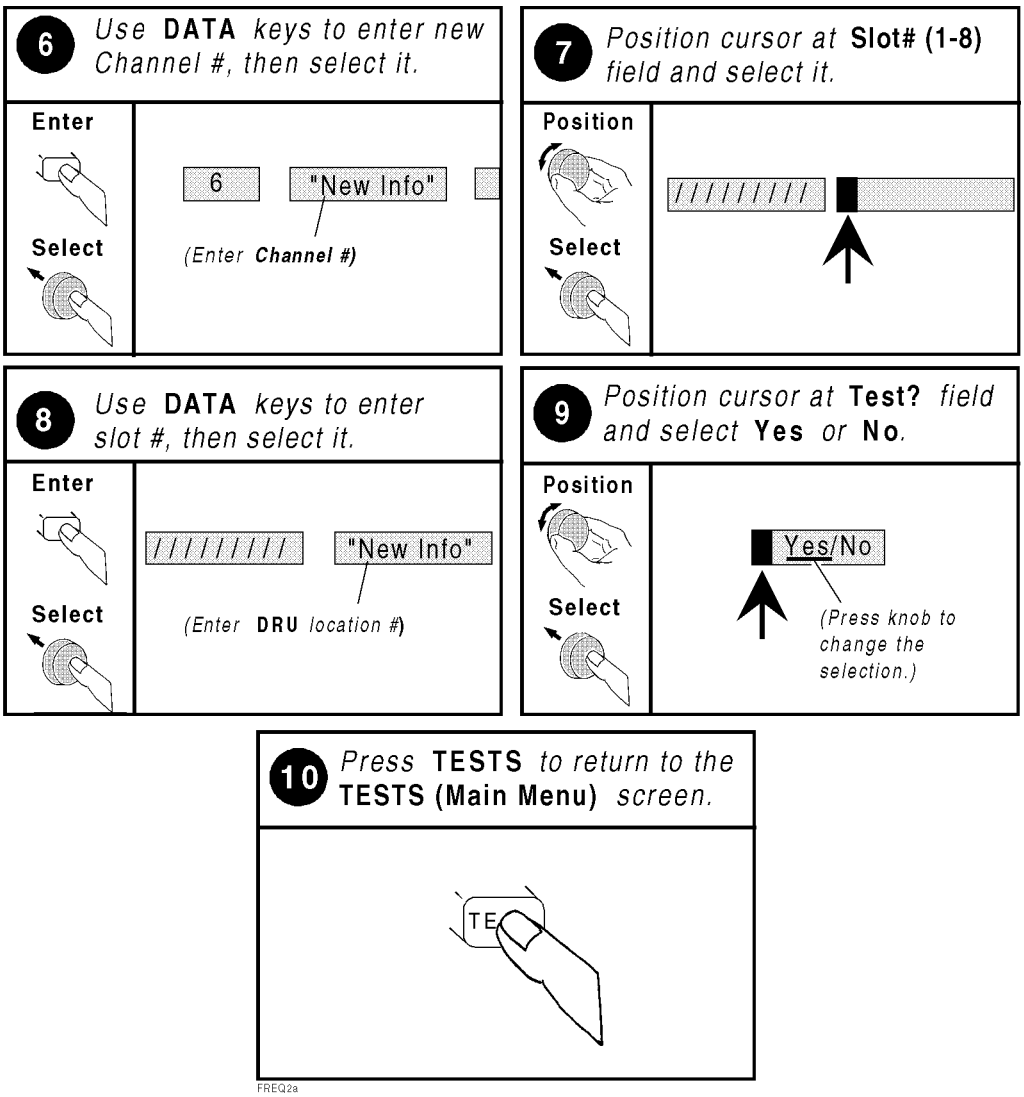
- **`Channel#`**
  - Enter the channels that you wish to test into this field. Enter –1 as channel number to truncate channel testing.
- **`Slot# (1-8)`**
  - Enter the slot number into this field. This number is the location of the transceiver in the rack. The locations are 1 through 8 from left to right on a shelf.
- **`Test?`**
  - Select **`Yes`** or **`No`** to specify whether to test the UUT at this channel/frequency. If you select **`Yes`**, the channel will be tested. If you select **`No`**, the 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 112**.

How to Specify Channel Information



Continue on next page

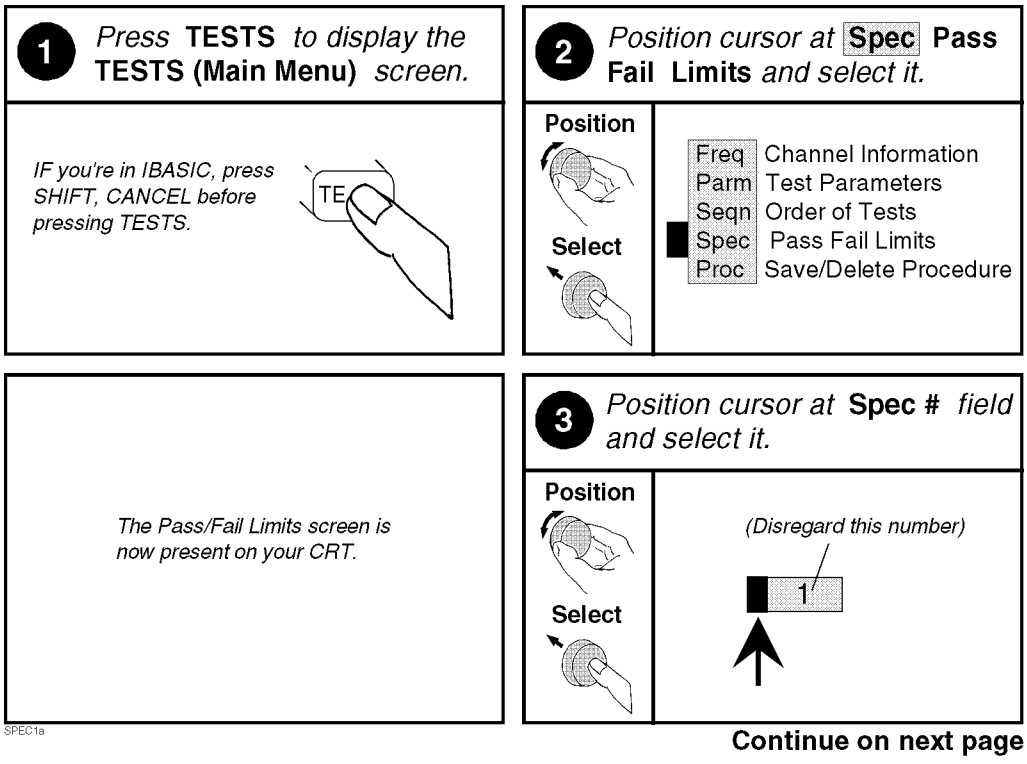

6
Use DATA keys to enter new Channel #, then select it.
Enter
Select
6
"New Info"
(Enter Channel #)
7
Position cursor at Slot# (1-8) field and select it.
Position
Select
8
Use DATA keys to enter slot #, then select it.
Enter
Select
"New Info"
(Enter DRU location #)
9
Position cursor at Test? field and 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

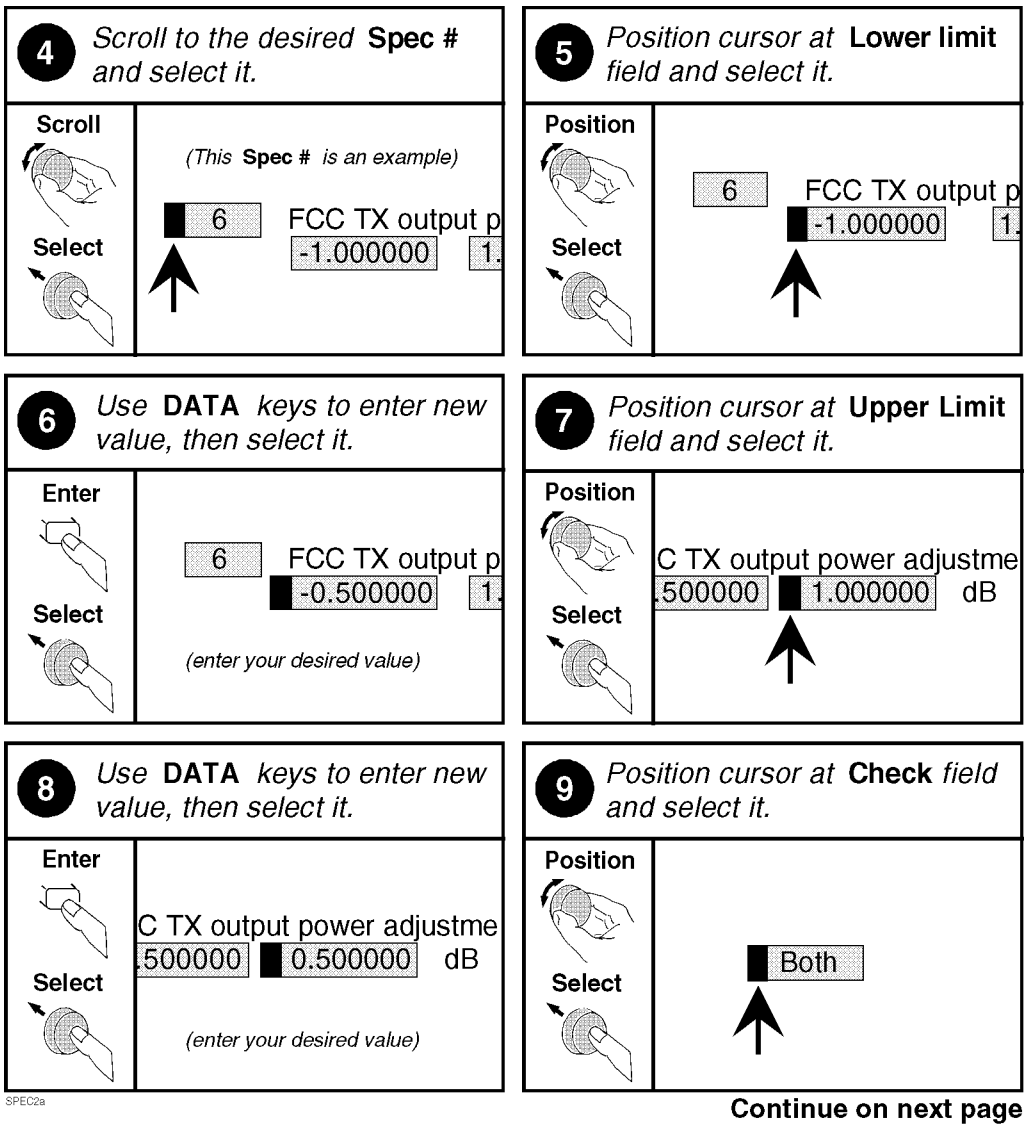
Pass/Fail limits define the values with which a measurement result is compared to determine if the UUT meets its specified standards. Default values are included in the Test Software. These values may be changed to suit your particular requirements.

This section describes how to change the pass/fail (upper and lower) limits using the Pass/Fail Limits screen. **See "P-Series Pass/Fail Limit Descriptions," in chapter 7, on page 237** for a description of each pass/fail limit. For information on saving customized pass/fail limits, see **"Saving a Test Procedure" on page 112**.

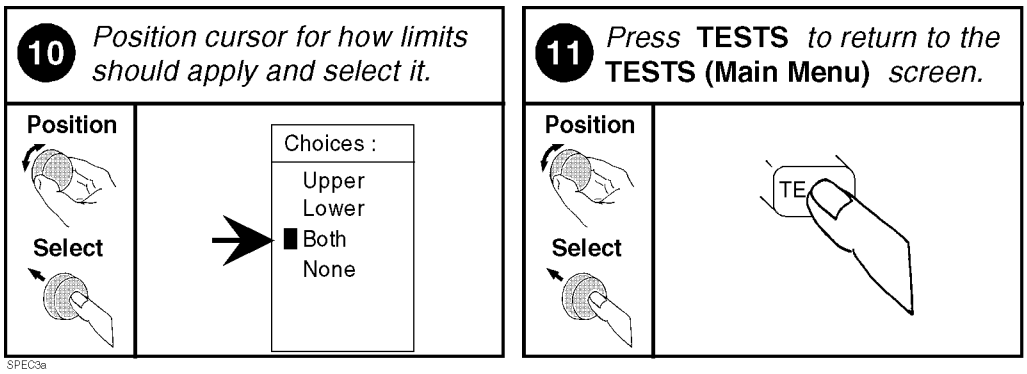
How to Change Pass/Fail Limits



Continue on next page



Continue on next page

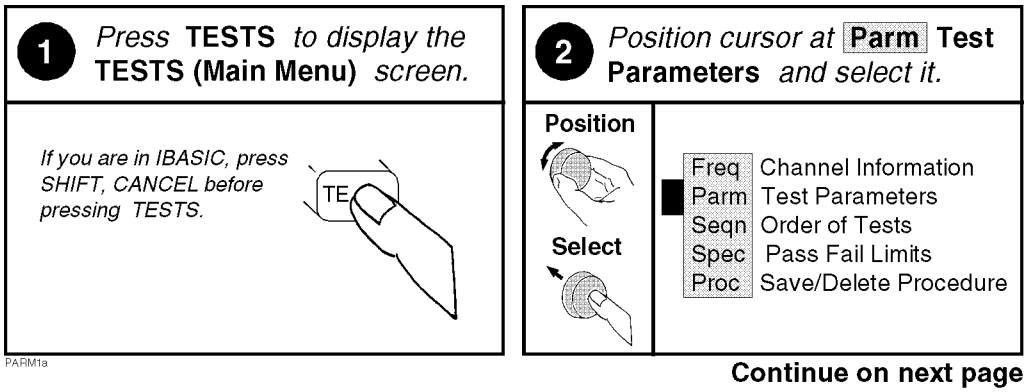

10
Position cursor for how limits should apply and select it.
Position
Select
Choices :
Upper
Lower
Both
None
11
Press TESTS to return to the TESTS (Main Menu) screen.
Position
Select
TE
SPEC3a

Changing the Test Parameters

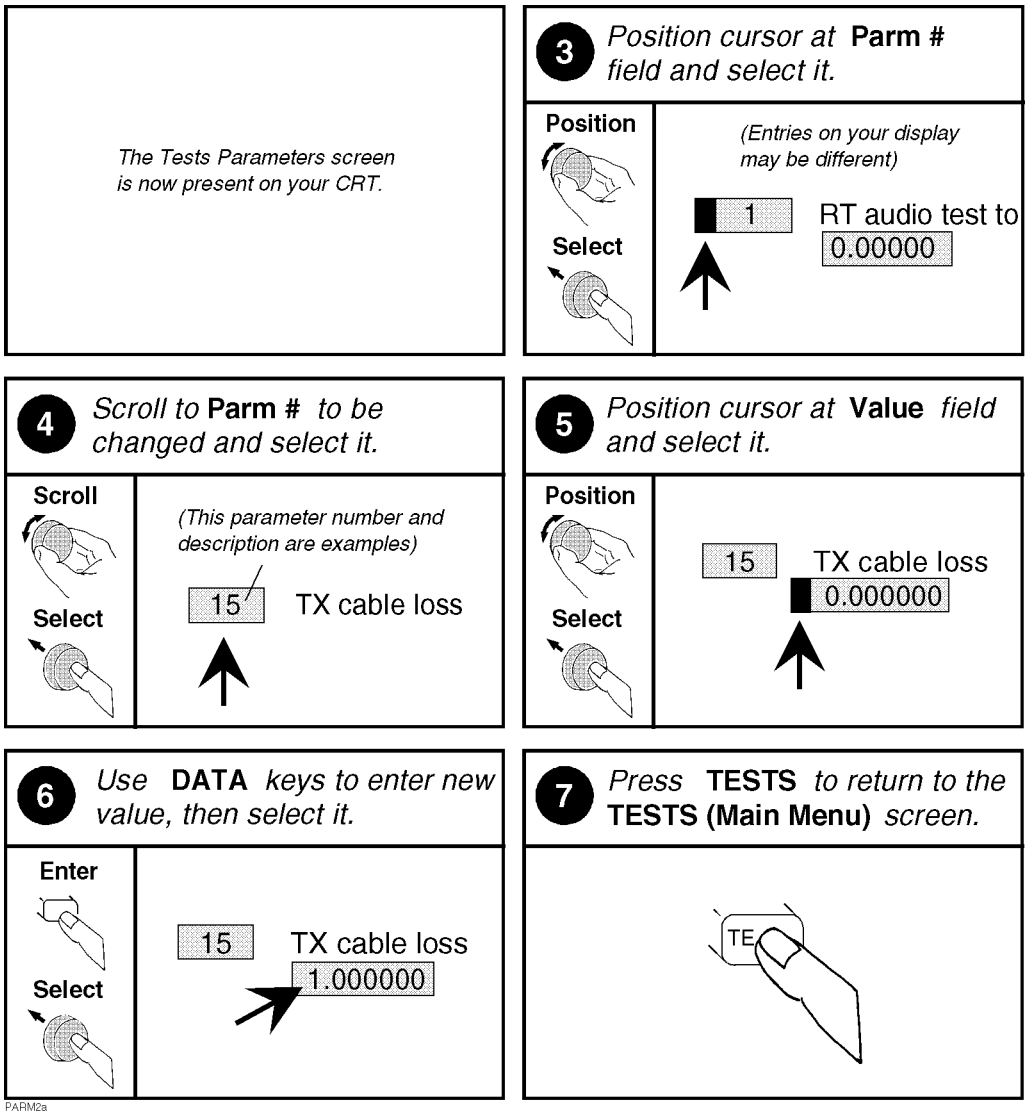
The Test Software uses parameters to optimize the test environment and conditions for the testing situation. Many of the test parameters are determined by examining the test requirements. The Test Software comes with default settings for test parameters. Review the defaults for your particular requirements.

This section describes how to change test parameters using the Test Parameters screen to optimize your testing conditions. **See "P-Series Parameter Descriptions," in chapter 7, on page 225** for a description of each test parameter. For information on saving customized test parameters, see **"Saving a Test Procedure" on page 112**.

How to Change the Test Environment and Conditions



Continue on next page


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

PARM2a

Saving a Test Procedure

A Test Procedure is a collection of channel information, test parameters, testing order, and pass/fail limits saved in a file that customizes the Test Software to a specific application. You may save the file to an SRAM card.

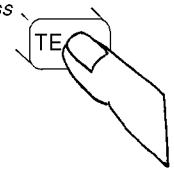
When you save a procedure, you will be saving the channel information, test parameters, pass/fail limits, and testing order, plus a library that contains the names of all test parameters, pass/fail limits, and tests that are resident in the Test Software. The library file comes from the Test Software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

This section describes how to save a new procedure to an SRAM card. For more information concerning procedures, **see "Procedures," in chapter 8, on page 285**.

How to Save a Test Procedure

1 *Press* **TESTS** *to display the* **TESTS (Main Menu)** *screen.*

If you are in **IBASIC,** *press* **SHIFT, CANCEL** *before pressing* **TESTS**.



2 *Position cursor at* **Proc Save/ Delete Pro...** *and select it.*

Position

Select

Freq Channel Information
Parm Test Parameters
Seqn Order of Tests
Spec Pass Fail Limits
Proc Save/Delete Procedure

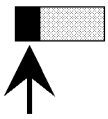
The Save/Delete Procedure screen is now present on your CRT.

3 *Position cursor at* **Select Procedure Loc...** *and select it.*

Position

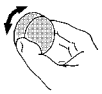
Select

Select Procedure Location:



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

Position

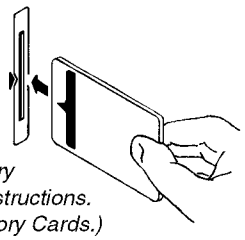


Select

Choices :
Card
RAM
Disk

(You can also save procedures to an internal RAM disk or external disk drive. See chapter 8 -Disks.)

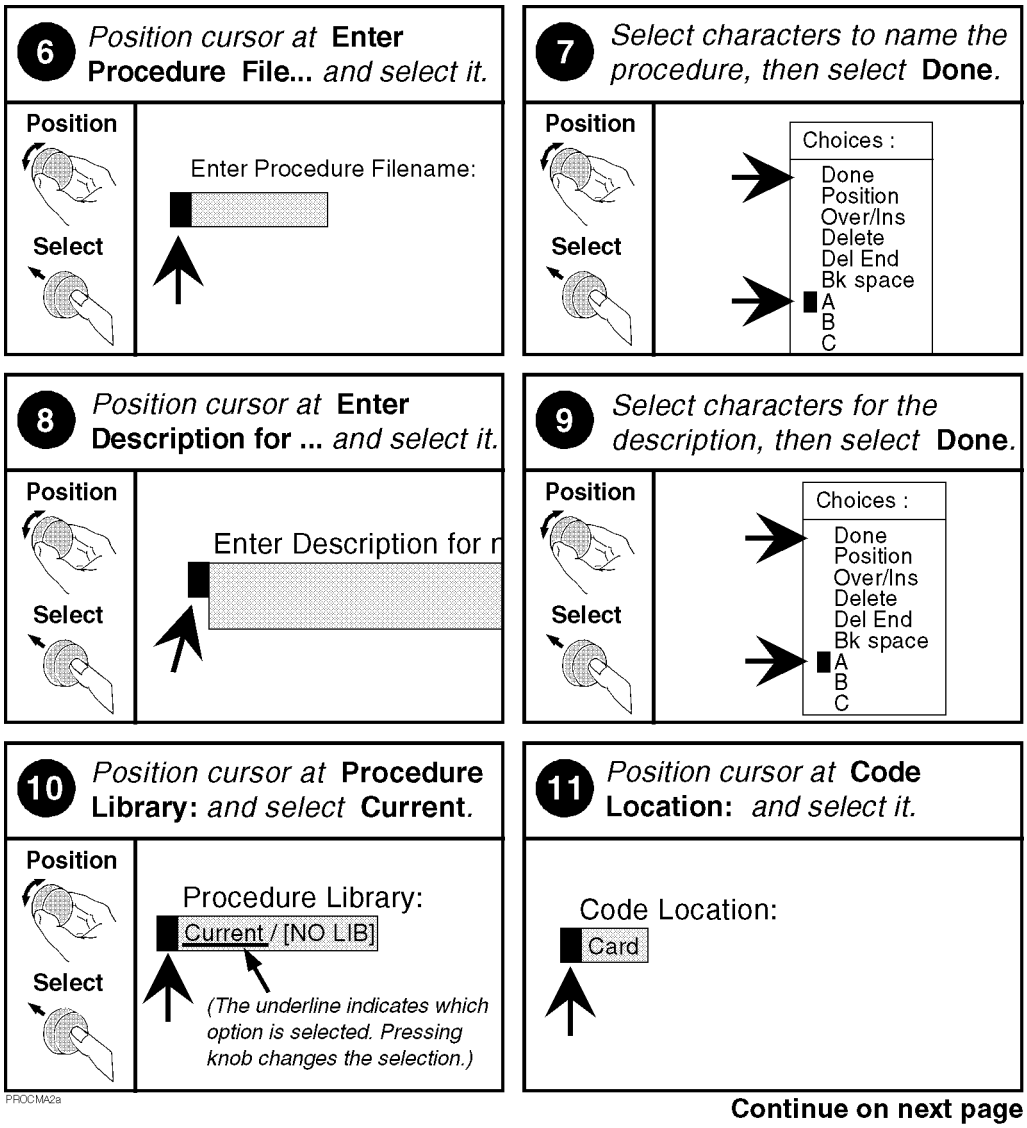
5 *Insert an initialized* **SRAM** *memory card.*



(For detailed memory card initialization instructions. see chapter 8 -Memory Cards.)

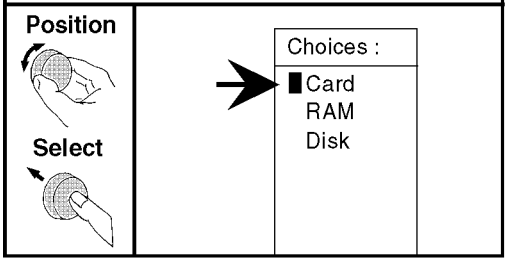
PROCMA1a

Continue on next page

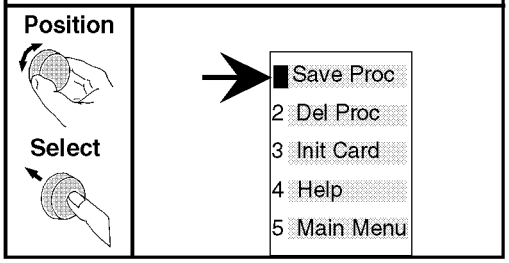


Continue on next page

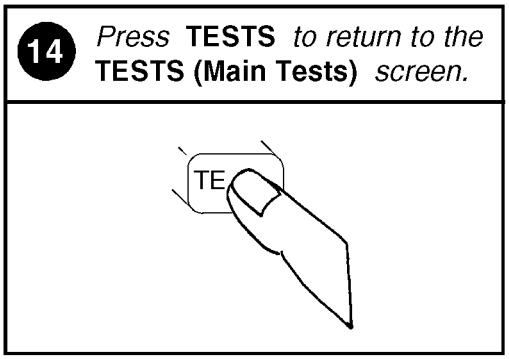
12 *Position cursor at* **Card** *and select it.*



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



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



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

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

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

PROCMA3a

Changing Test Execution Conditions

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 hard copy. (**`Output Results To`**)

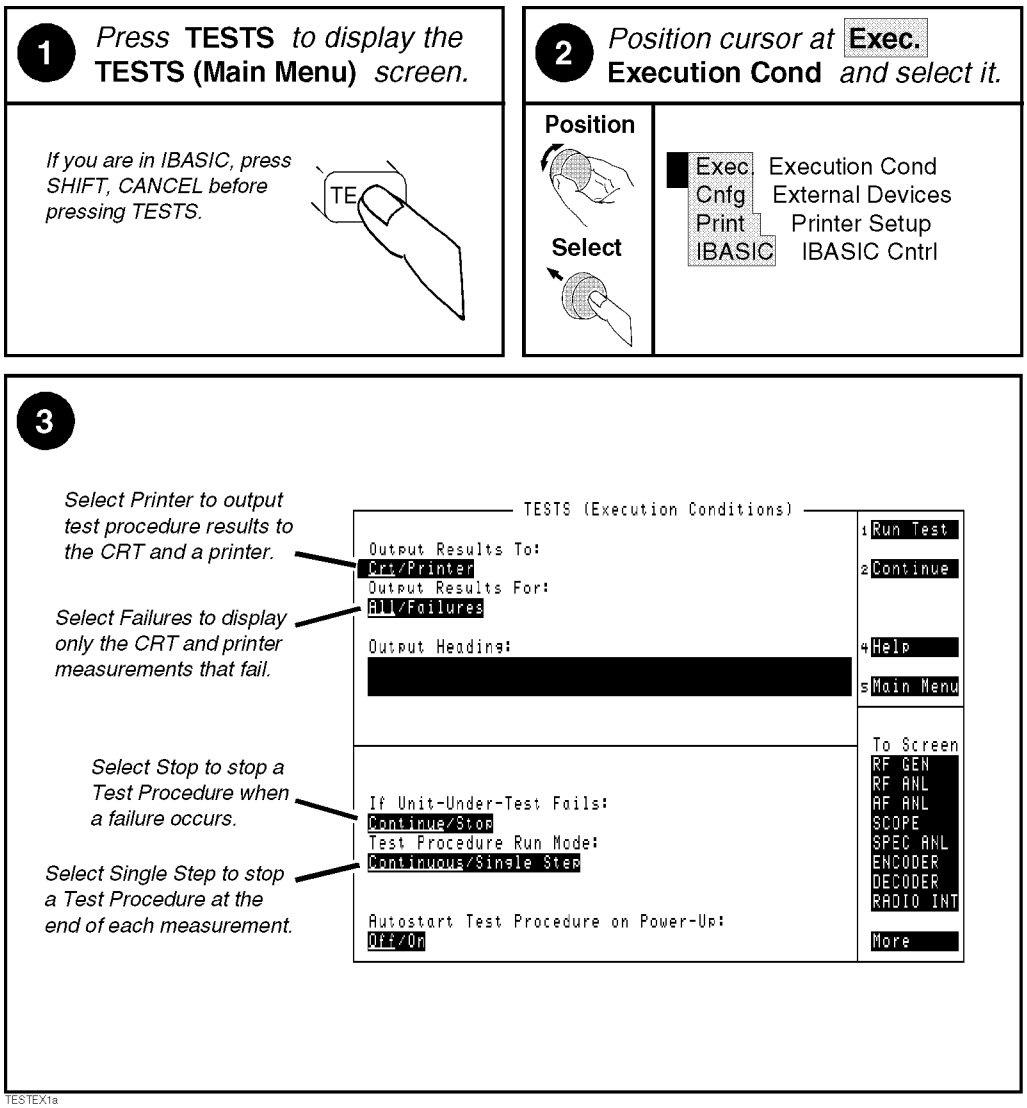
NOTE: If printing test results is desired, after selecting **`Printer`**, additional steps are required to connect and configure the printer. **See "Printing," in chapter 8, on page 272**.

- 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 Mode to send commands to the Base Station. (**`If Unit-Under-Test Fails`**)
- Pause between measurements, or run through the 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 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.

Test 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



Printing and Saving Test Results

Printing and saving test results are Test Software features that require additional equipment and configuration. **See "Printing," in chapter 8, on page 272** for detailed descriptions and instructions for these features.

6

Using the Test Software with FW Below Revision A.14.00

Firmware Enhancements

NOTE: Firmware revision A.14.00 in the HP 8921A,D Test Sets has several enhancements. This chapter applies to users with:

- **HP 8921A Test Sets with firmware revision below A.14.00**

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.

If you have an HP 8921A Test Set with firmware revision above A.14.00, refer to **chapter 5, "Using the Test Software with FW Above Revision A.14.00," on page 91**. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired.

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.

Testing Overview

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

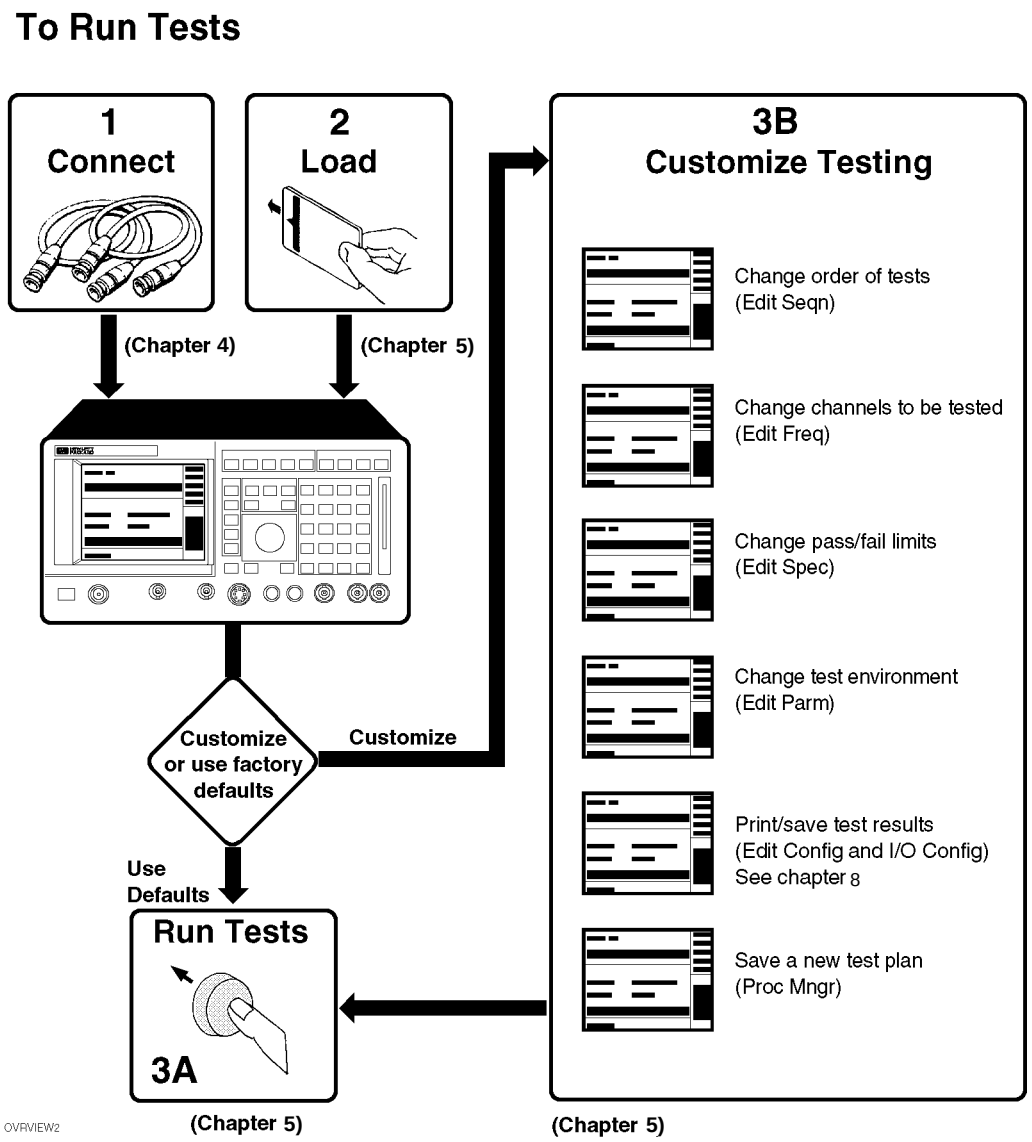
Begin running tests:

- If the factory default settings are acceptable for your application or
- If the Test Software has already been customized for your cell site, and saved to an SRAM card

or

Customize the Test Software:

- Decide which tests to run (Edit Sequence)
  - You might wish to run all, some, or just one of the tests.
- Specify which channels to test, and enter frequency information (Edit Frequency)
  - You might wish to test one, some, or all of the channels on your radio.
- Change the pass/fail limits for specific measurements (Edit Specifications)
  - You might wish to use tighter or looser pass/fail limits than the default settings.
- Change the test environment and conditions (Edit Parameters)
  - You might wish to decide if certain values should be measured or calculated.
  - You might wish to change the output format.
  - You might wish to enter specific information about cell site equipment and/or environment.
- Save any or all of the above customized changes (to an SRAM card)
- Select options:
  - You might wish to print test results or certain screens.
  - You might wish to select when and where test results will be displayed (Execution Conditions)


To Run Tests
1
Connect
2
Load
(Chapter 4)
(Chapter 5)
Customize
or use factory
defaults
Customize
Use
Defaults
Run Tests
3A
(Chapter 5)
3B
Customize Testing
Change order of tests
(Edit Seqn)
Change channels to be tested
(Edit Freq)
Change pass/fail limits
(Edit Spec)
Change test environment
(Edit Parm)
Print/save test results
(Edit Config and I/O Config)
See chapter 8
Save a new test plan
(Proc Mngr)
(Chapter 5)
OVRVIEW2

Running Tests

Before you begin to load the Test Software and run tests, you should have made the appropriate hardware connections. See **chapter 4, "Making Connections," on page 71** if you have not done so already.

The Test Software may be run with the factory default settings, or it may be customized to your specific requirements (see **"Customizing Testing" on page 126**).

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

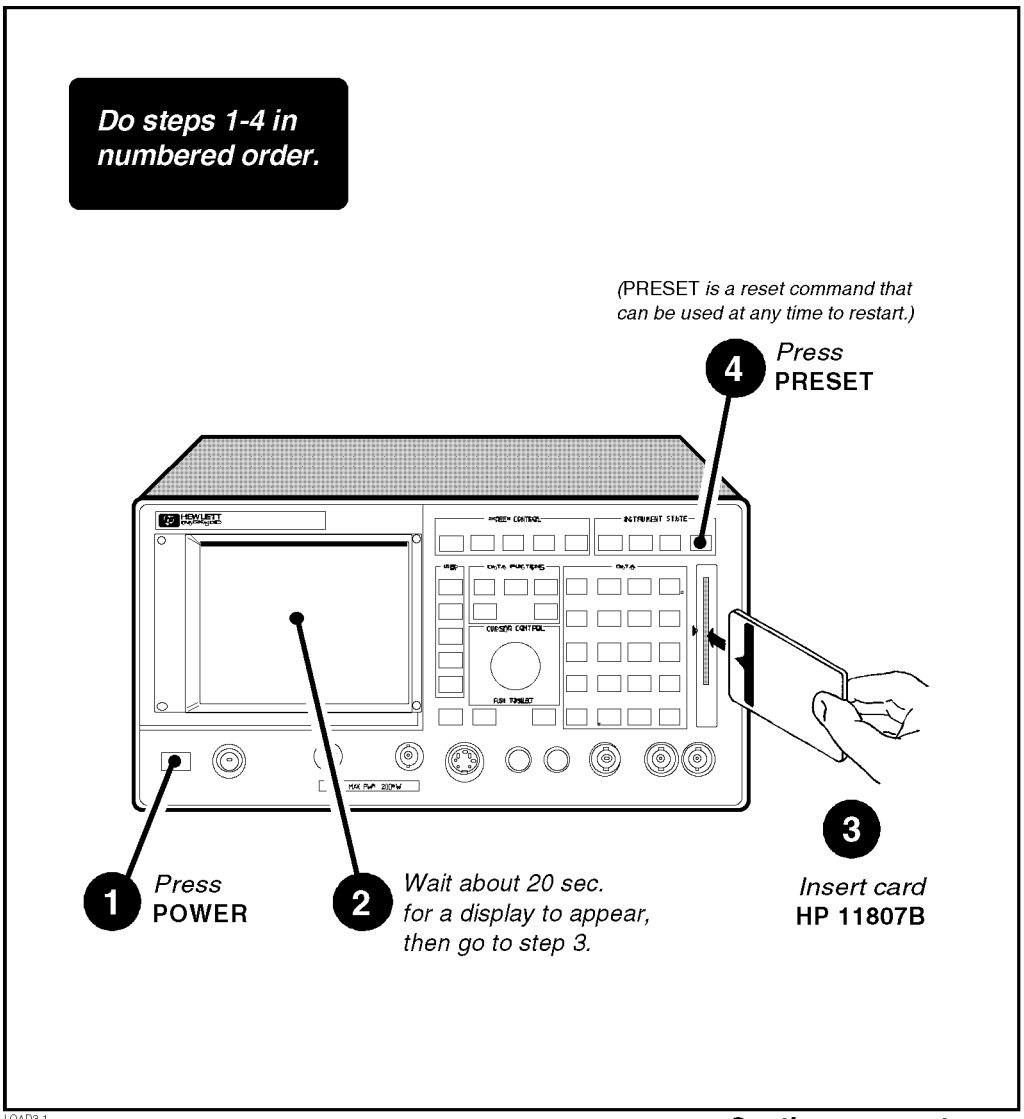
- Pressing CANCEL will pause the current test.
- Pressing k2 (**`Continue`**) will continue the test.

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.

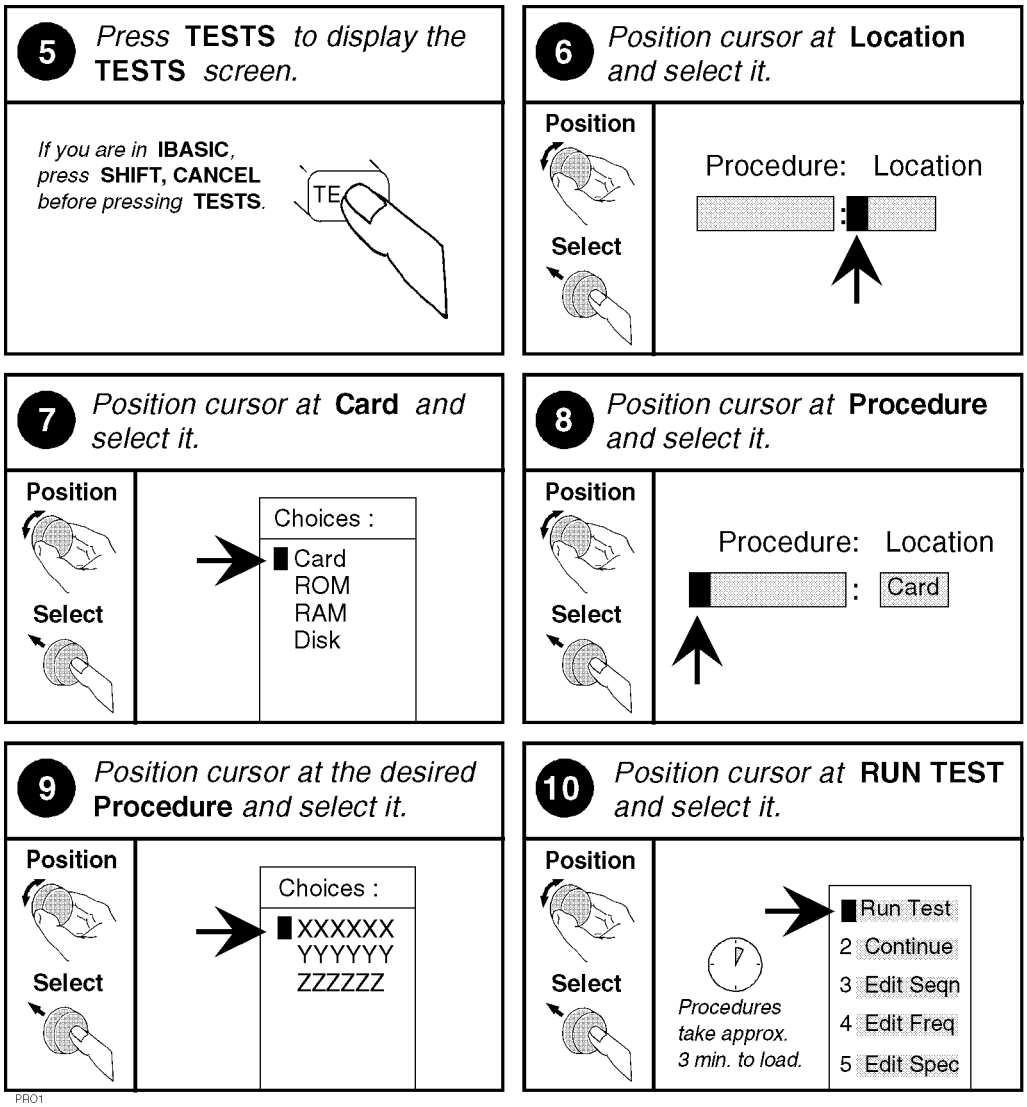
The Test Software memory card can be removed after the program is loaded into the HP 8921A Test Set memory. The program will remain in memory after a power-down/power-up cycle, unless it is manually deleted or a new program is loaded.

Starting Up



LOAD3-1

Continue on next page


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

Customizing Testing

The Test Software might require some customizing before it performs satisfactorily for your test environment. Because of the diversity of individual testing requirements, the Test Software has been designed so that changes may be made easily from the Test Set front panel. You may store these changes on an SRAM card so that you may skip these steps in the future. See **"Saving a Test Procedure (Procedure) (Procedure Manager)" on page 139**.

You may customize your Test Software at any time. Because your requirements might change, the Test Software allows changes to its default settings when you wish and in any order that you choose. For example, tests may be inserted or deleted, and later, after running the tests, you may change the pass/fail limits or elect to test different channels.

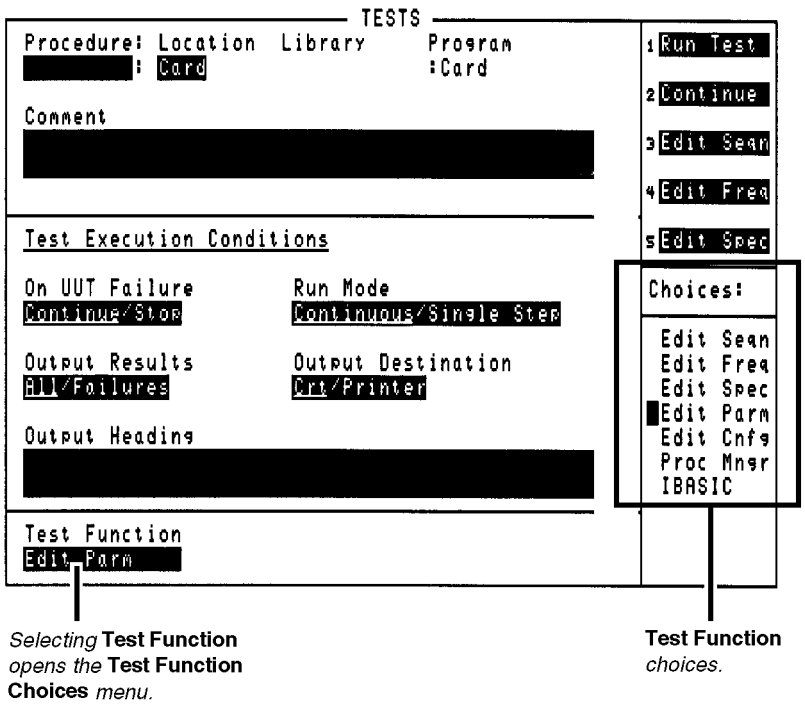
Most testing customization is accomplished through the Test Set Test Function screens. These Test Function screens are accessed from the main TESTS screen as shown in the following figure. All Test Functions are explained in this chapter by function.

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

- The Edit Configuration screen is used when setting up printers, data collection, and message logging. **See "Printing"**, **Data Collection (Saving and Retrieving Test Results)**, and **"Logging" in chapter 8**.
- The IBASIC 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 should acquire the following manuals:
  - *HP Instrument BASIC User's Handbook*
    Part Number: HP E2083-90000.
  - *HP 8921 Programming Manual*
    Part Number: HP 08921-90031.

How to Customize Testing

TESTS Screen



Selecting **Test Function** *opens the* **Test Function Choices** *menu.*

Test Function *choices.*

CUSTOM1

Changing a Sequence of Tests (Edit Sequence)

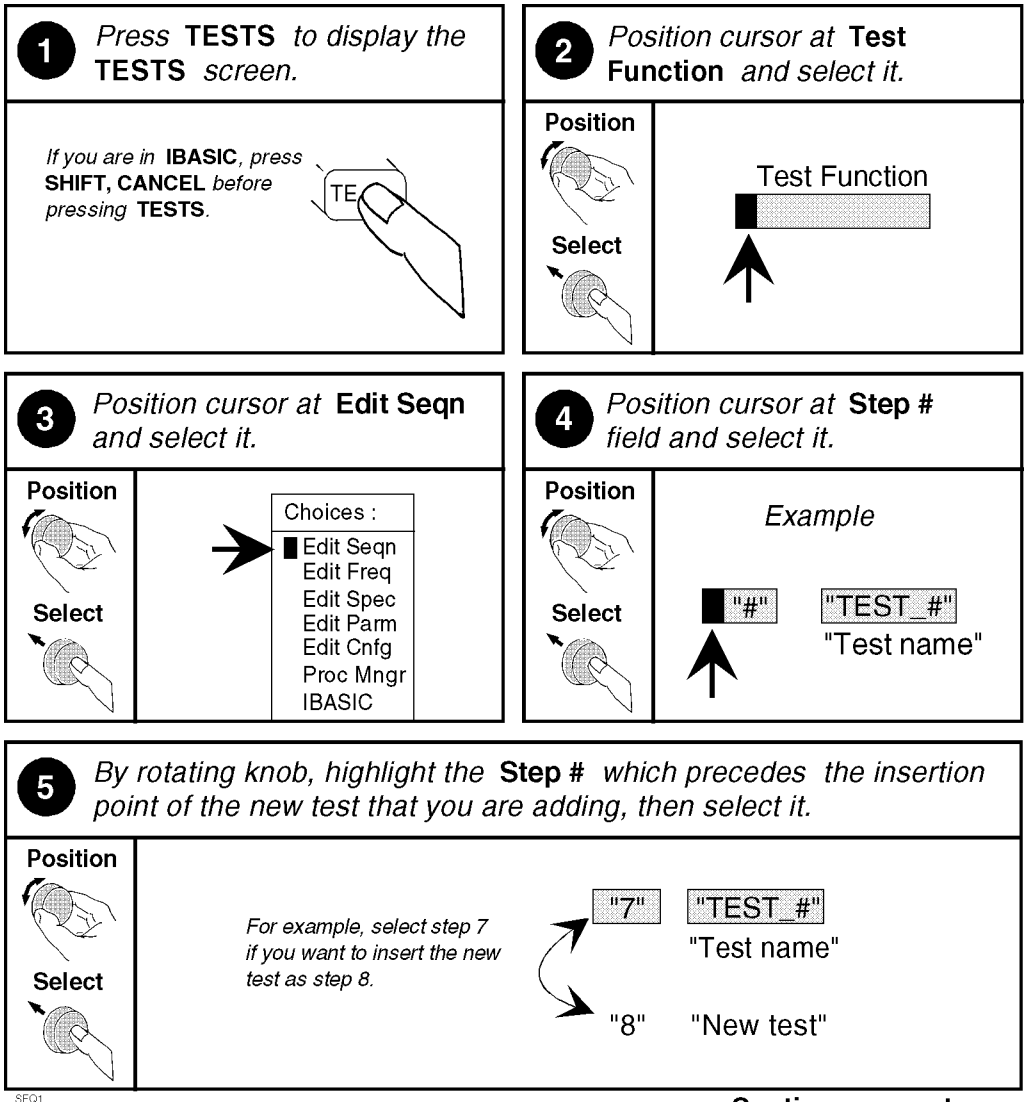
You may define a test sequence to include all, some, or just one of the tests available. When the first test is finished, the next will run. The test sequence will remain in the Test Set battery backed-up memory until another test sequence is loaded or set up. For information on saving a customized test sequence, see **"Saving a Test Procedure (Procedure) (Procedure Manager)" on page 139**.

Creation of a test sequence is accomplished by inserting tests into or deleting tests from the list of tests that come with the Test Software package. **See "Test Descriptions," in chapter 7, on page 169**, for a tests list and descriptions.

The **`All Chans?`** field is not used by this Test Software package.

This section describes how to create a new test sequence using the Edit Sequence screen.

How to Change a Sequence of Tests



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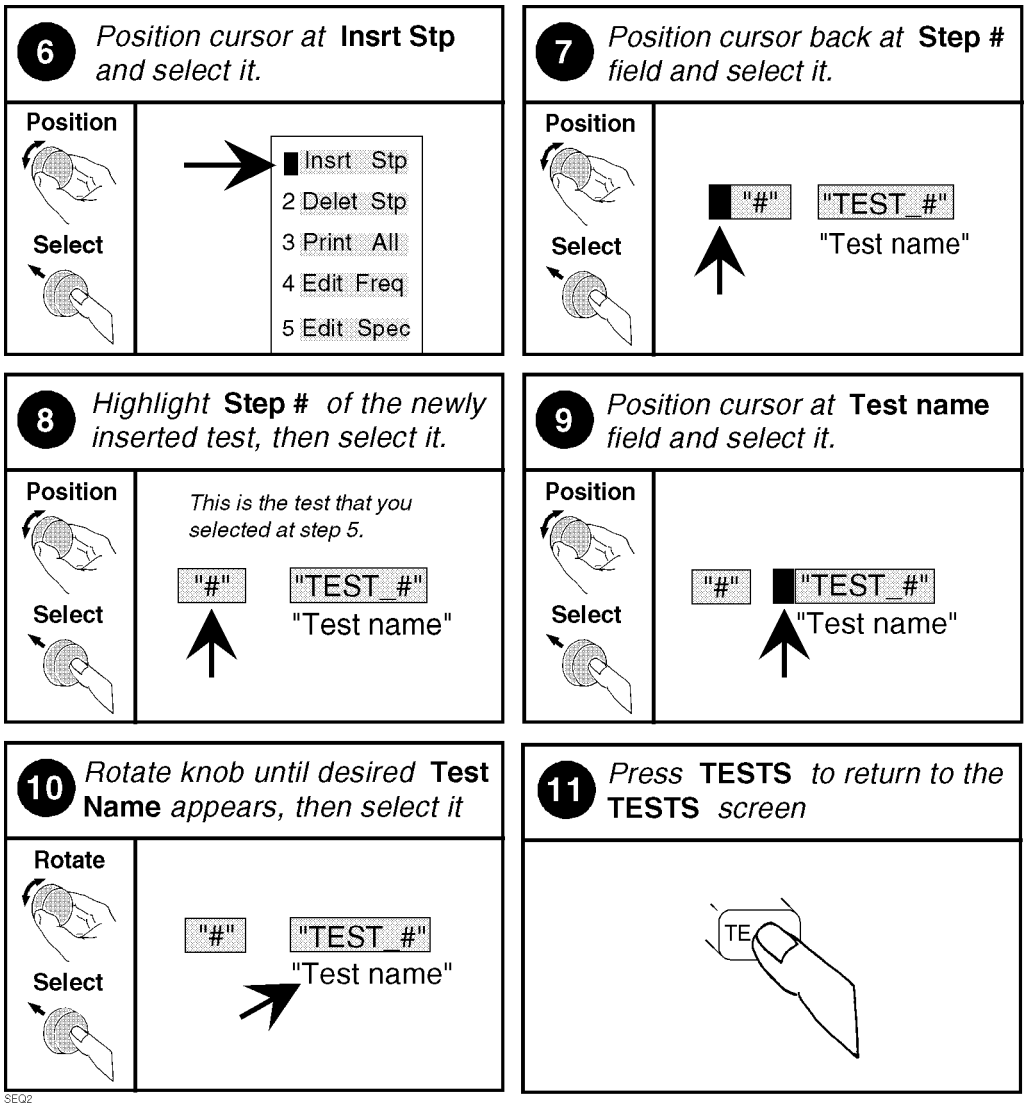

6
Position cursor at Insrt Stp and select it.
Position
Select
Insrt Stp
2 Delet Stp
3 Print All
4 Edit Freq
5 Edit Spec
7
Position cursor back at Step # field and select it.
Position
Select
"#"
"TEST_#"
"Test name"
8
Highlight Step # of the newly inserted test, then select it.
Position
Select
This is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

Specifying Channel Information (Edit Frequency)

There are three ways to enter channel information. The first is through the Edit Frequency 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 Edit Frequency screen for LCR testing. The value in *PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]* determines the method.

The edit frequency method is useful if you wish to store all cell site frequencies on a card for later testing. The Edit Frequency 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 Edit Frequency 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 Edit Frequency screen:

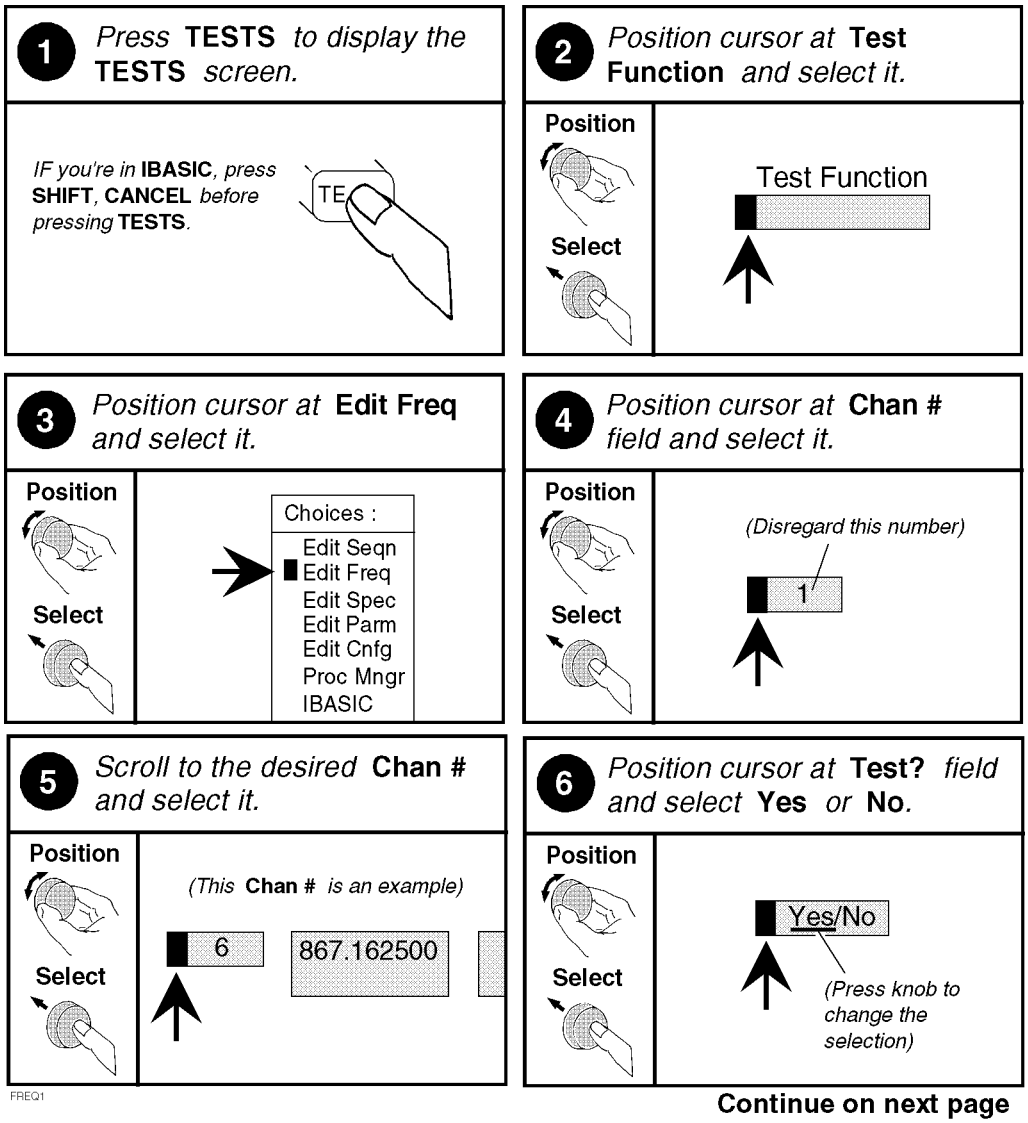
- **`RX Chan Info`**
  - Enter the channels that you wish to test into this field. Enter –1 as channel number to truncate channel testing.
- **`TX Chan Info`**
  - Enter the P-Series radio slot location number into this field. This number is the location of the transceiver in the rack. The locations are 1 through 8 from left to right on a shelf.
- **`Test?`**
  - Select **`Yes`** or **`No`** to specify whether you wish to test the UUT at this channel/frequency. If you select **`Yes`**, the channel will be tested. If you select **`No`**, the channel/frequency will not be used. This is a shortcut to temporarily turning “on” and “off” channels in the table without creating a new test procedure.

NOTE: The following fields are not used in this Test Software program and should be left empty:

- **`RX Freq (MHz)`**
- **`TX Freq (MHz)`**

For information on saving the channel table, see **"Saving a Test Procedure (Procedure) (Procedure Manager)" on page 139**.

How to Specify Channel Information



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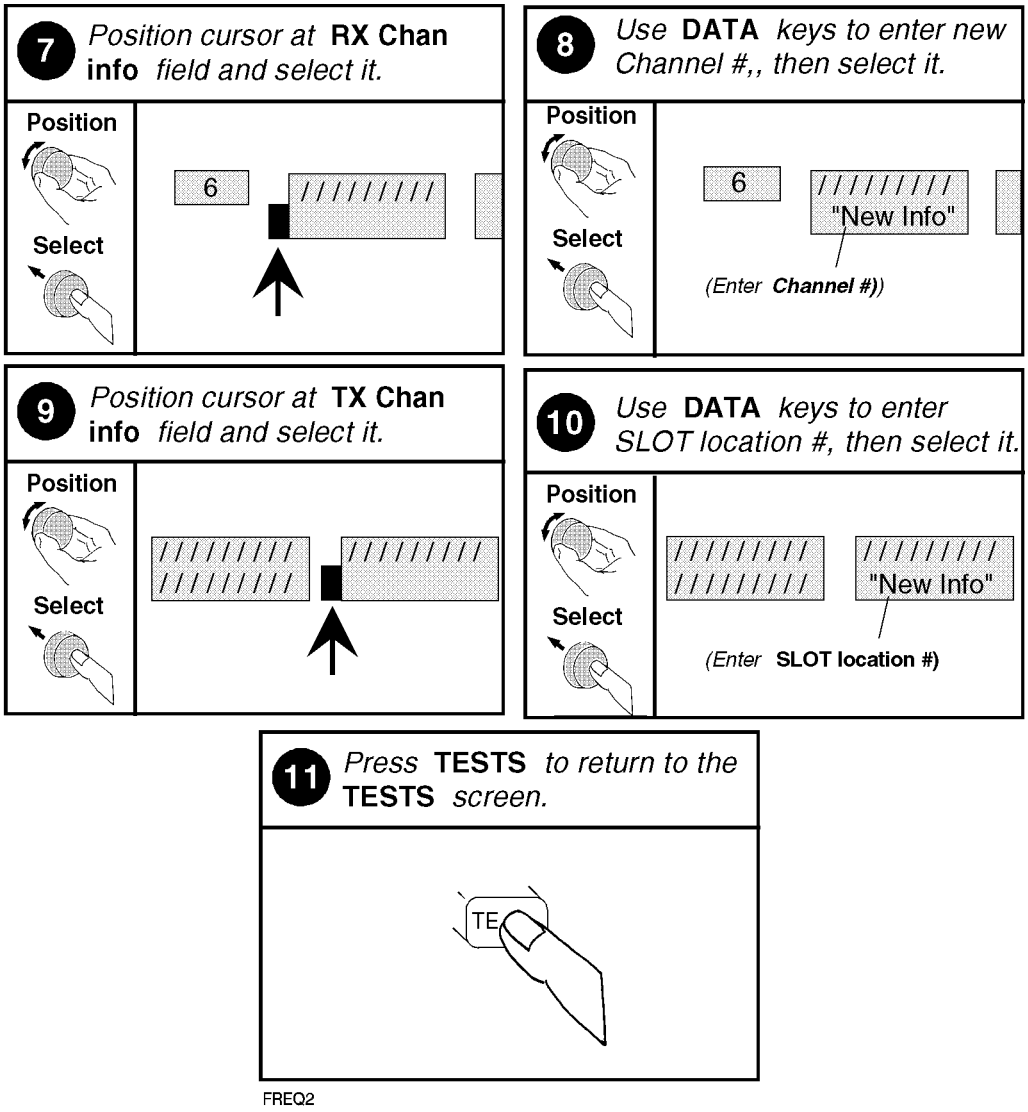

7 Position cursor at RX Chan info field and select it.
Position
Select
6
8 Use DATA keys to enter new Channel #,, then select it.
Position
Select
6
"New Info"
(Enter Channel #))
9 Position cursor at TX Chan info field and select it.
Position
Select
10 Use DATA keys to enter SLOT location #, then select it.
Position
Select
"New Info"
(Enter SLOT location #)
11 Press TESTS to return to the TESTS screen.
TE

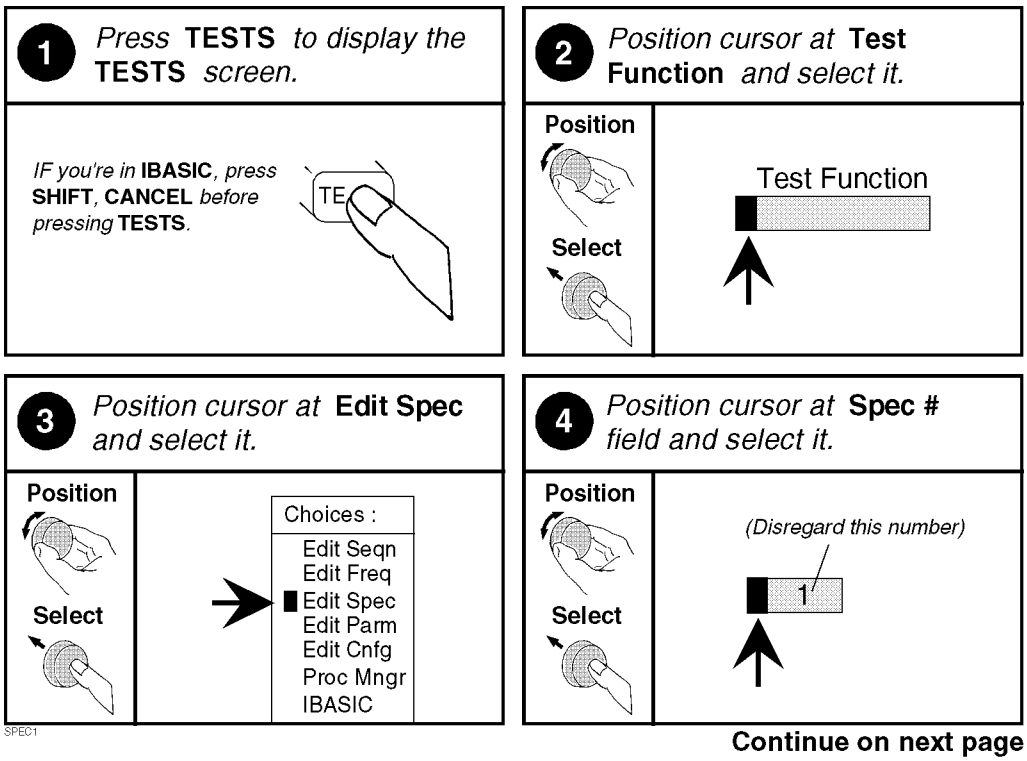
FREQ2

Changing Pass/Fail Limits (Edit Specifications)

Pass/fail limits are values that set the verification values for tests. Default values are included in the Test Software. These values may be changed to suit your testing requirements.

This section describes how to change the pass/fail (upper and lower) limits using the Edit Specifications screen. **See "P-Series Pass/Fail Limit Descriptions," in chapter 7, on page 237** for a description and default values for pass/fail limits. For information on saving customized pass/fail limits, see **"Saving a Test Procedure (Procedure) (Procedure Manager)" on page 139**.

How to Change Pass/Fail Limits



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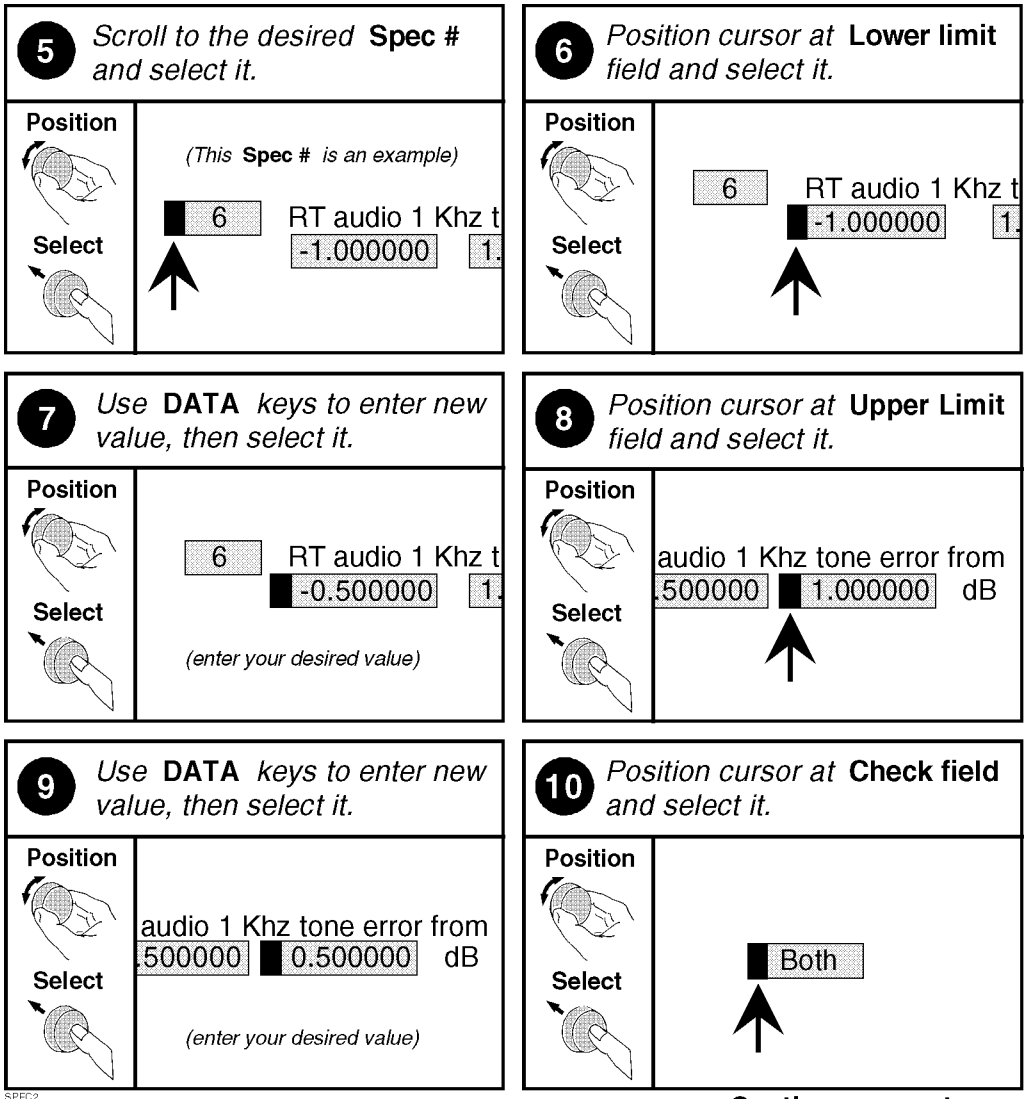

SPEC2

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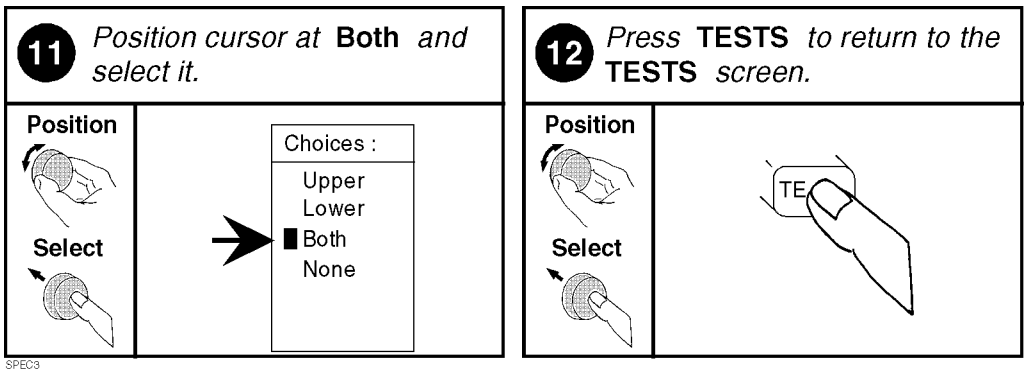
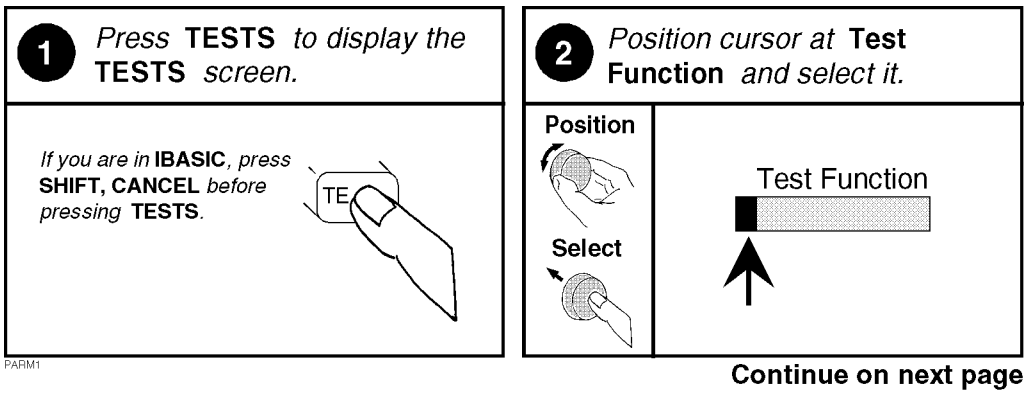

11
Position cursor at Both and select it.
Position
Select
Choices :
Upper
Lower
Both
None
SPEC3
12
Press TESTS to return to the TESTS screen.
Position
Select
TE

Changing the Test Environment and Conditions (Edit Parameters)

The Test Software uses parameters to optimize the test environment and conditions for your testing situation. Many of the parameters are determined by examining your test requirements. Other parameters are determined by performing measurements to calibrate items in your system. Examples of parameters include RX SINAD, TX PA power step size, RT audio adjust, and Test Mode. The Test Software comes with default settings for parameters. The defaults should be reviewed for your particular requirements. **See "P-Series Parameter Descriptions," in chapter 7, on page 225** for a description and default values for each parameter. For information on saving customized parameters, see **"Saving a Test Procedure (Procedure) (Procedure Manager)" on page 139**.

This section describes how to change parameters using the Edit Parameters screen to optimize your testing conditions.

How to Change the Test Environment and Conditions



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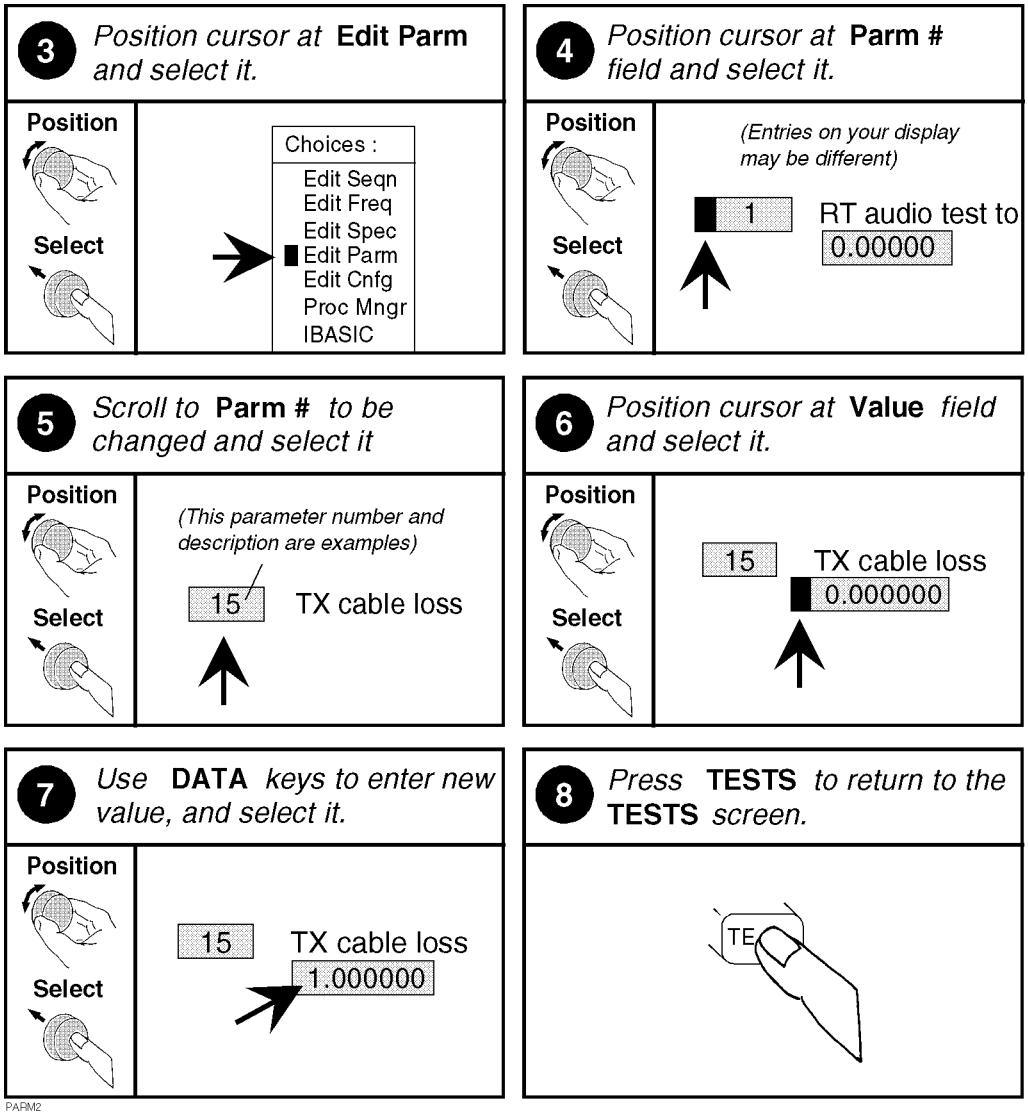

3 Position cursor at Edit Parm and select it.
Position
Select
Choices :
Edit Seqn
Edit Freq
Edit Spec
Edit Parm
Edit Cnfg
Proc Mngr
IBASIC
4 Position cursor at Parm # field and select it.
Position
Select
(Entries on your display may be different)
1
RT audio test to
0.00000
5 Scroll to Parm # to be changed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

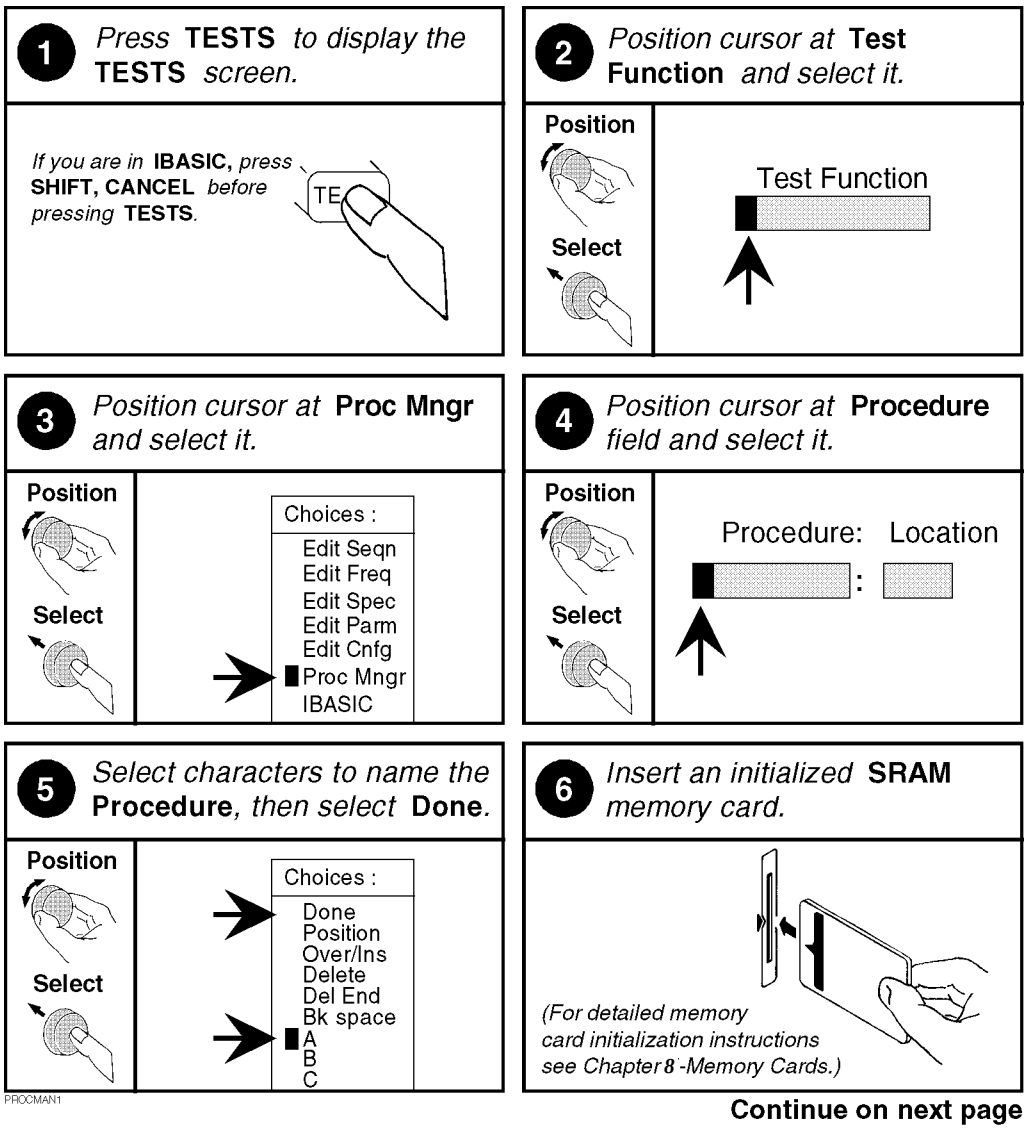
Saving a Test Procedure (Procedure) (Procedure Manager)

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

When you save a Procedure, you will be the saving parameters, pass/fail limits, and a test sequence, plus a library that contains the names of all 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.

This section describes how to save a new procedure to an SRAM card. For more information concerning procedures, **See "Procedures," in chapter 8, on page 285**.

How to Save a Test Procedure



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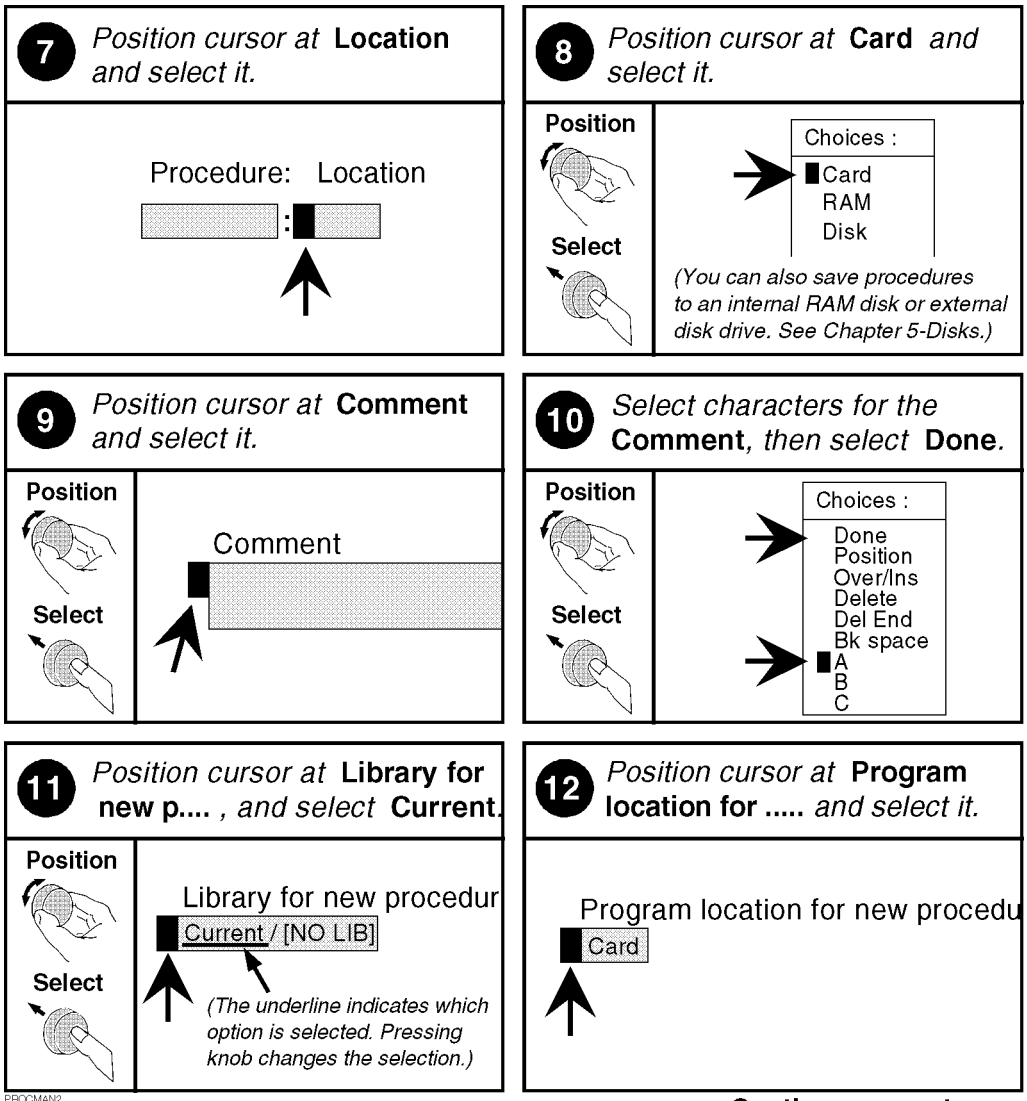

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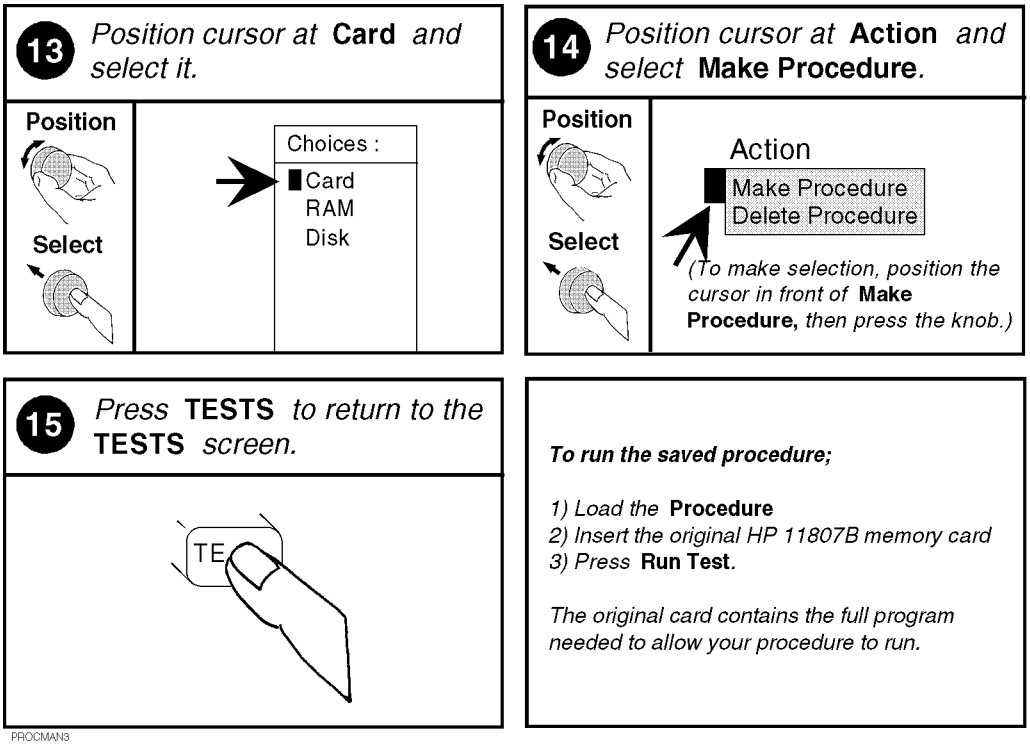

13
Position cursor at Card and select it.
Position
Select
Choices :
Card
RAM
Disk
14
Position cursor at Action and select Make Procedure.
Position
Select
Action
Make Procedure
Delete Procedure
(To make selection, position the cursor in front of Make Procedure, then press the knob.)
15
Press TESTS to return to the TESTS screen.
TE
To run the saved procedure;
1) Load the Procedure
2) Insert the original HP 11807B memory card
3) Press Run Test.
The original card contains the full program needed to allow your procedure to run.
PROCMAN3

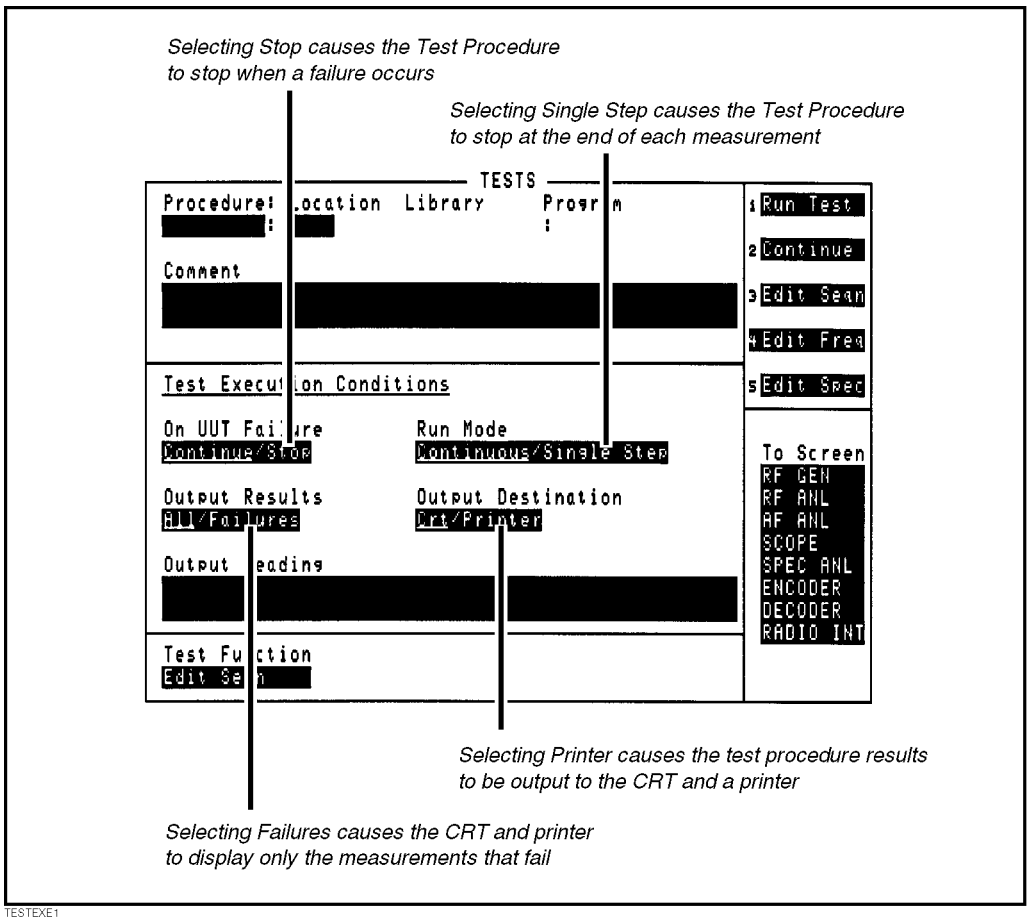
Changing Test Execution Conditions

Test execution conditions define where and when test output will occur. You may elect to:

- Stop testing when a measurement fails or continue through all of the tests without stopping. Note: if **`Stop`** is selected and the program pauses as a result of this, you will be given a choice to continue, repeat the measurement, or go to the Laptop Emulator to send commands to the Base Station. (**`On UUT Failure`**)
- Display (or print) only measurements that fail, or display (or print) all measurements that pass or fail. (**`Output Results`**)
- Pause between measurements, or run through the 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. (**`Run Mode`**)
- Display output on the screen only, or display on the screen and print hard copy. (**`Output Destination`**)
- If printing test results is desired, after selecting **`Printer`** additional steps are required to connect and configure the printer. **See "Printing," in chapter 8, on page 272**.
- Enter a title for an output heading for the displayed or printed results. (**`Output Heading`**)

The **`Test Execution Conditions`** menu is located on the TESTS screen. To change a default setting, position the cursor to the desired field. Pressing the knob will toggle the underlined selection. Test 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



TESTEXE1

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 8, on page 272** for detailed descriptions and instructions for these features.

7

Test, Parameter, and Pass/Fail Limit Descriptions

Overview

This Test Software includes a smart card pre-programmed with nine 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 with 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 test sets. Results are collected and displayed on the Test Set screen in an organized and understandable format.

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

Available Procedures

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

- TST_SHLF
- TST_RMC
- QCK_SHLF
- QCK_RMC
- FULL_RX
- NT_P_SER
- NT_LCR_A
- NT_LCR_B
- ANT_SWEEP

Detailed descriptions of each procedure follow the **"Cable Loss Test" on page 148** and **"Initialization Screen" on page 149** of this chapter. Instructions for loading a procedure are located in **chapter 1, "Getting Started with FW Above Revision A.14.00," on page 23**.

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 except **PROCEDURE_09 ANT_SWEEP**, 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_09 ANT_SWEEP**, in which the settings are not used.

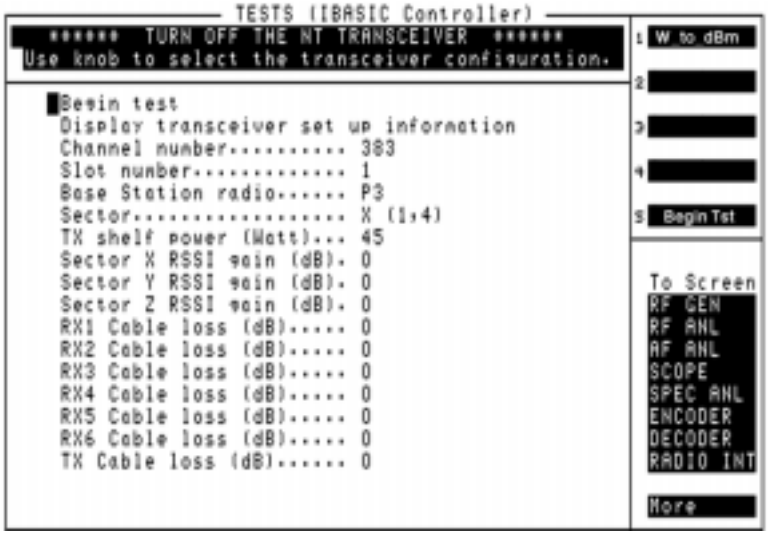


Figure 7 **Initialization Screen**

Description of Initialization Screen Parameters:

- **`Display transceiver set up information`** Selecting this field displays a screen that contains information on how to set up the transceiver for testing. Press k2 (**`Done`**) when you are finished reading the information to return to the Initialization Screen.
- **`Channel number`** Enter the channel number to be tested. See **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR] on page 225**.
- **`Slot number`** Enter the slot number to be tested. (This is the location of the radio in the shelf. Locations are numbered 1 through 8, starting from the front left.)
- **`Base Station radio`** Select the radio type. The choices are: P1NES, P1ES, P2NES, P2ES, and P3.

- **`Sector`** Select the sector to be tested; X, Y, Z, PARM, or ALL. PARM refers to the antennas selected by **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]** *and* **PARAMETER_29 RXB test ant [0=None 4,5,6=single 7=all]**.
- **`TX shelf power (Watts)`** Enter the value to be used as the maximum power value when calculating TX power error.

NOTE: If **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]** is set to 1=**`Comb`**, 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 out of the PA by 3 to 4 dB.

- **`Sector X RSSI gain (dB)` `Sector Y RSSI gain (dB)` `Sector Z RSSI gain (dB)`** When testing at the RMC input, the sector gain is 4 dB in a typical Nortel (Northern Telecom) cell site to account for the path gain between the RMC input and the radio backplane input. If testing is at the shelf, the Test Software always compensates 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 this case, there is no gain and the sector gain during shelf testing is 0 dB (see the note on the next page).
- **`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.

SECTOR GAIN

When testing at the RMC input, the sector gain is 4 dB in a typical Nortel (Northern Telecom) cell site to account for the path gain between the RMC input and the radio backplane input. If testing is at the shelf, the Test Software always compensates 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 this case, there is no gain and the sector gain during shelf testing is 0 dB.

In a typical Nortel (Northern Telecom) Cell Site there is a 4-dB signal or path gain between the RMC input and the receiver input connector on the back of the radio. For example, suppose the path gain is 4 dB and an RF signal of −84 dBm is input into the RMC. Theoretically, a radio with no internal RSSI offset will report a −80 dBm RSSI level. Since the detector in a radio is not ideal, in some cases the 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 be supplied 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 indicating 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 intermods in urban areas. In this case, the path gain is no longer 4 dB. Depending on your system design, it might not be advisable for the sector gains on the Initialization Screen to remain at 4 dB. 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.

Procedure Descriptions

The HP 11807B Option 044 P-Series Test Software card comes preprogrammed with nine 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 TST_SHLF

This procedure performs RX and TX measurements at the Receiver Shelf, as depicted in **figure 3 on page 78**. Only the transceivers on the shelf that you are testing are affected, therefore you may maintain service to the rest of the cell site.

The tests performed in this procedure are the same ones that are performed in PROCEDURE_02 TST_RMC, PROCEDURE_03 QCK_SHLF, and PROCEDURE_04 QCK_RMC. The default settings for the following parameters are what differentiates these procedures:

- **PARAMETER_06 RX audio output Average Voice Level (AVL)** is set to –22 dBm.
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]** is set to 1=**yes**, so that RSSI linearity is checked without the offset.
- **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]** is set to 0=**no**, so that RSSI offset will not be adjusted.
- **PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]** is set to 0=**no**, so that the rmc gain is not checked.
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]** is set to 1=**yes**, so that SINAD is tested using the set and measure method.
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0=**Rcvr shelf**, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_30 TX audio input Average Voice Level (AVL)** is set to –22 dBm.
- **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]** is set to 1=**on fail**, so that the TX power will be adjusted if the measurement fails.
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]** is set to 0=**PA shelf**, so that the TX measurements are performed at the PA Shelf.

There are several more parameters used in this procedure. The parameters listed above are the ones that have default settings that are different in PROCEDURE_01 TST_SHLF through PROCEDURE_04 QCK_RMC. See the individual test descriptions for a complete listing of parameters affecting this procedure (**see "Test Descriptions" on page 169**).

Tests Used

- **P-Series TEST_01 - GN Standard Test Cabling**
- **P-Series TEST_24 - RX Quick Tests**
- **P-Series TEST_15 - TX Power Level and Adjustment**
- **TEST_25 - 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 169**.

PROCEDURE_02 TST_RMC

This procedure performs RX and TX measurements at the RMC, as depicted in **figure 4 on page 79**. The antennas for the cell site will need to be disconnected, therefore service to the entire cell site will be interrupted.

The tests performed in this procedure are the same ones that are performed in PROCEDURE_01 TST_SHLF, PROCEDURE_03 QCK_SHLF, and PROCEDURE_04 QCK_RMC. The default settings for the following parameters are what differentiates these procedures:

- **PARAMETER_06 RX audio output Average Voice Level (AVL)** is set to –22 dBm.
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]** is set to 0=**no**, so that RSSI linearity is checked with the offset.
- **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]** is set to 2=**always**, so that RSSI offset will always be adjusted.
- **PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]** is set to 1=**yes**, so that the rmc gain is checked.
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]** is set to 1=**yes**, so that SINAD is tested using the set and measure method.
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1=**RMC**, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_30 TX audio input Average Voice Level (AVL)** is set to –22 dBm.
- **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]** is set to 2=**always**, so that the TX power will always be adjusted.
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]** is set to 1=**Comb**, so that the TX measurements are performed at the Combiner.

There are several more parameters used in this procedure. The parameters listed above are the ones that have default settings that are different in PROCEDURE_01 TST_SHLF, PROCEDURE_03 QCK_SHLF, and PROCEDURE_04 QCK_RMC. See the individual test descriptions for a complete listing of parameters affecting this procedure (**see "Test Descriptions" on page 169**).

Tests Used

- **P-Series TEST_01 - GN Standard Test Cabling**
- **P-Series TEST_24 - RX Quick Tests**
- **P-Series TEST_15 - TX Power Level and Adjustment**
- **TEST_25 - 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 169**.

PROCEDURE_03 QCK_SHLF

This procedure performs RX and TX measurements at the Receiver Shelf, as depicted in **figure 3 on page 78**. Only the transceivers on the shelf that you are testing are affected, therefore you may maintain service to the rest of the cell site.

The tests performed in this procedure are the same ones that are performed in PROCEDURE_01 TST_SHLF, PROCEDURE_02 TST_RMC, and PROCEDURE_04 QCK_RMC. The default settings for the following parameters are what differentiates these procedures:

- **PARAMETER_06 RX audio output Average Voice Level (AVL)** is set to –18 dBm.
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]** is set to 0=**no**, so that RSSI linearity is checked with the offset.
- **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]** is set to 0=**no**, so that RSSI offset will not be adjusted.
- **PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]** is set to 0=**no**, so that the rmc gain is not checked.
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]** is set to 0=**no**, so that SINAD is not tested using the set and measure method.
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0=**Rcvr shelf**, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_30 TX audio input Average Voice Level (AVL)** is set to –18 dBm.
- **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]** is set to 2=**always**, so that the TX power will always be adjusted.
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]** is set to 0=**PA Shelf**, so that the TX measurements are performed at the Combiner.

There are several more parameters used in this procedure. The parameters listed above are the ones that have default settings that are different in PROCEDURE_01 TST_SHLF, PROCEDURE_02 TST_RMC, and PROCEDURE_04 QCK_RMC. See the individual test descriptions for a complete listing of parameters affecting this procedure (**see "Test Descriptions" on page 169**).

Tests Used

- **P-Series TEST_01 - GN Standard Test Cabling**
- **P-Series TEST_24 - RX Quick Tests**
- **P-Series TEST_15 - TX Power Level and Adjustment**
- **TEST_25 - 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 169**.

PROCEDURE_04 QCK_RMC

This procedure performs RX and TX measurements at the RMC, as depicted in **figure 4 on page 79**. The antennas for the cell site will need to be disconnected, therefore service to the entire cell site will be interrupted.

The tests performed in this procedure are the same ones that are performed in PROCEDURE_01 TST_SHLF, PROCEDURE_02 TST_RMC, and PROCEDURE_03 QCK_SHLF. The default settings for the following parameters are what differentiates these procedures:

- **PARAMETER_06 RX audio output Average Voice Level (AVL)** is set to –18 dBm.
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]** is set to 1=**yes**, so that RSSI linearity is checked without the offset.
- **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]** is set to 2=**always**, so that RSSI offset will always be adjusted.
- **PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]** is set to 0=**no**, so that the rmc gain is not checked.
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]** is set to 0=**no**, so that SINAD is not tested using the set and measure method.
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1=**RMC**, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_30 TX audio input Average Voice Level (AVL)** is set to –18 dBm.
- **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]** is set to 2=**always**, so that the TX power will always be adjusted.
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]** is set to 1=**Comb**, so that the TX measurements are performed at the Combiner.

There are several more parameters used in this procedure. The parameters listed above are the ones that have default settings that are different in PROCEDURE_01 TST_SHLF, PROCEDURE_02 TST_RMC, and PROCEDURE_03 QCK_SHLF. See the individual test descriptions for a complete listing of parameters affecting this procedure (**see "Test Descriptions" on page 169**).

Tests Used

- **P-Series TEST_01 - GN Standard Test Cabling**
- **P-Series TEST_24 - RX Quick Tests**
- **P-Series TEST_15 - TX Power Level and Adjustment**
- **TEST_25 - 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 169**.

PROCEDURE_05 FULL_RX

This procedure performs RX and TX measurements at the RMC, as depicted in **figure 4 on page 79**. The antennas for the cell site will need to be disconnected, therefore service to the entire cell site will be interrupted.

The default settings for the following parameters are set to test RX SAT and ST at extremes:

- **PARAMETER_06 RX audio output Average Voice Level (AVL)** is set to –18 dBm.
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]** is set to 1=**yes**, so that RSSI linearity is checked without the offset.
- **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]** is set to 2=**always**, so that RSSI offset will always be adjusted.
- **PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]** is set to 0=**no**, so that the rmc gain is not checked.
- **PARAMETER_15 RX RSSI offset RF level (–50 to –100) (dBm)** is set to –80 dBm.
- **PARAMETER_17 RX SAT & ST test @ extremes [0=no 1=yes]** is set to 1=**yes**, so that RX SAT and ST are tested @ extremes.
- **PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]** is set to 1=**yes**, so that RX SAT is tested with audio and ST tones, and RX ST is tested with audio and SAT tones.
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]** is set to 1=**yes**, so that SINAD is tested using the set and measure method.
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1=**RMC**, so that the RX measurements are performed at the Receiver Shelf.
- **PARAMETER_30 TX audio input Average Voice Level (AVL)** is set to –21 dBm.
- **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]** is set to 2=**always**, so that the TX power will always be adjusted.

- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]** is set to 1=**Comb**, so that the TX measurements are performed at the Combiner.

There are several more parameters used in this procedure. The parameters listed above are the ones that have default settings that are different in PROCEDURE_01 TST_SHLF, PROCEDURE_02 TST_RMC, PROCEDURE_03 QCK_SHLF, and PROCEDURE_04 QCK_RMC. See the individual test descriptions for a complete listing of parameters affecting this procedure (**see "Test Descriptions" on page 169**).

Tests Used

- **P-Series TEST_01 - GN Standard Test Cabling**
- **P-Series TEST_24 - RX Quick Tests**
- **TEST_25 - 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 169**.

PROCEDURE_06 NT_P_SER

This is the same procedure that was provided on the original version of the HP 11807B Option 044 P-Series Test Software (A.00.00). The total test time for this procedure is considerably longer than for the new procedures (Procedures 1 through 4), but it is included in the current version to provide backward compatibility for those users who need it.

This procedure is intended for periodic maintenance of cell sites. It checks the RF parametric performance of the transceiver to verify that it is working correctly. This procedure makes the RX and TX connections at the shelf as depicted in **figure 3 on page 78**.

Tests Used

- **P-Series TEST_01 - GN Standard Test Cabling**
- **P-Series TEST_02 - RT Audio Loopback and 1 kHz Test Tone**
- **P-Series TEST_22 - RX Standard Tests**
- **P-Series TEST_23 - TX Standard Tests**

Tests Used 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 169**.

PROCEDURE_07 NT_LCR_A

This procedure is designed to verify that the operation of the locating receiver A (RXA) 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 79**.

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 5, on page 104**.

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 P-Series radio.

Tests Used

- **P-Series TEST_13 - RXA RSSI Offset and Path Gain**
- **P-Series TEST_05 - RXA RSSI Linearity**

This procedure is designed to test receiver A only. In order to test receiver B, run PROCEDURE_08 NT_LCR_B.

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 169**.

PROCEDURE_08 NT_LCR_B

This procedure is designed to verify that the operation of the locating receiver B (RXB) 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 79**.

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 5, on page 104**.

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 P-Series radio.

Tests Used

- **P-Series TEST_14 - RXB RSSI Offset and Path Gain**
- **P-Series TEST_06 - RXB RSSI Linearity**

This procedure is designed to test receiver B only. In order to test receiver A, run PROCEDURE_07 NT_LCR_A.

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 169**.

PROCEDURE_09 ANT_SWEEP

This procedure performs the swept return loss test for checking antennas.

The purpose of this procedure is to provide an example of a simple procedure containing only one test. The user may customize this procedure by adding additional tests and then save this as a new procedure on an initialized memory card for future use. For more information, **see "Customizing Testing," in chapter 5, on page 99**.

Tests Used

- **P-Series TEST_28 - GN Swept Return Loss**

The description of the specific test listed above can be found in the **"Test Descriptions" on page 169**.

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 a Nortel (Northern Telecom) cell site are located on shelves with space for eight transceivers per shelf. The antenna inputs on all eight transceivers 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 test 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 Freq`**) screen. **See chapter 5, "Using the Test Software with FW Above Revision A.14.00"**. A procedure set up in this manner will run all of the tests defined in the **`Order of Tests`** (or **`Edit Seqn`**) 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 of the channels in the Channel Information 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 Freq`**) 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 number`** (or **`RX Chan Info`**) field to match the channels for the transceivers on that shelf. If you wish to test all of the transceivers as a unit, you must set **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]** to 0=**`Edit Freq`**.

Testing Transceivers Individually

The Test Software is shipped with the default for **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]** set to 1=**`Single`**. 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 receive multicoupler (RMC). If testing is conducted at the shelf, the Test Software will compensate the Test Set RF generator for cable losses and the eight-way-splitter loss in the shelf. This will make the desired RF signal level appear to be at the receiver input on the radio backplane. If testing is conducted at the RMC, the Test Set RF generator 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 the receiver testing is performed when interpreting your test results.

Saving the Cell Site Parameters on a Card for Later Use

Since the configuration of each cell site is different, the Test Software is customizable to handle the site variations. On the Test Set screen, you may customize the Test Software 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 it for future maintenance of the particular cell site. See **"Saving a Test Procedure" on page 112** 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 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, then perform all of the other receiver tests on just two antennas to make certain that each receiver is operating properly for each test. Three parameters in the Test Software package allow you to do this: **PARAMETER_09 RX RSSI linear test all ants [0=no 1=yes]**, **PARAMETER_16 RX RSSI offset test all ants [0=no 1=yes]**, and **PARAMETER_22 RX SINAD test all ants [0=no 1=yes]**. Selecting 1=**`yes`** to any of these parameters will perform that particular test on all six antennas and perform all of 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 test 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, but it will take longer.

Test SAT and ST at Extremes

In congested areas such as cities, supervisory audio tome (SAT) and signaling tone (ST) performance becomes very important. You might wish to perform more extensive testing of SAT and ST in such instances. **PARAMETER_17 RX SAT & ST test @ extremes [0=no 1=yes]** is provided to test SAT and ST at the extreme deviation limits.

Transceiver Types and Test Set Firmware Revisions

At the start of each testing sequence, you will be prompted to select the transceiver type to test. If your Test Set has a firmware revision earlier than A.09.07, the Test Software uses the information in **table 7** when testing the transceiver. If your Test Set has a firmware revision of A.09.07 or later, the Test Software is not constrained by the information in the table and can determine if the Base Station has Dynamic Power, Dual SAT, or RSSI offset. Hewlett-Packard has derived this table of transceiver information from several sources and hopes that it is correct. However, it is recognized that there are many different types of transceiver hardware and firmware revisions and that this information might not cover all Base Stations. For this reason, it is strongly recommended that you use firmware revision A.09.07 or later. You may purchase firmware upgrades for older instruments. Firmware A.09.07 will allow the Test Software to print the RSSI offset if available at the start of the test and provide more error free communication with the Base Station.

Table 7 Transceiver Types

Model	Software Rev	Product Code	Expanded Spectrum	Dynamic Power	Dual SAT	RSSI Offset
P1NES		NT3P21HA	No	No	No	No
P2NES		NT3P21HB	No	No	No	No
P2ES		NT3P21HC	Yes	0-3	No	No
P1ES		NT3P21HD	Yes	No	No	No
P1ES	1.1 and above	NT3P21HD	Yes	0-7	No	Yes
P3		NT3P21HE	Yes	0-7	Yes	Yes

BSTRX 800 Transceiver before Revision 13

BSTRX 800 transceivers before revision 13 have unity gain when looped back between FWD and REV audio. BSTRX 800 transceivers of revision 13 and later have a 4-dB loss between FWD and REV audios. The Test Software compensates for this difference in audio gains in the loop back test. Because the P1NES and P2NES transceivers might be of either type, the Test Software will display one of the following two prompts after you enter the type in the **`Base Station radio`** field on the Initialization Screen.

`Is P1NES hardware revision greater or equal to 13?`

`Is P2NES hardware revision greater or equal to 13?`

Tests Using Audio Input and Output Levels and Audio Adjustments

There are two methods of performing tests that use audio REV outputs and FWD inputs and adjusting audio levels. The first is the method specified in the Nortel manual. It consists of zeroing all of the FWD and REV DIP switches and performing all audio tests with a reference AVL of –22 dBm, then adjusting the audio levels to the system AVLs at the end of testing. The second method can be used if the audio levels are already set for the system AVLs. With this method, leave the DIP switches set to the system AVLs and use the AVLs as the reference for all audio tests. Both methods can be performed with the Test Software.

The first method is done by setting **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** to 1=**`yes`**. The comparison AVL will be –22 dBm. You will be prompted at the first audio test to zero the DIP switches. To adjust the audio DIP switches to the AVLs for the system to be tested, place the RXB Audio Level test as the last receiver test in the sequence and set **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]** to 1=**`RXB`**. This parameter specifies the receiver on which to adjust the audio level. The RX Standard Test and RX Quick Test always places the audio adjustment at the end of the test sequence. Place the TX Voice Modulation test after the TX Voice Limiting test. The TX Standard Test is set up in this way.

Set **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** to 2=**`always`**. This will cause adjustments to be performed always at the end of the audio and modulation tests. When an adjustment is made, the AVL for the adjustment will *always* be the value for **PARAMETER_06 RX audio output Average Voice Level (AVL)** and **PARAMETER_30 TX audio input Average Voice Level (AVL)**. You must enter the AVLs for the system to be tested in the RX and TX AVL parameters. This allows you to adjust the audio level for the system after you have checked the audio level with the DIP switches zeroed.

For the second method leave the DIP switches set and make all RX and TX measurements with that switch setting. This allows you to check the Base Station with settings already in place. Set **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** to 0=**no**.

Under these conditions, the AVL defined by **PARAMETER_06 RX audio output Average Voice Level (AVL)** and **PARAMETER_30 TX audio input Average Voice Level (AVL)** will be used for the reference in the respective audio measurements. You may then set **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** to 1=**on fail**. In this case, the audio levels will be adjusted only if the initial audio measurement fails. You may wish to put **P-Series TEST_11 - RXA Audio Level and Adjustment** first in the sequence of receiver tests. Set **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]** to 0=**RXA** so that the audio adjustment is performed first. Verify that this testing philosophy works for the system to be tested before testing.

Test Descriptions

A TEST is a series of measurements, and one or more tests make up a procedure (**see chapter 5, "Using the Test Software with FW Above Revision A.14.00"**). While you may change the tests that make up a procedure, you may not change the measurements that 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 Nortel 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
- **TX** - Transmitter
- **TXD** - TDMA Transmitter

P-Series TEST_01 - GN Standard Test Cabling

This test displays an arrangement of connections between the Base Station and the Test Set. This test is the first in the sequence of tests in the NT_P_SER procedure that is supplied on the card. If you are customizing a sequence of tests different from the Procedure supplied, 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.

Table 8 Cabling

From Test Set	To Base Station
RF IN/OUT	PA # based on slot # selected
DUPLEX OUT	ANT # based on parameter settings
AUDIO OUT	FWD D
AUDIO IN	REV D

Parameters Used

- **PARAMETER_09 RX RSSI linear test all ants [0=no 1=yes]**
- **PARAMETER_22 RX SINAD test all ants [0=no 1=yes]**
- **PARAMETER_24 RX ST detection RF level (dBm)**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**

Pass/Fail Limits Used

There are no pass/fail limits in this test.

P-Series TEST_02 - RT Audio Loopback and 1 kHz Test Tone

This test performs three measurements: first a FWD audio signal is applied and looped back and measured at the REV audio output, next the FWD audio remains on but loopback is turned off and the amount of feed-through audio is measured at the REV audio output, and last the internal 1 khz tone is turned on and the audio level is measured at the REV audio output. Input FWD audio levels are defined by the AVL parameter settings and output REV audio levels are compared against the AVLs defined in the parameters. If **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** is set to 1=**yes**, the AVLs will be –22 dBm. If the parameter is set to 0=**no** the AVLs will be the value in **PARAMETER_06 RX audio output Average Voice Level (AVL)** and **PARAMETER_30 TX audio input Average Voice Level (AVL)**.

Notice there are different audio loopback output error pass/fail limits depending on the hardware revision of the Base Station. **See "P-Series Pass/Fail Limit Descriptions" on page 237** for more information.

Analyzer Settings

- Detector: RMS
- High Pass Filter: 300 Hz
- Low Pass Filter: 3 kHz
- IF Filter: 30 kHz

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**
- **PARAMETER_06 RX audio output Average Voice Level (AVL)**
- **PARAMETER_30 TX audio input Average Voice Level (AVL)**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_03 RT aud loopback err from AVL (Rev <13)**
- **PASS/FAIL LIMIT_04 RT aud loopback err from AVL+4 (Rev>=13)**
- **PASS/FAIL LIMIT_05 RT aud loopback unlooped**
- **PASS/FAIL LIMIT_06 RT audio 1 kHz tone error from AVL**

P-Series TEST_03 - RXA SINAD Sensitivity

The Test Software provides two methods for measuring the sensitivity of the receivers in the Base Station.

- 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_20 RX SINAD (dB)**. The RF level is checked against **PASS/FAIL LIMIT_17 RX SINAD sensitivity RF level (dBm)** to determine the pass/fail status.
- In the second method, the RF level entered into **PARAMETER_21 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_16 RX SINAD for set & measure (dB)** to determine the pass/fail status.

The Test Software chooses the method by checking the value in **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]**. Set this parameter to 1=**yes** if you want to use the second, set and measure method.

The second method always provides a result 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_22 RX SINAD test all ants [0=no 1=yes]** and the **Sector** field of the Initialization Screen. If **PARAMETER_22 RX SINAD test all ants [0=no 1=yes]** is set to 1=**yes**, 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_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0=**Rcvr shelf**. Enter the loss into the **PARAMETER_07 RX rcvr shelf splitter loss (Typically 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_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_20 RX SINAD (dB)**
- **PARAMETER_21 RX SINAD RF level for set & measure (dBm)**
- **PARAMETER_22 RX SINAD test all ants [0=no 1=yes]**
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_16 RX SINAD for set & measure (dB)**
- **PASS/FAIL LIMIT_17 RX SINAD sensitivity RF level (dBm)**

P-Series TEST_04 - RXB SINAD Sensitivity

This test is identical to the test **P-Series TEST_03 - RXA SINAD Sensitivity**, applied to receiver B (RXB). See the previous test. The Test Software will use the parameter with an *RXB* prefix.

P-Series TEST_05 - 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 –100 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 at 8 kHz deviation.

The low RF level is set by **PARAMETER_11 RX RSSI linearity RF level low (–100 Min)(dB)** and the high RF level is set by **PARAMETER_10 RX RSSI linearity RF level high (–50 Max) (dB)**.

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_27 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_07 RX rcvr shelf splitter loss (Typically 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_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1=**RMC**, the following results are displayed:

- ANTx RSSI level @ –xx dBm: Reported RSSI level from the radio at the –xx level.
- ANTx RSSI err @ –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).

When testing a P3 transceiver (**`P3`** is selected in the **`Base Station radio`** field on the Initialization Screen), if **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0=**`Rcvr shelf`**, and **PARAMETER_08 RX RSSI lin chk w/ o offset [0=no 1=yes]** is set to 1=**`yes`**, the following results are displayed:

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

The RSSI w/o offset is calculated by using the following equation:

RSSI w/o offset = Reported RSSI - RSSI internal offset

The RSSI error is calculated by using the following equation:

RSSI error = Reported RSSI - RSSI internal offset - RF level

SECTOR GAIN

When testing at the RMC input, the sector gain is 4 dB in a typical Nortel (Northern Telecom) cell site to account for the path gain between the RMC input and the radio backplane input. If you are testing at the shelf, the Test Software always compensates 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 this case, there is no gain and the sector gain during shelf testing is 0 dB.

In a typical Nortel (Northern Telecom) Cell Site there is a 4 dB signal or path gain between the RMC input and the receiver input connector on the back of the radio. For example, suppose the path gain is 4 dB and an RF signal of –84 dBm is input into the RMC. Theoretically, a radio with no internal RSSI offset will report a –80 dBm RSSI level. Since the detector in a radio is not ideal, in some cases the internal RSSI offset is needed to make the radio 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_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]**
- **PARAMETER_10 RX RSSI linearity RF level high (–50 Max) (dB)**
- **PARAMETER_11 RX RSSI linearity RF level low (–100 Min)(dB)**
- **PARAMETER_15 RX RSSI offset RF level (–50 to –100) (dBm)**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_08 RX RSSI level err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI level err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI level err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI level err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_12 RX RSSI level err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_13 RX RSSI level err @ –100 dBm (dB)**

P-Series TEST_06 - RXB RSSI Linearity

This test is identical to the test **P-Series TEST_05 - 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.

P-Series TEST_07 - 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_19 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_17 RX SAT & ST test @ extremes [0=no 1=yes]** is set to 1=**yes**, 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.

If **PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]** is set to 1=**yes**, then RX SAT is also detected at each of the three SAT frequencies with an audio tone and an ST tone present.

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_17 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]**
- **PARAMETER_19 RX SAT detection RF level (dBm)**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

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

P-Series TEST_08 - RXB SAT Detection

This test is identical to the test **P-Series TEST_07 - 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.

P-Series TEST_09 - 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_24 RX ST detection RF level (dBm)**.

If **PARAMETER_17 RX SAT & ST test @ extremes [0=no 1=yes]** is set to 1=**yes**, the deviation is changed to the extremes of 8.2 kHz and 8.8 kHz and ST detection is checked.

If **PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]** is set to 1=**yes**, then RX ST is also detected with an audio tone and a SAT tone present.

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_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_17 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]**
- **PARAMETER_24 RX ST detection RF level (dBm)**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

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

P-Series TEST_10 - RXB ST Detection

This test is identical to the test **P-Series TEST_07 - RXA SAT Detection**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameter with an *RXB* prefix.

P-Series TEST_11 - RXA Audio Level and Adjustment

This test injects an RF signal into a the RXA receiver, with the compandor on. The RF level is –50 dBm modulated with a 1-kHz tone. The tone deviation is specified by **PARAMETER_25 RX standard test level deviation**. The Test Set measures the REV audio signal level out of the Base Station. The audio level is compared against the Average Voice Level (AVL) defined by the parameter settings. If **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** is set to 1=**yes**, the comparison AVL will be –22 dBm. If *parameter 3* is set to 0=**no** the AVL will be the value in **PARAMETER_06 RX audio output Average Voice Level (AVL)**.

You can also use this test to adjust the REV audio level to match your systems pass/fail limits. To do this **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** should be set to 2=**always**. This will always perform an adjustment after the above measurement is made. When an adjustment is made, the AVL for the adjustment will *always* be the value for **PARAMETER_06 RX audio output Average Voice Level (AVL)**. This allows you to adjust the audio level to your system after you have checked the audio level with the DIP switches zeroed.

After the adjustments have been made, a **Repeat** USER key is provided to allow the user to repeat the measurement of RX audio level. This allows you to update a test printout to show a pass result for the RX Audio Level and Adjustment test. **See "Test Execution Conditions" on page 298**.

If you are performing all your receiver tests with the REV audio DIP switches zeroed as is defined in the Nortel test document, you will want to make sure that the audio adjustment is the last receiver test performed. To do this place **P-Series TEST_12 - RXB Audio Level and Adjustment** as the last receiver test in your sequence and set **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]** to **1=RXB**. This parameter defines which receiver to adjust the audio level. **P-Series TEST_22 - RX Standard Tests** always puts the audio adjustment at the end of the test sequence.

Another method of adjustment may be done if the Base Station REV DIP switches are already aligned to your system. Leave the switches set as is and make all the receiver measurements with the switches set. This allows you to check the Base Station with your settings already in place. To do this set **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** to 0=**no**. Now the AVL defined by **PARAMETER_06 RX audio output Average Voice Level (AVL)** will be used for the initial audio measurement. You can then set **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** to 1= **on fail**. In this case the audio level will only be adjusted in the initial audio measurement fails. You may want to put **P-Series TEST_11 - RXA Audio Level and Adjustment** first in the sequence and set **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]** to 0=**RXA** so the audio adjustment is done first. Verify that this testing philosophy works for your system before testing.

Analyzer Settings

- Detector: RMS
- High Pass Filter: 300 Hz
- Low Pass Filter: 3 kHz
- IF Filter: 30 kHz

Parameters

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**
- **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]**
- **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]**
- **PARAMETER_06 RX audio output Average Voice Level (AVL)**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_25 RX standard test level deviation**
- **PARAMETER_26 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_07 RX audio output AVL err w/compandor on**

P-Series TEST_12 - RXB Audio Level and Adjustment

This test is identical to the **P-Series TEST_11 - RXA Audio Level and Adjustment**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an RXB prefix.

P-Series TEST_13 - RXA RSSI Offset and Path 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_27 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_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**.

If **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 1=**RMC**, and **PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]** is set to 1=**yes**, 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 radio. 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. The Test Software queries the radio 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_15 RX RSSI path gain (dB)** the user will be given the option to adjust the RMC gain. Selecting k1 (**yes**), will display an adjustment meter. Manually adjust the RMC gain until needle lies within the specification lines of the meter.

RMC GAIN

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 minimize the RSSI error from the detector by adjusting the internal radio RSSI offset. The Test Set injects the modulated RF signal into the RMC input or receiver shelf input. The Test Software queries the radio for the reported RSSI level, and calculates the RSSI error using the following equation:

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

When testing P3 radio only, if the resulting RSSI error exceeds the limits set by **PASS/FAIL LIMIT_14 RX RSSI offset error (dB)**, the Test Software will adjust the radio RSSI offset until the reported RSSI error equals zero to minimize RSSI error, if **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]** is set to 1=**`fail`** or 2=**`always`**. If the Test Software cannot set the offset after five attempts, the user will be prompted to manually set the offset. Since there is only one internal offset for all six antennas you must select which antenna to perform the adjustment on. The combination of **PARAMETER_13 RX RSSI offset adjust on [0=RXA 1=RXB]** and the **`Sector`** field on the Initialization Screen determine the antenna where the RSSI internal offset can be adjusted.

If **Parameter PARAMETER_37 GN if test fails [0=continue 1=stop]** is set to **`1=stop`**, or you have set the Test Execution Conditions to stop on a failure, you can choose to repeat a test that has failed. Alternatively, you can continue on with testing, accepting the failure.

See "PARAMETER_37 GN if test fails [0=continue 1=stop]" on page 236 or **"Test Execution Conditions" on page 298** for details on using these features.

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_27 RX RSSI offset internal rssi offset (dB)** to determine if the programmed value is within acceptable limits.

SECTOR GAIN

When testing at the RMC input, the sector gain is 4 dB in a typical Nortel (Northern Telecom) cell site to account for the path gain between the RMC input and the radio backplane input. If you are testing at the shelf, the Test Software always compensates 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 this case, there is no gain and the sector gain during shelf testing is 0 dB. In a typical Nortel (Northern Telecom) Cell Site there is a 4 dB signal or path gain between the RMC input and the receiver input connector on the back of the radio. For example, suppose the path gain is 4 dB and an RF signal of –84 dBm is input into the RMC. Theoretically, a radio with no internal RSSI offset will report a –80 dBm RSSI level. Since the detector in a radio is not ideal, in some cases the internal RSSI offset is needed to make the radio 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_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]**
- **PARAMETER_13 RX RSSI offset adjust on [0=RXA 1=RXB]**
- **PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]**
- **PARAMETER_15 RX RSSI offset RF level (–50 to –100) (dBm)**
- **PARAMETER_16 RX RSSI offset test all ants [0=no 1=yes]**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_29 RXB test ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_14 RX RSSI offset error (dB)**
- **PASS/FAIL LIMIT_15 RX RSSI path gain (dB)**
- **PASS/FAIL LIMIT_27 RX RSSI offset internal rssi offset (dB)**

P-Series TEST_14 - RXB RSSI Offset and Path Gain

This test is identical to the test **P-Series TEST_13 - RXA RSSI Offset and Path Gain**, but is applied to receiver B (RXB). See the previous test. The Test Software will use the parameters with an RXB prefix.

P-Series TEST_15 - TX Power Level and Adjustment

This test performs TX power measurements at PA outputs. The power levels at which the measurement is performed is determined by the transceiver type identified at the prompt at the beginning of the test sequence. The Test Software is set up to test the following transceivers at the power levels specified below:

Table 9 **Power Levels for each Transceiver Type**

PA	Power Level(s)
P1NES	0
P2NES	0
P2ES	0-3
P1ES ≥software rev 1.1	0-7
P1ES <software rev1.1	0
P3ES	0-7

Table 9 lists the entire set of possible power level measurements. These power level settings can be overridden to make fewer measurements by setting **PARAMETER_34 TX PA power, check down to level (0-7)** to a number less than that in **table 9**. If the power level needs adjustment, a meter will appear on the screen if **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]** is set to 1=**`on fail`** or 2=**`always`**.

The Test Software uses the **`TX Max Power`** field on the Initialization Screen and **PARAMETER_33 TX PA power step size** to obtain the value of the maximum power setting and the value of the PA power step size.

The PA power is 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.

Results Output

Three outputs are 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 defined power is determined by using the **`TX Max Pow`** field on the Initialization Screen and **PARAMETER_33 TX PA power step size** to calculate the power for each step.

*Calculated Power = Max Power (dBm) - (power level * power step)*

Power measurement accuracy depends on the accuracy of the values you have obtained for the PA path losses. Path losses may be measured and stored using **P-Series TEST_31 - GN Measure Cable Loss**.

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]**
- **PARAMETER_33 TX PA power step size**
- **PARAMETER_34 TX PA power, check down to level (0-7)**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_19 TX power error (dB)**
- **PASS/FAIL LIMIT_20 TX power error at power level 0 (dB)**

P-Series 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 in 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_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_18 TX frequency error (kHz)**

P-Series TEST_17 - TX Voice Modulation Limiting

This test injects a large audio signal into the TX Audio Input, keys the transmitter, and measures the peak + and peak – deviation on the transmitter. The initial audio signal injected is determined by **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**. If this parameter is set to 1=**yes**, the initial injected signal will be –22 dBm. If this parameter is set to 0=**no**, the Test Software will look at **PARAMETER_30 TX audio input Average Voice Level (AVL)** and use it as the initial audio signal. The Test Software will then add 17.7 dB to the initial audio level. This should set the TX deviation to approximately 8 kHz. The audio level is increased until it obtains maximum deviation (where a further increase in level will decrease deviation). The measurement is taken at the point at which this happens. The Test Software will test both positive-peak and negative-peak deviation.

Analyzer Settings

- Detector: ± peak
- High Pass Filter: 50 Hz
- Low Pass Filter: 15 kHz
- IF Filter: 30 kHz

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**
- **PARAMETER_30 TX audio input Average Voice Level (AVL)**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_25 TX voice deviation limiting**

P-Series TEST_18 - TX Voice Modulation and Adjustment

This test applies an audio signal at the specified AVL to the Base Station FWD audio input, keys the transmitter, and measures the deviation on the RF signal produced by the audio signal. The Average Voice Level (AVL) is defined by the parameter settings. If **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** is set to 1=**yes**, the input AVL will be –22 dBm. If the parameter is set to 0=**no** the AVL will be the value in **PARAMETER_30 TX audio input Average Voice Level (AVL)**.

You can also use this test to adjust the FWD audio level to match your system specifications. To do this **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** should be set to 2=**always**. This will always perform an adjustment after the above measurement is made. When an adjustment is made, the AVL level input to the FWD jack will *always* be the value for **PARAMETER_30 TX audio input Average Voice Level (AVL)**. This allows you to adjust the voice modulation level to your system after you have checked the voice modulation with the DIP switches zeroed.

If you are performing all your transmitter audio tests with the FWD audio DIP switches zeroed as is defined in the Nortel test document, you will want to make sure that the voice modulation adjustment is the last transmitter audio test performed. To do this, place **P-Series TEST_18 - TX Voice Modulation and Adjustment** after **P-Series TEST_17 - TX Voice Modulation Limiting**. **P-Series TEST_23 - TX Standard Tests** is set up in this way.

Another method of adjustment may be done if the Base Station FWD DIP switches are already aligned to your system. Leave the switches set as is and make all the transmitter audio measurements with the switches set. This allows you to check the Base Station with your settings already in place. To do this set **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** to 0=**no**. Now the AVL defined by **PARAMETER_30 TX audio input Average Voice Level (AVL)** will be used for the initial voice modulation measurement. You can then set **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** to 1= **on fail**. In this case the voice modulation level will only be adjusted in the initial modulation measurement fails. You may want to put **P-Series TEST_18 - TX Voice Modulation and Adjustment** first in the sequence and set the parameter. Verify that this testing philosophy works for your system before performing.

If **Parameter PARAMETER_37 GN if test fails [0=continue 1=stop]** is set to **1=stop**, or you have set the Test Execution Conditions to stop on a failure, you can choose to repeat a test that has failed. Alternatively, you can continue on with testing, accepting the failure.

See "PARAMETER_37 GN if test fails [0=continue 1=stop]" on page 236 or **"Test Execution Conditions" on page 298** for details on using these features.

Analyzer Settings

- Detector: RMS times 1.414
- High Pass Filter: 300 Hz
- Low Pass Filter: 3 kHz
- IF Filter: 30 kHz

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**
- **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]**
- **PARAMETER_30 TX audio input Average Voice Level (AVL)**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_24 TX voice deviation**

P-Series TEST_19 - TX Residual FM

This test keys the transmitter and measures the residual FM on the transmitter.

Analyzer Settings

- Detector: RMS
- High Pass Filter: 50 Hz
- Low Pass Filter: 15 kHz
- IF Filter: 30 kHz

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_21 TX residual FM deviation (%)**

P-Series TEST_20 - TX Wideband Modulation

This test turns the TX data A pattern on, keys the transmitter, and measures wideband modulation deviation. It measures both positive peak and negative peak.

Analyzer Settings

- Detector: ± peak
- High Pass Filter: 50 Hz
- Low Pass Filter: >99 kHz
- IF Filter: 230 kHz

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_26 TX wideband data deviation (kHz)**

P-Series TEST_21 - TX SAT Modulation

This test turns on the internal SAT frequency of the Base Station, keys the transmitter, and measures all three SAT deviations and frequencies (5970 Hz, 6000 Hz, 6030 Hz).

Analyzer Settings

- Detector: RMS times 1.414
- High Pass Filter: 300 Hz
- Low Pass Filter: 15 kHz
- Frequency Counter Gate Time: 1 second

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_22 TX SAT deviation (kHz)**
- **PASS/FAIL LIMIT_23 TX SAT frequency error (Hz)**

P-Series TEST_22 - RX Standard Tests

This is the original RX standard test from Test Software version A.00.00. It is similar to the new test provided in this Test Software version, **P-Series TEST_24 - RX Quick Tests**, however the total time for TEST_22 is considerably longer than for TEST_24. It is included in the current 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

- **P-Series TEST_03 - RXA SINAD Sensitivity**
- **P-Series TEST_05 - RXA RSSI Linearity**
- **P-Series TEST_07 - RXA SAT Detection**
- **P-Series TEST_09 - RXA ST Detection**
- **P-Series TEST_11 - RXA Audio Level and Adjustment**

then on Receiver B

- **P-Series TEST_04 - RXB SINAD Sensitivity**
- **P-Series TEST_06 - RXB RSSI Linearity**
- **P-Series TEST_08 - RXB SAT Detection**
- **P-Series TEST_10 - RXB ST Detection**
- **P-Series TEST_12 - RXB Audio Level and Adjustment**

The antennas on which each test is performed is determined by **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**, **PARAMETER_29 RXB test ant [0=None 4,5,6=single 7=all]**, **PARAMETER_22 RX SINAD test all ants [0=no 1=yes]**, and **PARAMETER_09 RX RSSI linear test all ants [0=no 1=yes]**.

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

If the REV audio is to be adjusted, it is important that it be done last. This test will always do the adjustment on the last antenna selected for the receiver chosen in **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]**.

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_10 RX RSSI linearity RF level high (–50 Max) (dB)** and **PARAMETER_11 RX RSSI linearity RF level low (–100 Min)(dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_15 RX RSSI offset RF level (–50 to –100) (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_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]**
- **PARAMETER_10 RX RSSI linearity RF level high (–50 Max) (dB)**
- **PARAMETER_11 RX RSSI linearity RF level low (–100 Min)(dB)**
- **PARAMETER_15 RX RSSI offset RF level (–50 to –100) (dBm)**
- **PARAMETER_17 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]**
- **PARAMETER_19 RX SAT detection RF level (dBm)**
- **PARAMETER_20 RX SINAD (dB)**
- **PARAMETER_21 RX SINAD RF level for set & measure (dBm)**
- **PARAMETER_22 RX SINAD test all ants [0=no 1=yes]**
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]**
- **PARAMETER_24 RX ST detection RF level (dBm)**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_29 RXB test ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_07 RX audio output AVL err w/compandor on**
- **PASS/FAIL LIMIT_08 RX RSSI level err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI level err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI level err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI level err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_12 RX RSSI level err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_13 RX RSSI level err @ –100 dBm (dB)**
- **PASS/FAIL LIMIT_16 RX SINAD for set & measure (dB)**
- **PASS/FAIL LIMIT_17 RX SINAD sensitivity RF level (dBm)**

P-Series TEST_23 - TX Standard Tests

This is the original TX standard test from Test Software version A.00.00. It is similar to the new test provided in this Test Software version, **TEST_25 - TX Quick Tests**, however the total time for TEST_23 is considerably longer than for TEST_25. It is included in the current version to provide backward compatibility for those users who need it.

This test performs the transmitter tests in the following order:

- **P-Series TEST_15 - TX Power Level and Adjustment**
- **P-Series TEST_16 - TX Frequency Error**
- **P-Series TEST_17 - TX Voice Modulation Limiting**
- **P-Series TEST_18 - TX Voice Modulation and Adjustment**
- **P-Series TEST_19 - TX Residual FM**
- **P-Series TEST_20 - TX Wideband Modulation**
- **P-Series TEST_21 - TX SAT Modulation**

Analyzer Settings

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

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**
- **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]**
- **PARAMETER_30 TX audio input Average Voice Level (AVL)**
- **PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]**
- **PARAMETER_33 TX PA power step size**
- **PARAMETER_34 TX PA power, check down to level (0-7)**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_18 TX frequency error (kHz)**
- **PASS/FAIL LIMIT_19 TX power error (dB)**
- **PASS/FAIL LIMIT_20 TX power error at power level 0 (dB)**
- **PASS/FAIL LIMIT_21 TX residual FM deviation (%)**
- **PASS/FAIL LIMIT_22 TX SAT deviation (kHz)**
- **PASS/FAIL LIMIT_23 TX SAT frequency error (Hz)**
- **PASS/FAIL LIMIT_24 TX voice deviation**
- **PASS/FAIL LIMIT_25 TX voice deviation limiting**
- **PASS/FAIL LIMIT_26 TX wideband data deviation (kHz)**

P-Series TEST_24 - RX Quick Tests

This test performs all the RX measurements, similar to **P-Series TEST_22 - 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

- **P-Series TEST_13 - RXA RSSI Offset and Path Gain**
- **P-Series TEST_05 - RXA RSSI Linearity**
- **P-Series TEST_11 - RXA Audio Level and Adjustment**
- **P-Series TEST_03 - RXA SINAD Sensitivity**
- **P-Series TEST_07 - RXA SAT Detection** (does not check falsing)
- **P-Series TEST_09 - RXA ST Detection** (does not check falsing)

then on Receiver B

- **P-Series TEST_14 - RXB RSSI Offset and Path Gain**
- **P-Series TEST_06 - RXB RSSI Linearity**
- **P-Series TEST_12 - RXB Audio Level and Adjustment**
- **P-Series TEST_04 - RXB SINAD Sensitivity**
- **P-Series TEST_08 - RXB SAT Detection** (does not check falsing)
- **P-Series TEST_10 - 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_22 RX SINAD test all ants [0=no 1=yes]**, **PARAMETER_16 RX RSSI offset test all ants [0=no 1=yes]**, and **PARAMETER_09 RX RSSI linear 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_10 RX RSSI linearity RF level high (–50 Max) (dB)** and **PARAMETER_11 RX RSSI linearity RF level low (–100 Min)(dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_15 RX RSSI offset RF level (–50 to –100) (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_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**
- **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]**
- **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]**
- **PARAMETER_06 RX audio output Average Voice Level (AVL)**
- **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**
- **PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]**
- **PARAMETER_10 RX RSSI linearity RF level high (–50 Max) (dB)**
- **PARAMETER_11 RX RSSI linearity RF level low (–100 Min)(dB)**
- **PARAMETER_15 RX RSSI offset RF level (–50 to –100) (dBm)**
- **PARAMETER_17 RX SAT & ST test @ extremes [0=no 1=yes]**
- **PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]**
- **PARAMETER_19 RX SAT detection RF level (dBm)**
- **PARAMETER_20 RX SINAD (dB)**
- **PARAMETER_21 RX SINAD RF level for set & measure (dBm)**
- **PARAMETER_22 RX SINAD test all ants [0=no 1=yes]**
- **PARAMETER_23 RX SINAD test by set & meas [0=no 1=yes]**
- **PARAMETER_24 RX ST detection RF level (dBm)**
- **PARAMETER_25 RX standard test level deviation**
- **PARAMETER_26 RX test w/external splitter [0=no 1=yes]**
- **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]**
- **PARAMETER_28 RXA test ant [0=None 1,2,3=single 7=all]**
- **PARAMETER_29 RXB test ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_07 RX audio output AVL err w/compandor on**
- **PASS/FAIL LIMIT_08 RX RSSI level err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI level err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI level err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI level err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_12 RX RSSI level err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_13 RX RSSI level err @ –100 dBm (dB)**
- **PASS/FAIL LIMIT_14 RX RSSI offset error (dB)**
- **PASS/FAIL LIMIT_16 RX SINAD for set & measure (dB)**
- **PASS/FAIL LIMIT_17 RX SINAD sensitivity RF level (dBm)**

TEST_25 - TX Quick Tests

This test performs all the TX measurements, similar to **P-Series TEST_23 - TX Standard Tests**, however, because of differences in the code, and that **P-Series TEST_15 - TX Power Level and Adjustment** is not performed, 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:

- **P-Series TEST_16 - TX Frequency Error**
- **P-Series TEST_18 - TX Voice Modulation and Adjustment**
- **P-Series TEST_17 - TX Voice Modulation Limiting**g
- **P-Series TEST_19 - TX Residual FM**
- **P-Series TEST_20 - TX Wideband Modulation**
- **P-Series TEST_21 - TX SAT Modulation**

Analyzer Settings

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

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**
- **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]**
- **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]**
- **PARAMETER_30 TX audio input Average Voice Level (AVL)**
- **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_18 TX frequency error (kHz)**
- **PASS/FAIL LIMIT_21 TX residual FM deviation (%)**
- **PASS/FAIL LIMIT_22 TX SAT deviation (kHz)**
- **PASS/FAIL LIMIT_23 TX SAT frequency error (Hz)**
- **PASS/FAIL LIMIT_24 TX voice deviation**
- **PASS/FAIL LIMIT_25 TX voice deviation limiting**
- **PASS/FAIL LIMIT_26 TX wideband data deviation (kHz)**

P-Series TEST_26 - GN Laptop Emulator

This “test” does not actually perform any measurements. This test allows the RS-232 to interface with the NT Base Station. The laptop emulation will output the RS-232 commands to the NT Base Station, and display the response from the Base Station. This screen is similar to the FS Debug screen. This test can also be accessed by the **`Laptop`** user key when a failure causes the test to stop (if the Test Set is set to **`Stop on Fail`** mode; **see "If Unit-Under-Test Fails (If UUT Fails)" on page 299**).

The screen displays a list of commands, and the status of each. By turning the knob you will move the arrow up and down the list. Pressing the knob will select the command the arrow is pointing at.

You will be prompted with the possible entries for that command, or the command may toggle.

NOTE: If the user changes a parameter in the Base Station by using this interface, the program will not restore that parameter before testing starts. Therefore, you must restore the Base Station to its original state if you wish to continue testing.

The list of commands extends beyond the bottom of the screen. Press k2 (**`Page Down`**) to display commands that are below the displayed list. Press k3 (**`Page Up`**) to return to the original top portion of the list. Press l5 (**`Exit`**) when you want to exit the Laptop Emulation Mode.

NOTE: If you get an “error” response in the status field of this screen, there is a communication problem with the Base Station. Try sending the command again. If this does not work, you may need to turn off a previous command such as TX data. Refer to the Nortel manual for a description of the commands. If everything else fails the communication with the Base Station may be locked up. In this case, you will have to turn the Base Station off and on and run the test again.

Parameters Used

- **PARAMETER_01 GN channel [0=Edit Freq 1=Single 2=LCR]**

Pass/Fail Limits Used

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

P-Series TEST_27 - GN Manual Switch Control

This test can be used to manually control a RF switches in your system. The switches can be those 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 the GN measure cable loss test. Repeat these two tests in the sequence for as many switch positions you wish to calibrate.

This test will not successfully run unless your switches are configured with entries on the **`External Devices`** (or **`Edit Cnfg`**) screen. **See "Configuration," in chapter 8, on page 245**.

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

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

P-Series TEST_28 - 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_02 GN RF lev for VSWR and cable loss tests [dBm]** for the minimum level that provides good resolution for the measurement you are making. Set the frequency range carefully.

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

If you are in an area with other receive antennas nearby, you may want to use **P-Series TEST_29 - GN Discrete Return Loss**. This test measures the return loss at a frequency offset from a selectable range of AMPS channels. The offset (in kHz) from the AMPS channels can be set.

This test measures the return loss of a cable or device in the swept mode. A SWR bridge and a 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 8, on page 272**.

VSWR can be calculated from the return loss. The following table (**table 10**) contains some of the values from a calculation.

Table 10 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

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.

Parameters

- **PARAMETER_02 GN RF lev for VSWR and cable loss tests [dBm]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

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

P-Series TEST_29 - GN Discrete Return Loss

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

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

See **P-Series TEST_28 - GN Swept Return Loss** for a return loss to VSWR conversion table and formula and a way to estimate the return loss of an antenna connected to the end of a feed line.

Parameters Used

- **PARAMETER_02 GN RF lev for VSWR and cable loss tests [dBm]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_01 GN VSWR for discrete return loss (dB)**

P-Series TEST_30 - GN Cable Fault

TEST SIGNAL CAN CAUSE INTERFERENCE

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

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

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

Cable Fault Performance

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

Selecting Cable Type

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

- Cable length
- Cable length units
  - Pressing the knob will toggle the selection between feet and meters.
- Cable class
  - Pressing the knob will provide choices for HELIAX, RG, and Custom options.
- The next prompt varies depending on the selection for cable class:
- If HELIAX is selected, you will be prompted to enter the cable type. A list will appear with choices of foam, air, and flex of varying thickness. Push the knob to select the desired cable type.
- If RG is selected, you will be prompted to enter the cable type with the example [RG 58/U = 58]. You must enter a value between 0 and 1000.
- If Custom is selected, you will be prompted to enter the cable velocity of propagation constant and attenuation per 100 feet (or meters) at 500 MHz. The propagation velocity must be a value between 0 and 1.
- Select **`Begin Test`** when all the appropriate entries have been made.
- Connect the cables as instructed, and press k2 (**`continue`**).

VELOCITY FACTORS AND ATTENUATION

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

TYPICAL CABLE FAULT RETURN LOSS MEASUREMENTS

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

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

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

Entering Cable Length

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

Parameters Used

There are no parameters used in this test.

Pass/Fail Limits Used

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

P-Series TEST_31 - GN Measure 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 result, or by manually changing it on the data entry screen when you run any of the RF tests.

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

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

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 prompts you with the question **"Do you want to repeat the loss measurement"**, press k2 (**No**) and the test will end.

Parameters Used

- **PARAMETER_02 GN RF lev for VSWR and cable loss tests [dBm]**
- **PARAMETER_37 GN if test fails [0=continue 1=stop]**

Pass/Fail Limits Used

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

P-Series TEST_32 - 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. Previously, users were required to hand enter the data retrieval program located in the **"Data Collection (Saving and Retrieving Test Results)" on page 251** of this manual. This test contains the data retrieval program necessary to transfer files.

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 appears:
  - 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, refer to the **"Data Collection (Saving and Retrieving Test Results)" on page 251**. For more information regarding HP-IB or Serial Port printing, refer to **"Printing" on page 272**.

Parameters Used

There are no parameter used during this test.

Pass/Fail Limits Used

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

P-Series 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 5, on page 99**.

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

GN - General

RX - Receiver

RXA - Receiver A

RXB - Receiver B

TX - Transmitter

ZZZZ - Test/demo mode selection

PARAMETER_01 GN channel [0=Edit Freq 1=Single 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=**Edit Fr**),
- the entry in the **Channel** field on the Initialization Screen (select 1=**single**),
- the channel numbers from the frequency table for LCR testing (select 2=**LCR**).

If you select 2=**LCR**, 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 transceiver each time.

PARAMETER_02 GN RF lev for VSWR and cable loss tests [dBm]

Enter the RF source duplex out level for the VSWR and Cable Loss tests.

PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]

Earlier versions of the Nortel test procedure specified that the tests using audio inputs and outputs be done with the Forward and Reverse audio DIP switches zeroed and also an Average Voice Level (AVL) of –22 dBm. If you would like to perform your tests this way, set this parameter to 1=**yes**.

Another method is to leave the DIP switches set to the AVLs for your system and use your AVLs for the audio input and output levels. If you would like to perform the test this way, set the parameter to 0=**no**. The audio levels are then set to the AVLs specified by **PARAMETER_06 RX audio output Average Voice Level (AVL)** and **PARAMETER_30 TX audio input Average Voice Level (AVL)**.

NOTE: You can make all the measurements at the –22 dBm AVL and then adjust DIP switches to your system AVL at the end of testing. This can be done because the adjustment parts of **P-Series TEST_11 - RXA Audio Level and Adjustment** and **P-Series TEST_12 - RXB Audio Level and Adjustment**, and **P-Series TEST_18 - TX Voice Modulation and Adjustment** only use **PARAMETER_06 RX audio output Average Voice Level (AVL)** and **PARAMETER_30 TX audio input Average Voice Level (AVL)**. To do this, set these parameters to the AVL for your system. Set **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** 1 to 2=**always**, and set **PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]** to 1=**RXB**. Make a testing procedure where **P-Series TEST_12 - RXB Audio Level and Adjustment** is the last RX test where audio levels are used. Also make **P-Series TEST_18 - TX Voice Modulation and Adjustment** the last TX test that uses audio levels.

PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]

This parameter is used to determine if the Test Software will automatically adjust the audio output and audio input Average Voice Level (AVL). If an adjustment is performed, the Test Software uses the value in **PARAMETER_06 RX audio output Average Voice Level (AVL)** for **P-Series TEST_11 - RXA Audio Level and Adjustment** and **P-Series TEST_12 - RXB Audio Level and Adjustment** or the value in **PARAMETER_30 TX audio input Average Voice Level (AVL)** for **P-Series TEST_18 - TX Voice Modulation and Adjustment**.

PARAMETER_05 RX audio level adjust on [0=RXA 1=RXB 2=both]

This parameter determines whether the RX audio level adjustment is made on Receiver A, B or both during the RX audio level test. To perform the adjustment **PARAMETER_04 RT audio level adjust [0=no 1=on fail 2=always]** must be set to something other than 0=**no**. **See "P-Series TEST_11 - RXA Audio Level and Adjustment" on page 185** for additional information on setting this parameter.

Setting this parameter to 2=**both** is intended for use when you are servicing the radio and both RXA and RXB can be adjusted.

PARAMETER_06 RX audio output Average Voice Level (AVL)

This parameter is the RX Average Voice Level (AVL) or audio output level from the transceiver REV D Jack that conforms to your system requirements. This parameter is always used for adjusting the RX audio level in P-Series TEST_11 and TEST_12. If **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** is set to 0=**no**, then this parameter will be used for all RX audio output levels rather than –22 dBm.

PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)

The value in this parameter is only used if **PARAMETER_27 RX tests perform at [0=Rcvr shelf 1=RMC]** is set to 0=**Rcvr shelf**.

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 transceiver 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 P-Series documentation or from Nortel (Northern Telecom).

PARAMETER_08 RX RSSI lin chk w/o offset [0=no 1=yes]

This parameter allows the Test Software to check RSSI linearity in **P-Series TEST_05 - RXA RSSI Linearity** and **P-Series TEST_06 - RXB RSSI Linearity**, without the transceiver internal offset. Removing the internal offset allows a check of RSSI linearity without having to change the pass/fail limits.

PARAMETER_09 RX RSSI linear test all ants [0=no 1=yes]

This parameter determines the antenna ports on the receiver shelf that will be checked during RSSI linearity tests. If set to 1=**yes**, RSSI Linearity will be checked on all six antennas.

This parameter overrides the value entered in the **Sector** field on the Initialization Screen, for **P-Series TEST_13 - RXA RSSI Offset and Path Gain** and **P-Series TEST_14 - RXB RSSI Offset and Path Gain** only.

PARAMETER_10 RX RSSI linearity RF level high (–50 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_11 RX RSSI linearity RF level low (–100 Min)(dB)**, 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_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**. See the description for **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)** earlier in this section.

In **P-Series TEST_22 - RX Standard Tests** and **P-Series TEST_24 - 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_15 RX RSSI offset RF level (–50 to –100) (dBm)**. Primary antennas are determined by the **Sector** field on the Initialization Screen.

PARAMETER_11 RX RSSI linearity RF level low (–100 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_10 RX RSSI linearity RF level high (–50 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_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**. See the description for **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)** earlier in this section.

In **P-Series TEST_22 - RX Standard Tests** and T**P-Series TEST_24 - 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_15 RX RSSI offset RF level (–50 to –100) (dBm)**. Primary antennas are determined by the **`Sector`** field on the Initialization Screen.

PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]

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

If this parameter is set to 1=**`fail`**, an adjustment will be made if

- RSSI offset error exceeds the limits set by **PASS/FAIL LIMIT_14 RX RSSI offset error (dB)**.

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

PARAMETER_13 RX RSSI offset adjust on [0=RXA 1=RXB]

When testing P3 radios only, this parameter determines whether the RX RSSI offset adjustment is made on Receiver A or B during the RX RSSI offset and Path Gain test. To perform the adjustment **PARAMETER_12 RX RSSI off adj [0=no 1=fail 2=always]** must be set to something other than 0=**no**.

PARAMETER_14 RX RSSI offset chk rmc gain [0=no 1=yes]

This parameter determines whether RMC gain is checked during **P-Series TEST_13 - RXA RSSI Offset and Path Gain** and **P-Series TEST_14 - RXB RSSI Offset and Path Gain**. **See "P-Series TEST_13 - RXA RSSI Offset and Path Gain" on page 189** for more information.

PARAMETER_15 RX RSSI offset RF level (–50 to –100) (dBm)

This parameter sets the RF level applied to the receiver during **P-Series TEST_13 - RXA RSSI Offset and Path Gain** and **P-Series TEST_14 - RXB RSSI Offset and Path 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_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**.

See the description for **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB) on page 227** earlier in this section.

For **P-Series TEST_22 - RX Standard Tests** and **P-Series TEST_24 - 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_16 RX RSSI offset test all ants [0=no 1=yes]

This parameter determines the antenna ports on the receiver shelf that will be checked during **P-Series TEST_13 - RXA RSSI Offset and Path Gain** and **P-Series TEST_14 - RXB RSSI Offset and Path Gain**. This parameter overrides the value entered in the **`Sector`** field on the Initialization Screen, for TEST_13 and 14 only.

PARAMETER_17 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 **P-Series TEST_07 - RXA SAT Detection** and **P-Series TEST_09 - RXA ST Detection**.

PARAMETER_18 RX SAT & ST test with tones [0=no 1=yes]

This parameter is used to determine which tones are present when performing SAT and ST detection tests. If this parameter is set to 1=**yes**, both audio and ST tones are used in **P-Series TEST_07 - RXA SAT Detection**, **P-Series TEST_08 - RXB SAT Detection**, and both audio and SAT tones are used in **P-Series TEST_09 - RXA ST Detection** and **P-Series TEST_10 - RXB ST Detection**.

If this parameter is set to 0=**no**, no tones are used.

PARAMETER_19 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_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**. See the description for **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB) on page 227** earlier in this section.

PARAMETER_20 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 **P-Series TEST_03 - RXA SINAD Sensitivity** and **P-Series TEST_04 - RXB SINAD Sensitivity**. Normally this value is set to 12 dB.

See **"PARAMETER_21 RX SINAD RF level for set & measure (dBm)" on page 232**.

PARAMETER_21 RX SINAD RF level for set & measure (dBm)

This parameter sets the level that is applied to the Base Station 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_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**. See the description for **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB) on page 227** earlier in this section.

PARAMETER_22 RX SINAD test all ants [0=no 1=yes]

This parameter determines the antenna ports on the receiver shelf that will be checked during **P-Series TEST_03 - RXA SINAD Sensitivity** and **P-Series TEST_04 - RXB SINAD Sensitivity**. If this parameter is set to 1=**yes**, the Test Software will prompt the user to test all six antennas for the SINAD test.

During the SINAD test, this parameter overrides the value entered into the **Sector** field on the Initialization Screen for *TEST_03/04* only.

PARAMETER_23 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=**no** 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_21 RX SINAD RF level for set & measure (dBm)** and the SINAD is measured and compared to **PASS/FAIL LIMIT_16 RX SINAD for set & measure (dB)**.

See **"P-Series TEST_03 - RXA SINAD Sensitivity" on page 173**.

PARAMETER_24 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_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**. See the description for **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB) on page 227** earlier in this section.

PARAMETER_25 RX standard test level deviation

This is the Test Set RF deviation used for the RX audio level test. This value is typically 2.9 kHz.

PARAMETER_26 RX test w/external splitter [0=no 1=yes]

In some cases it is beneficial to use a 6-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 need to be made during testing. If you want to use the external splitter, set this parameter to 1=**yes**. Doing this will draw the correct diagrams for the user on the Test Set screen.

NOTE: Make certain that you compensate for the splitter loss by adding it to each RX 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_27 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=**`Rcvr shelf`**, the Test Set RF generator will compensate for the receiver shelf splitter loss in **PARAMETER_07 RX rcvr shelf splitter loss (Typically 11 dB) (dB)**. If this parameter is set to 1=**`RMC`**, no compensation for the splitter will occur. The Test Set RF generator output is available at the DUPLEX OUT port.

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

PARAMETER_28 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.

When set to **`0=none`**, the test sequence will skip RXA *unless* one or more of the following parameters are set to **`1=yes`**:

PARAMETER_09 RX RSSI linear test all ants [0=no 1=yes] on page 228
PARAMETER_16 RX RSSI offset test all ants [0=no 1=yes] on page 230
PARAMETER_22 RX SINAD test all ants [0=no 1=yes] on page 232

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

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

PARAMETER_29 RXB test ant [0=None 4,5,6=single 7=all]

See the previous parameter.

PARAMETER_30 TX audio input Average Voice Level (AVL)

This parameter is the TX Average Voice Level (AVL) or audio input level to the transceiver FWD D Jack that conforms to your system. This parameter is always used for adjusting the TX voice deviation. If **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** is set to 0=**no**, then this parameter will be used for all TX audio input levels rather than –22 dBm.

PARAMETER_31 TX duplexer/combiner loss (dB)

This parameter is the combined loss of the duplexer and combiner. If **PARAMETER_35 TX tests perform at [0=PA shelf 1=Comb] on page 236** is set to 1=**Comb**, the value entered here is subtracted from the 45W to set the initial value in the **TX Max Power** field on the Initialization Screen.

PARAMETER_32 TX PA power adj [0=no 1=on fail 2=always]

This parameter is used to determine if the Test Software will provide a meter display so the adjustment of the TX PA power can be made. This can be performed while
P-Series TEST_15 - TX Power Level and Adjustment is running.

PARAMETER_33 TX PA power step size

Enter the TX power step size. This is used as the difference between the power levels in **P-Series TEST_15 - TX Power Level and Adjustment**.

PARAMETER_34 TX PA power, check down to level (0-7)

If the transceiver is capable of dynamic power stepping, **P-Series TEST_15 - TX Power Level and Adjustment** will check down to the power level specified by this parameter. See **"P-Series TEST_15 - TX Power Level and Adjustment" on page 194** for information on transceiver power levels.

PARAMETER_35 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=**`PA shelf`**. 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=**`Comb`** 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_36 ZZZZ Test Mode [0=normal 1=demo]

This parameter is used to set up a demo mode.

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

PARAMETER_37 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=**`stop`**, 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 the testing. **See "P-Series TEST_26 - GN Laptop Emulator" on page 214**.

P-Series Pass/Fail Limit Descriptions

Pass/fail limits define the values with which a measurement result is compared to determine if the UUT meets its specified standards.

For information on editing pass/fail limits, **see "Customizing Testing," in chapter 5, on page 99**.

All pass/fail limits include lower and upper limits that may be changed. 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 will be used when compared with measurements. Some of the default pass/fail limits provided in the Test Software include only one of the limits. If you enter the other limit, make certain 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 the pass/fail limits from being lost when a new procedure is selected, you must save these in a procedure.**See "Saving a Test Procedure," in chapter 5, on page 112**. To print the list of pass/fail limits, **see "To print TESTS screens:," in chapter 8, on page 279**.

Pass/fail limits may be secured. **See "Securing a Procedure," in chapter 8, on page 290**.

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 system pass/fail limits

RT = Receiver and Transmitter

RX = Receiver pass/fail limits

TX = Transmitter pass/fail limits

PASS/FAIL LIMIT_01 GN VSWR for discrete return loss (dB)

This is the minimum return loss that is acceptable for discrete return loss.

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

This is the minimum return loss that is acceptable for swept return loss.

PASS/FAIL LIMIT_03 RT aud loopback err from AVL (Rev <13)

This is the pass/fail limit for audio loopback error from Average Voice Level (AVL) on BSTRX800 transceivers less than Hardware Revision 13.

THE AVERAGE VOICE LEVEL (AVL) IS SPECIFIED BY THE PARAMETERS

If **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** is set to **1=yes**, the AVL is –22. If this parameter is set to **0=no**, the AVL is the value entered in **PARAMETER_06 RX audio output Average Voice Level (AVL)**.

PASS/FAIL LIMIT_04 RT aud loopback err from AVL+4 (Rev>=13)

This is the pass/fail limit for audio loopback error from Average Voice Level (AVL) BSTRX800 transceivers Hardware Revision 13 or greater, and BSTRX800 EX.

THE AVERAGE VOICE LEVEL (AVL) IS SPECIFIED BY THE PARAMETERS

If **PARAMETER_03 GN zero DIP sw & –22 dBm AVL [0=no 1=yes]** is set to **1=yes**, the AVL is –22. If this parameter is set to **0=no**, the AVL is the value entered in **PARAMETER_06 RX audio output Average Voice Level (AVL)**.

PASS/FAIL LIMIT_05 RT aud loopback unlooped

This is the highest allowable audio level between the Forward and Reverse audio with no loopback selected.

PASS/FAIL LIMIT_06 RT audio 1 kHz tone error from AVL

This is the 1 kHz audio tone output level error from the Average Voice Level (AVL).

PASS/FAIL LIMIT_07 RX audio output AVL err w/compandor on

This is the audio output level error or reverse audio level error from the Average Voice Level (AVL) with the compandor on.

PASS/FAIL LIMIT_08 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 **"P-Series TEST_05 - RXA RSSI Linearity" on page 176**.

PASS/FAIL LIMIT_09 RX RSSI level err @ –60 dBm (dB)

See *RX RSSI level err –50 dBm*. Replace “–50 dBm” with “–60 dBm”.

PASS/FAIL LIMIT_10 RX RSSI level err @ –70 dBm (dB)

See *RX RSSI level err @ –50 dBm*. Replace “–50 dBm” with “–70 dBm”.

PASS/FAIL LIMIT_11 RX RSSI level err @ –80 dBm (dB)

See *RX RSSI level err @ –50 dBm*. Replace “–50 dBm” with “–80 dBm”.

PASS/FAIL LIMIT_12 RX RSSI level err @ –90 dBm (dB)

See *RX RSSI level err @ –50 dBm*. Replace “–50 dBm” with “–90 dBm”.

PASS/FAIL LIMIT_13 RX RSSI level err @ –100 dBm (dB)

See *RX RSSI level err @ –50 dBm*. Replace “–50 dBm” with “–100 dBm”.

PASS/FAIL LIMIT_14 RX RSSI offset error (dB)

This is the maximum and minimum error allowed from the user- specified offset after the offset has been set.

PASS/FAIL LIMIT_15 RX RSSI 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_16 RX SINAD for set & measure (dB)

If the measured SINAD is greater than the number entered into the lower limit, an RX sensitivity test will pass. For example, if the lower 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_21 RX SINAD RF level for set & measure (dBm)**. See **"P-Series TEST_03 - RXA SINAD Sensitivity" on page 173**.

PASS/FAIL LIMIT_17 RX SINAD sensitivity RF level (dBm)

This pass/fail limit sets the limits for the Base Station receiver RF input level when the receiver sensitivity for a particular SINAD is determined using an iterative technique.

See **"P-Series TEST_03 - RXA SINAD Sensitivity" on page 173**.

PASS/FAIL LIMIT_18 TX frequency error (kHz)

This pass/fail limit sets the difference between the measured and assigned transmitter frequencies.

PASS/FAIL LIMIT_19 TX power error (dB)

This pass/fail limit sets the error of the PA output power. The error is derived by subtracting the measured power from the power defined by the **TX Max Power** field on the Initialization Screen, and **PARAMETER_33 TX PA power step size**. This pass/fail limit is used when the power error is checked at each power level.

See **"P-Series TEST_15 - TX Power Level and Adjustment" on page 194**.

PASS/FAIL LIMIT_20 TX power error at power level 0 (dB)

This sets the pass/fail limit of the error of the PA output power. This pass/fail limit is used when the power error is checked at power level 0. Adjustments are performed on power level 0, so you may want this pass/fail limit tighter than **PASS/FAIL LIMIT_19 TX power error (dB)**.

PASS/FAIL LIMIT_21 TX residual FM deviation (%)

This pass/fail limit sets the acceptable RMS frequency modulation of the PA output signal.

See **"P-Series TEST_19 - TX Residual FM" on page 200**.

PASS/FAIL LIMIT_22 TX SAT deviation (kHz)

This pass/fail limit sets maximum and minimum SAT tone FM deviation. Transmitter deviation resulting from the SAT tone is nominally 2 kHz.

PASS/FAIL LIMIT_23 TX SAT frequency error (Hz)

This pass/fail limit sets the error in the frequency of the 5970 Hz, 6000 Hz or 6030 Hz SAT tones modulated onto the transmitter carrier signal.

PASS/FAIL LIMIT_24 TX voice deviation

Enter the maximum and minimum deviation limits for the transmitted voice deviation.

PASS/FAIL LIMIT_25 TX voice deviation limiting

Enter the maximum and minimum deviation limits for the transmitter voice deviation when in limiting.

PASS/FAIL LIMIT_26 TX wideband data deviation (kHz)

This pass/fail limit sets the maximum and minimum peak frequency deviation resulting from a wideband data signal.

PASS/FAIL LIMIT_27 RX RSSI offset internal rssi offset (dB)

This pass/fail limit sets the acceptable range for the internal RSSI offset value programmed into the radio.

See "P-Series TEST_13 - RXA RSSI Offset and Path Gain" on page 189 and **"P-Series TEST_14 - RXB RSSI Offset and Path Gain" on page 193**.

8

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's front panel.

`Procedure`: - Characters displayed on the Test Set's screen.

k1 (**`Run Test`**) - A USER key in the column next to the Test Set's screen. **`Run Test`** is displayed on the screen.

`0.000000` - A field on the Test Set's screen in which entries may be made.

Titles of documentation are printed in italics.

The term Test Set refers to the HP 8921A,D.

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 Test Set's 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 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.

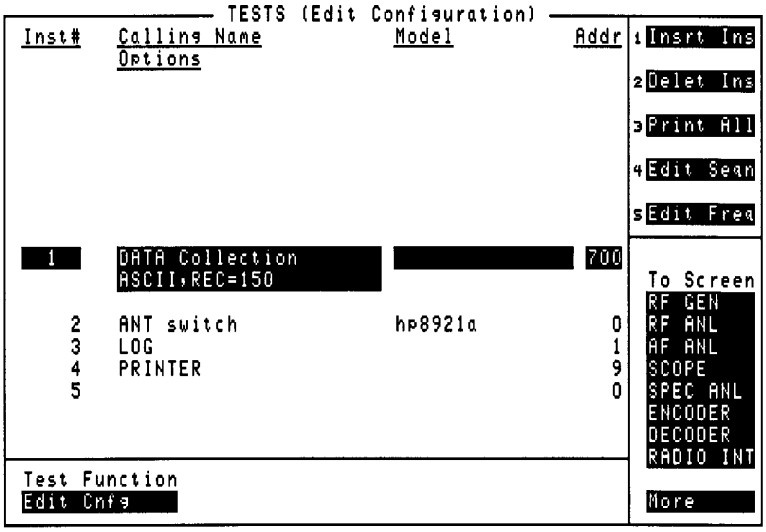


Figure 8 **An Example of External Devices (Edit Configuration) Screen**

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's 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 11 on page 247 and **table 12 on page 248** contain keywords that the Test Software will recognize. These keyword entries are made into the External Devices (or Edit Configuration) screen.

Keywords are entries that you make and 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's 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 11 Data Collection, Printing, and Logging Configuration

Purpose	Inst#	Calling Name Options	Model	Addr	Description
HP-IB/Serial Data Collection see **"Data Collection (Saving and Retrieving Test Results)" on page 251**	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)
Printing Test Results (not on FW Rev. A.12.04 and greater)	2	PRINTER	don't care	7xx[4]	HP-IB Printer
	2	PRINTER	don't care	9	Printer, Serial
	2	PRINTER	don't care	15	Printer, Parallel
	Option:	LN=xx,[5]			xx lines before a form feed.
	Option:	START,[5]			Form feed at the start of each test in the sequence.
	Option:	END[5]			Form feed at the end of each test in the sequence.
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 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 is DOS. HP-UX is used if the card format is LIF.
4. xx=Last two digits of HP-IB address.
5. Multiple options can be separated by a comma or space.

Table 12 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. 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 11**.)
   a. Use the ⇐ key to backspace.
   b. 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's battery-backed-up memory. The Configuration used after power-up is the same one that was in the Test Set's 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" on page 295**. 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’s 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:

- 8921A,D
  - *HP Instrument Basic User’s Handbook* HP part number E2083-90000.
  - *HP 8921 Test Set Programmer’s Guide* HP part number 08921-90031.

See also: **"Data Collection (Saving and Retrieving Test Results)" on page 251** and **"Initializing a Memory Card" on page 267**.

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 media 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 that 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 267** if using a new memory card. The file types under LIF can be used by the Test Set's IBASIC controller and some HP workstations. The DOS format is required if you wish to use the card with a PC.

Table 13 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, (number of records)	don't care	7xx[4]	LIF format LIF format DOS file type DOS or HP-UX file type 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 is DOS. 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 **"P-Series TEST_32 - GN Data Collection File Transfer" in chapter 7** 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 **table 14, "Global Configuration Settings" on page 254**, **table 15, "Terminal Configuration Settings" on page 255**, and **table 16, "Remote Configuration Settings" on page 255** to set the configuration settings.

Table 14 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 15 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 16 Remote Configuration Settings

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

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 17** 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 17 Equivalent Front-Panel Control Characters

Function	Equiv. ESC Char.	Function	Equiv. ESC Char.	Function	Equiv. ESC Char.
CANCEL	!	SAVE	G	PRESET	i
PERCENT MHZ_V	(	REF_SET	J	INCR_DIV_10	j
S_KHZ_MV	)	METER	K	INCR_SET	k
BACKSPACE	-	AVG	L	INCR_TIMES_10	l
ENTER	.	LO_LIMIT	M	DOWN	m
RELEASE	0	HI_LIMIT	N	UP	n
K1	1	E	R	SEVEN	o
K2	2	F	S	EIGHT	p
K3	3	B	U	NINE	q
K4	4	C	V	FOUR	r
K5	5	D	W	FIVE	s
K1_PRIME	6	A	X	SIX	t
K2_PRIME	7	EEX	Z	ONE	u
K3_PRIME	8	YES_ON_OFF	[	TWO	v
ASSIGN	9	NO_PPM_W	]	THREE	w
KNOB_TURN_CCW	<	RX	a	ZERO	x
KNOB_TURN_CW	>	TX	b	POINT	y
MSSG	A	DUPLEX	c	PLUS_MINUS	z
HELP	B	PREV	d	OHM_PCT_DEL_DBUV	{
CONFIG	C	TESTS_MAIN	e	DB_GHZ_DBM	|
HOLD	D	LOCAL	f	MS_HZ_UV	}
PRINT	E	RECALL	g		
ADRS	F	MEAS_RESET	h		

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 transceiver 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 card for later use (see **"Procedures" on page 285**).

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 transceiver 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_01 GN channel [0=Edit Freq 1=Single 2=LCR]** allows you to choose if the Test Software should read frequency information from the Frequency Table (set parm to 0=Edit Fr), or from a prompt that will appear at the beginning of Run Test (set parm to 1=Prompt). Setting this parameter to 1=Prompt will allow you to test only one channel at a time. The default setting for this parameter is 1=Prompt. You must change it to 0=Edit Fr if you desire 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 TESTS screen.

HP-IB Control Annunciators

The words, letters, and symbols at the top right corner of the Test Set 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 Test Set 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 limits 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 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's 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.

Loading a Test Software Upgrade, FW below rev A.12.04 only

If you have purchased a Test Software upgrade from the factory and are loading it for the first time, you must clear the old revision Test Software from the Test Set memory before running the new revision Test Software. If you do not, the new revision will not be loaded, and the old revision will be used. This is for FW below revision A.12.04 only. For firmware revision A.12.04 and above, the Test Set will check for differences in the code, and automatically load the most updated version.

The easiest way to clear the old revision Test Software is to load a different Test Software program. The LIST_OPTS program that is stored in internal ROM can be used for this purpose.

To Load the LIST_OPTS Program:

1. Press TESTS.
2. Position the cursor to **`Select Procedure Location`** and select it.
3. From the **`Choices`** menu, select **`ROM`**.
4. Position the cursor to **`Select Procedure Filename`** and select it.
5. From the **`Choices`** menu, select **`LIST_OPTS`**.
6. Press k1 (**`Run Test`**).

The new revision Test Software can now be loaded.

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 18 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 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,D Test Sets with firmware above revision A.14.00. If these settings do not match your needs, or you have firmware below revision A.14.00, 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 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.

If you have firmware below revision A.14.00, 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 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 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 **"P-Series TEST_32 - GN Data Collection File Transfer" in chapter 7** 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 needs.

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 285**.

To print the parameters list, see **"To print TESTS screens:" on page 279**.

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

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 7, "Test, Parameter, and Pass/Fail Limit Descriptions"** of this manual. A lock is provided to prevent access to the pass/fail limits. See **"Securing a Procedure" on page 290**.

Pass/fail limits remain in the Test Set's 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 285**.

To print the pass/fail limits list, see **"To print TESTS screens:" on page 279**.

To edit a pass/fail limit value:

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

Pausing or Stopping a TEST

To pause the program, press CANCEL.

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

NOTE:

Changing Settings while Paused

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 259**.

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)

To Print (task list)

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 272**).
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 273**).
3. Configure the Test Set for your printer and its interface (see **"Configuring the Test Set for Printing" on page 275**).
4. Instruct the Test Set what to print (see **"To print test results:" on page 276**).

Supported Printers

- HP ThinkJet printers
- 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 9** . 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

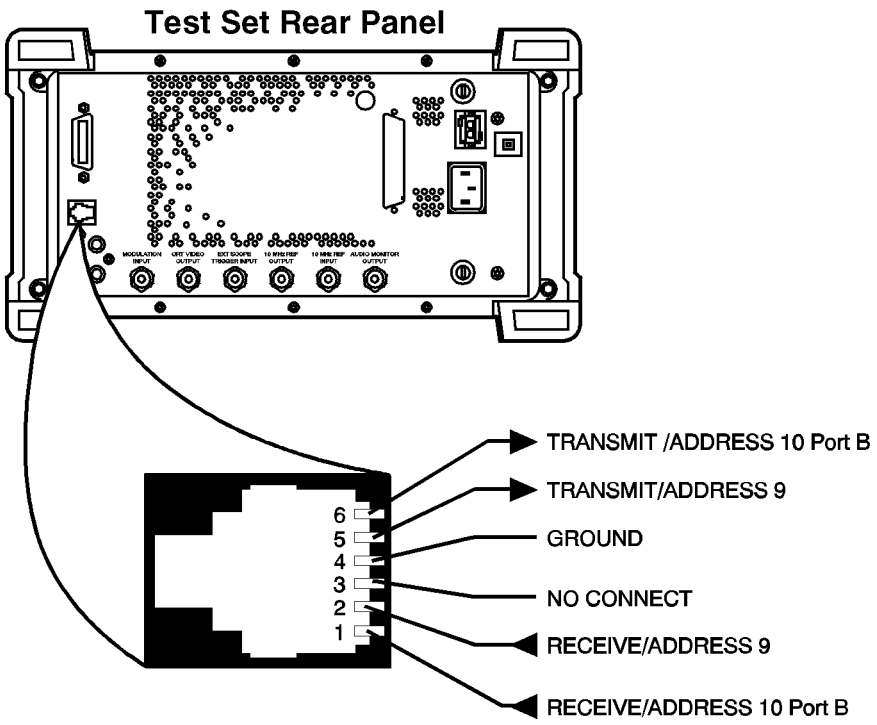


Figure 9 **Test Set RJ-11 Serial Port Connections**

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 10** for pin information. You may order this cable from Hewlett-Packard using part number HP C2950A.

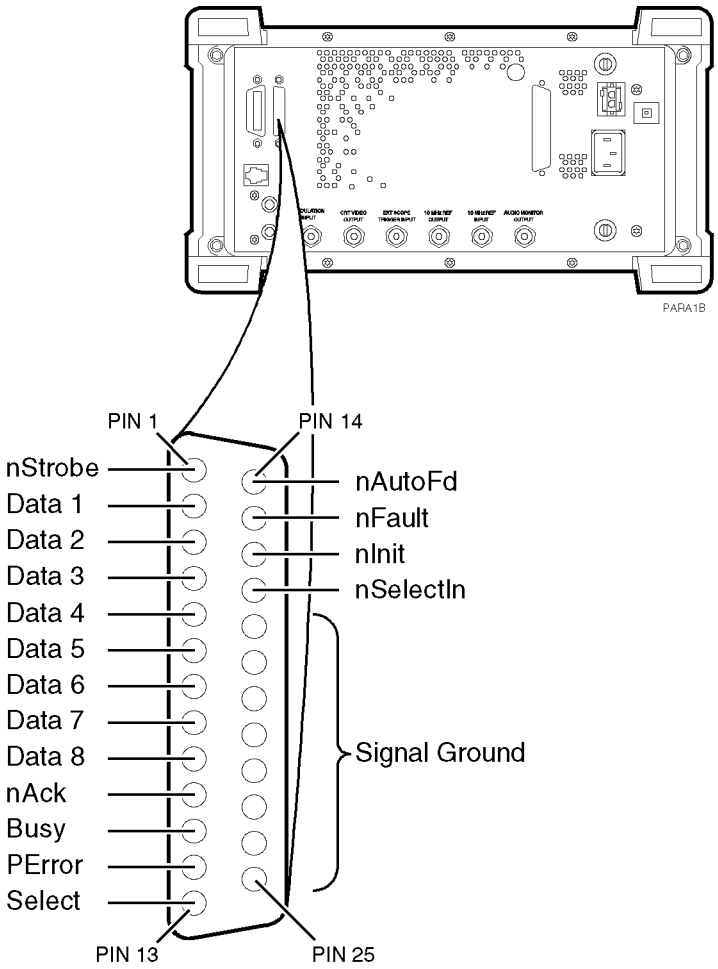


Figure 10 **Test Set Parallel Port Connections**

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.

NOTE:

Printer Setup Differences

The HP 8921A Test Set has several firmware enhancements, some of which affected the printer setup screens. The following **`Setup Printer`** section applies to users with:

- HP 8921A Test Sets with firmware above revision A.14.00.

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.

If you have an HP 8921A Test Set with firmware revision below A.14.00, refer to the later section entitled “To Set Up Printer Using HP 8921A FW Below Revision A.14.00”. Contact Hewlett-Packard at 1-800-922-8920 for details on upgrading your firmware if desired.

To Set Up Printer Using HP 8921A Test Set FW Above Rev A.14.00

1. Press TESTS
2. Select **`Printer Setup`** from the **`SET UP TEST SET`** list.
3. Position the cursor to **`Model`** and select the desired printer.
4. Position the cursor to **`Print Port`** and select the desired port.
5. (If HP-IB only) Position the cursor to **`Printer Adrs`** and enter the HP-IB address for your printer (0-30).
6. Set the following options if desired:
   a. Lines/Page (controls the number of lines, 20-120, printed on a page before a form feed is sent to the printer)
   b. FF at Start (to cause a form feed at the start of a test sequence)
   c. FF at End (to cause a form feed at the end of a test sequence)
7. From the **`To Screen`** menu, select **`More`**.
8. From the **`Choices`** menu, select **`IO CONFIG`**.
   a. For Serial Printing, set the **`Serial Baud`** field and other serial communications fields listed under it to correspond to your printer 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's user's 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 19 Escape Sequence Definitions for HP Printers

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

To print TESTS screens:

TESTS screens include:

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

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

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

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

To Set Up Printer Using HP 8921A Test Set FW Below Rev A.14.00

1. Press TESTS
2. Select **`Edit Cnfg`** from the **`Test Function`** field.
3. Position the cursor to the **`Inst#`** field and select it.
4. Rotate the knob until an empty **`Calling Name`** field appears, and select it.
5. Position the cursor to the **`Calling Name`** field and select it.
6. Using the list of characters in the **`Choices`** menu, enter the word **`Printer`**. Select **`Done`** when complete.
7. Position the cursor to the **`Model`** field and select it (optional).
8. Using the DATA keypad, enter the Model # and press ENTER.
9. Position the cursor to the **`Addr`** (address) field and select it.
10. Using the DATA keypad, enter **`9`** for serial printers, **`15`** for parallel printers, or **`70X`** for HP-IB printers, then press ENTER. .
11. Position the cursor to the **`Options`** field (directly under **`Calling Name`**) and select it.
12. Using the list of characters from the **`Choices`** menu, the following commands may be entered. Separate the commands with commas (example; **`LN=60,START,END`**)
    a. **LN** equals the number of printed lines per page.
    b. **START** causes a form feed at the start of each printout.
    c. **END** causes a form feed at the end of each printout.
13. From the **`To Screen`** menu, select **`More`**.
14. From the **`Choices`** menu, select **`IO CONFIG`**.
15. For Serial Printers:
    a. Set the **`Serial Baud`** field and other serial communications fields listed under it to correspond to your printer configuration.
16. For HP-IB Printers:
    a. Position the cursor to the **`Mode`** field and select it.
    b. From the **`Choices`** menu, select **`Control`**.
    c. Position the cursor to the **`Print Adrs`** field and select it.
    d. Rotate the knob and select the HP-IB address of your printer.
    e. Position the cursor to the **`Print To`** field. Pressing knob will toggle the underlined selection. Select to underline **`HP-IB`**.
17. Press TESTS to return to the TESTS screen.

To print test results

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

To send Escape Sequences to the printer

The Test Set may be used to send escape sequences to control printer options such as pitch, margins, paper size, and so forth. You may enter sequences that are compatible with your printer (use your printer's user's 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 **Edit Cnfg** from the **Test Function** field.
3. Position the cursor to the **Inst#** field and select it.
4. Rotate the knob until an empty **Calling Name** field appears, and select it.
5. Position the cursor to the **Calling Name** field and select it.
6. Enter **ESCAPE SEQ** using the characters in the **Choices** menu. Select **Done** when you are finished.
7. Position the cursor to the **Addr** (address) field and select it.
8. Using the DATA keypad, enter **9** for serial printers, **15** for parallel printers, or **70X** for HP-IB printers, then press ENTER. .
9. Position the cursor to the **Options** field (directly under **Calling Name**) and select it.
10. Select the desired sequence using the list of characters below the choices.

Table 20 Examples of Common Escape Sequences

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

To print TESTS screens

TESTS screens include:

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

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

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

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

Procedures

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

You 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 may save the setup to an SRAM card or internal RAM by doing the following.

The SRAM card that you use must be initialized before its first use. See **"Initializing a Memory Card" on page 267**.

To Save A Procedure

1. Press TESTS.
2. Select **Save/Delete Procedure** from the **CUSTOMIZE TEST PROCEDURE** list (or **Proc Mngr** from the **Test Function** field).
3. Position the cursor to the **Select Procedure Location** (or **Location**) field and select it.
4. From the **Choices** menu, select the desired location. The media must be initialized before a file can be saved. To initialize an SRAM card (HP 8921A,D Test Set firmware above revision A.14.00 only, otherwise see **"Initializing a Memory Card" on page 267**):
   - Insert card in the slot on the Test Set front panel.
   - Press k3 (**Init Card**).
   - 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 263**.
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 293**.

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"
```

Volume 0 contents 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 251**.

Serial Port

The 6-pin, RJ-11 connector contains two serial ports that are used to input and output serial data. Serial data is used for entering programs, printing, and for 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 (**figure 11, "Test Set RJ-11 Serial Port Connections," on page 297**). 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 then 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 21** before connecting cables to the instruments.

The following **table 21** lists connections for Transmit, Receive, and Ground pins (address 9).

Table 21 Connections for Transmit, Receive, and Ground Pins

HP 8921A/D 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)

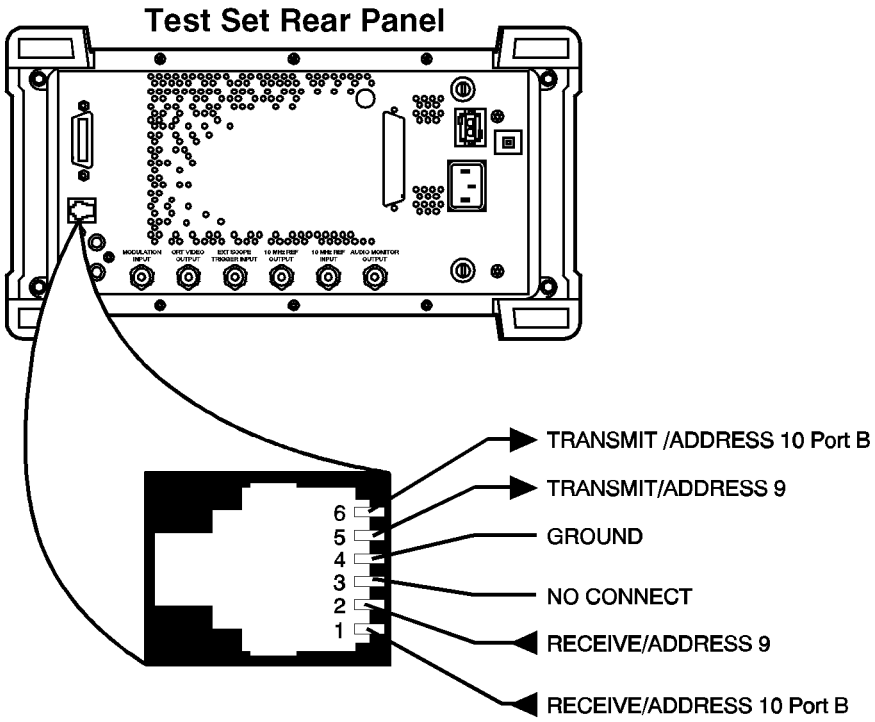


Figure 11 **Test Set RJ-11 Serial Port Connections**

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**. (These are displayed directly on the main TESTS screen in firmware below revision A.14.00).

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

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

Output Results To: (Output Destination)

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

You can specify where test results are to be placed. If you select **Crt**, results will be displayed on the Test Set 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 272**.

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 yu 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 pass/fail limit. You may 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`

If you have set up the Test Software to stop on a failure, you will see this USER key when a failed measurement is made. Selecting **`Abort`** will end the test sequence immediately.

`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," in chapter 8, on page 259**.

`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.

Edit Seqn
Edit Freq
Edit Spec

These keys can be used to quickly access a tests sub-screen (for firmware below revision A.14.00). For example, when you press **Edit Seqn**, the tests **(Edit Sequence)** screen will be displayed. 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 wish to have control of the transceivers (such as when a test has failed).

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, and are used to quickly display items in the list when some of the items will not fit on the screen.

`Print All`

This USER key is displayed when the screens to edit test conditions are displayed, for example TESTS **`(Edit Sequence)`** (in firmware revisions below A.14.00 only). The USER key can be used to print, using the Serial or HP-IB ports, the sequence, test channels, pass/fail limits, 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.

`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.
Sngl Step	This USER key steps the IBASIC program one line at a time. This is different from **Continuous/Single Step** run mode. See **See "Test Execution Conditions," in chapter 8, on page 298**.
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.
Yes **No**	These USER keys are pressed when answering questions displayed on the Test Set screen.

9

Problem Solving

This chapter contains problem modules and error messages.

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

If a problem persists, call the HP Factory Hotline from anywhere in the USA or Canada (1-800-922-8920, 8:30 a.m. - 5:00 p.m. Pacific time).

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

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 RCU control.
- Verify that the RS-232 cable is connected to the RJ-11 connector on the RCU with the correct pin connections.

See chapter 4, "Making Connections".

To monitor the messages sent to and from the Base Station, **see "Logging," in chapter 8, on page 262**.

Data-Collection Function Does Not Work

❒ Check that you have **DATA C** entered in the **External Devices** (or **Edit Cnfg**) menu.

1. Press TESTS.
2. Select the **External Devices** screen, from the **SET UP TEST SET** list (or **Edit Cnfg** from the **Test Function** field).
3. Position the cursor to the **Calling Name** field, push the knob and enter:

   DATA C.

❒ Check the **Model** field, it should be kept empty since it is not used.

❒ Check the **Addr** (address) field to make sure the correct address is entered for where the data is to be stored.

1. If data is to be stored on an SRAM memory card, enter "**1**" into the **Addr** field.

If data is to be stored on an external computer through the Test Set's RS-232 serial port (if available), enter "**9**" into the **Addr** field.

❒ Check the **Options** field to make sure it is correctly set up:

1. For an SRAM memory card:
   a. Enter **ASCII** for saving data as an ASCII file.
   b. Enter **BDAT** for saving data as a Binary-Data file.
   c. 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.*)
2. **For a DOS format SRAM memory card, you may keep the Options field empty, or you may enter any of the following key words:**
   a. Enter **ASCII** for saving data as an ASCII file.
   b. Enter **BDAT** for saving data as a Binary-Data file.
   c. 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.*)
   d. Enter a **(dot extension)** of 3 characters or less for the file name. For example, all model ABCD radio 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’s 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 4, "Making Connections".

Memory Space Problems

The program uses a substantial amount of the Test Set's 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.

  If have firmware below revision A.14.00

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

     For an HP-IB printer:

     a. Check that the printer **`Calling Name`** is "PRINTER" and its address is correctly set up in the **`External Devices`** (or **`Edit Cnfg`**) screen.
     b. Check that the I/O CONFIGURE screen has been set up correctly:
        i. Mode=Control
        ii. Print To=HP-IB
        iii. Print Adrs=address of your printer

     For a parallel printer:

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

     For a serial printer:

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

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

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

If you have an HP 8921A,D Test Set with firmware above revision A.14.00

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

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

Test Results are Unexpected

If one or more tests fail unexpectedly, or you believe there is a problem with the way tests are running, check the settings that are used for the tests.

1. Press TESTS.
2. Select **`Execution Cond`** from the **`SET UP TEST SET`** list (HP 8920B and HP 8921A,D Test Set fw above rev A.14.00 only).
3. Position the cursor to the **`Run Mode`** field (in Test Execution Conditions) and select **`Single Step`**.
   a. Run the test.
   b. When the message **`Press continue when ready`** is displayed in the top line of the IBASIC controller tests screen, press CANCEL to pause the IBASIC program.
4. From the **`To Screen`** menu, position the cursor to the desired instrument screen and select it.
5. After viewing the instrument settings, press PREV to return to the TESTS screen.

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

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

Test Set Doesn't Power Up

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

Error Messages

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

Many of the error messages are listed 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 Test Set's *User's Guide* and the *HP 8920A Instrument BASIC Programmer's Guide*).

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

Error Message Reference

Channel error. Range is 1 to 799 and 991 to 1023. Change channel number in the Channel Information screen.

Channel entries must be in this specified range.

- Enter channel numbers into the **`RX Chan Info`** field on the Channel Information screen.
- The **`TX Chan Info`** field for each of the **`Chan #`**s is used to indicate the radio slot number to be tested.
- The last **`RX Freq`** entry must be **`-1`** to terminate the channel list.

Could not set desired SINAD in 20 tries

If the SINAD test is set to find the RF level at which the specified SINAD occurs, and is unable to find that RF level after 20 attempts, this message is printed.

- Verify that your REV audio is connected.
- Verify that the Test Set's DUPLEX OUT is connected to the correct antenna.
- There may be a problem with the receiver in the radio.

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 Base Station 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 8**.

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.

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. Call the factory if this message appears (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** 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 DRU 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 Cnfg**) screen.

To access the **External Devices** (or **Edit Cnfg**) 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 13, in chapter 8, on page 253** 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. Call the factory if this message appears (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's 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's firmware. Call the factory as 1-800-922-8920.

To check which options are installed in the Test Set:

Loading this program into the Test Set's 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 memory card before loading the "LIST_OPTS" program. **See "Procedures" in chapter 8, "Reference (Alphabetical)."**.

1. Press TESTS.
2. Position the cursor to the **`Location`** field and select it.
3. From the **`Choices`** menu, select **`ROM`**.
4. Position the cursor to the **`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.

Error occurred at line…

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

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

Incorrect PA Switch Model in config scr, prog stopped.

The Test Software supports the use of the HP 8921A radio interface card to control an external PA switch. Check the entries on the TESTS **`External Devices`** (or **`Edit Cnfg`**) screen. To access the **`External Devices`** (or **`Edit Cnfg`**) 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 11, in chapter 8, on page 247** for appropriate entries.

Incorrect response from the base station to…

When a control command is sent to the Base Station a specific response is expected. If the response is not received this message will be displayed.

- Check the control cable between the Test Serial Port and the Base Station DATA jack.
- The control link between the Test Set and Base Station may be locked up. Reset the Base Station and restart the test.

Incorrect RF Switch Model in config scr, prog stopped.

The Test Software supports the use of the HP 8921A 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 Cnfg`**) screen. To access the **`External Devices`** (or **`Edit Cnfg`**) 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 11, in chapter 8, on page 247** for appropriate entries.

Printer address cannot be set to 10.

The second Test Set's serial port, Serial B, has an address of 10. It is used for Base Station 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," in chapter 8, on page 272**.

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 or the HP 83202A 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's DUPLEX OUT connector.

The Synthesizer is not locked

This message is displayed when the Base Station DEBUG screen returns a "no" for the STATUS field "synth lock".

- Try resetting the Base Station channel.
- If this does not work, consult the Nortel manual for information on synth lock.

This software will not run with firmware revision (FW rev. number) **presently installed in the test set. Consult software users manual for correct firmware revision.**

The Test Set must have a firmware revision **`A08.00`** or higher. 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 the factory (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 Cnfg`** screen **`Addr`** field match the address on the HP-IB address switch, and that it is an allowable address (**see "Configuration," in chapter 8, on page 245**).

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 Cnfg`**) screen **`Addr`** field match the address on the 3488 address switch, and that it is an allowable address (**see "Configuration," in chapter 8, on page 245**).
- 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 Cnfg`**) screen **`Addr`** field match the address on the 3488 address switch, and that it is an allowable address (**see "Configuration," in chapter 8, on page 245**).
- Verify that the HP-IB binary address switches are set properly.

Timeout on Logger at (address)

If the Test Software cannot log a DRU message within ten seconds, the program displays this error message.

- Check the entries in the **`External Devices`** (or **`Edit Cnfg`**) screen.
- If you are using an external device, check the cables, connections and address.

Unstable reading

In some tests, the Test Software continues to take measured readings until the readings agree with previous readings. This is done to make sure the measurement has settled. If the measurement has not settled after 10 tries, this message is printed. If this message happens occasionally there is probably nothing wrong. If it happens repeatedly, there may be a problem with the transceiver.

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 Switch Matrix. 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 12** . 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 8** for the entries you must make.

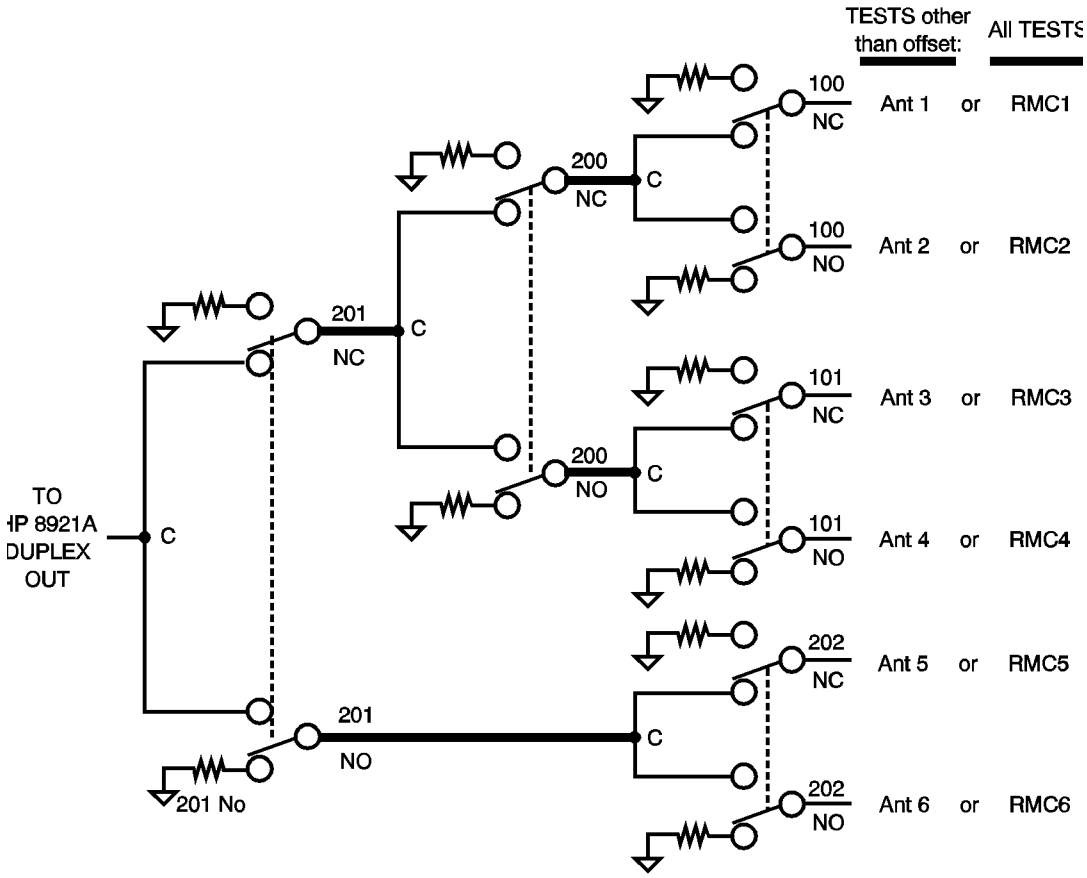


Figure 12 **HP 3488A Connections for ANT Switch**

Glossary

`Abort` A USER key choice that allows you to exit all testing if a failure is encountered.

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

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

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

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

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

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

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

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

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

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

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

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

`Edit Spec` (specifications) Function which allows you to edit the pass/fail limits. See also “specifications”.

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

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

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

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

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

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

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

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

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

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

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

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

library A collection of the names of all of the parameters, pass/fail limits, and tests in the test software. The test software and the Test Set 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, and so forth.

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

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

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

Also referred to as the "TESTS" screen.

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

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

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

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

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

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

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

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

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

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

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

ROM Read Only Memory

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

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

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

screen Refers to the video display of the test set.

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

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

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

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

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

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

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

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

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

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

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

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

Glossary

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