HP E6389A Nortel TRU
Base Station Test Software
User's Guide

Software Revision A.02.00 and above

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Rev. C

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In This Manual

This manual consists of the following chapters:

Chapter 1 -- Product Description

This chapter provides a description of the HP E6389A Northern Telecom TRU Cell Site Base Station Test Software.

Chapter 2 -- Introduction to Testing

This chapter provides information on loading the Test Software, setting up the Test Software, starting the tests, and the appropriate user responses to Test Software actions.

Chapter 3 -- Connections

This chapter provides information on equipment required for base station testing, and connections for cell site equipment, serial port, printer, and switch control.

Chapter 4 -- Reference

This chapter provides detailed descriptions of the general features and functions of the Test Software. Topics are arranged alphabetically for quick and easy reference.

Chapter 5 -- Tests, Parameters, and Specifications

This chapter offers a suggested testing philosophy, then describes each test, parameter, and pass/fail limits.

Conventions Used

Special presentations of text in this manual reflect the appearance of the referenced item. Examples of these special presentations are:

Menu -- A Test Set front panel key.

Pause/Continue (Reset) -- A Test Set front panel *shift* function key. The key name in parentheses is the title of the function. Press the **Shift** key then the specified key to access the *shift* function.

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

k1 (**`Run Test`**) -- A USER key in the key column next to the display. The words in parentheses are displayed on the screen.

Title -- Titles of documentation are printed in italics.

Test Set -- Refers to the HP 8935 Series E6380A CDMA Base Station Test Set or the HP 8935 Series E6381A TDMA Base Station Test Set.

Test Software -- Refers to the HP 6389A Northern Telecom P-Series Cell Site Test Software.

TEST -- Refers to the one of the individual test modules that is part of a test procedure.

PC card -- Refers to either the OTP card on which the Test Software is shipped or the SRAM card that is shipped with the Test Software for storing procedures.

PC card is an industry standard term that refers to two types of information storage cards. One meets the specifications of the Personal Computer Memory Card International Association (PCMCIA). The other meets the specifications of the Epson Corporation PC card standard. **HP 8935 Series Test Sets use only the PCMCIA type card.**

OTP card -- Refers to the type of PC card that is used to store the Test Software.

SRAM card -- Refers to the type of PC card that is shipped with the Test Software for storing procedures.

BTS -- Refers to the Base Transceiver Station.

In procedural steps in this manual, the following words are used to describe cursor and entry actions:

- **Select** refers to positioning the cursor at the appropriate field (**`inverse video`** area) and pressing 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.

Conventions Used

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1

Product Description

This chapter provides a description of the HP E6389A Northern Telecom TRU Cell Site Base Station Test Software.

HP E6389A Northern Telecom TRU Cell Site Base Station Test Software

The Test Software performs fast, accurate, and automated tests to determine if the RF and audio performance of TRU Cellular Base Stations is within prescribed limits. It is used with the HP E6381A TDMA Base Station Test Set or the HP E6380A CDMA Base Station Test Set and various ancillary equipment in testing those Base Stations (see **"Hardware Model Differences" on page 28**.

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

- TRU1/MPA
- TRU2/MPA
- TRU2/SCLPA
- TRU2/DPA (TDMA Metrocell)
- TRU2/NONE (Microcell)
- TRU2/MCPA (Urbancell)
- TRU2/FMPA+
- TRU3/SCLPA
- TRU3/DPA (TDMA Metrocell)
- TRU3/NONE (Microcell)
- TRU3/MCPA (Urbancell)
- TRU 1900/SCLPA
- TRU 1900/NONE

NOTE: As of the release date of this manual, operation of the Test Software has been verified with MTX 07 and prior loads.

Items Supplied

The Test Software package contains the following listed items.

NOTE: The Test Software package contains two sets of software and documentation. It includes two PC cards that contain software, one for TRU testing and one for P-Series testing; and it includes two User's Guides, one for TRU Test Software and one for P-Series Test Software.

- HP E6389A Northern Telecom TRU Cell Site Base Station
  Test Software PC card
  HP Part Number: E6389A-10002
- HP E6389A Northern Telecom TRU Cell Site Base Station
  Test Software User's Guide
  HP Part Number: E6389A-90002
- HP E6389A Northern Telecom P-Series Cell Site Base Station
  Test Software PC card
  HP Part Number: E6389A-10001
- HP E6389A Northern Telecom P-Series Cell Site Base Station
  Test Software User's Guide
  HP Part Number: E6389A-90001
- SRAM Card, 1-Megabyte
  HP Part Number: 0950-2635
- DB25 (m) to DB9 (f) 15-foot Cable
  HP Part Number: E8302-61005
- BTS Laptop Utility
  HP Part Number: E6961-10001
- Software Licensing Agreement

The SRAM card listed above is to be used for storing customized test programs and results, and must be initialized before use (see **"Initializing a PC Card" on page 118**.

Items Required

The equipment required to operate the Test Software is as follows:

- HP 8935 Series E6381A TDMA Base Station Test Set
  or
  HP 8935 Series E6380A CDMA Base Station Test Set
- HP 8935 firmware revision A.01.00 or later
- Accessories:

  HP 8935 Northern Telecom Base Station Connection Kit
  HP Part Number: E8302-61001
  or
  Other interconnect arrangements
- Optional Items:

  Printer and printer connection cable for documenting test results

  PC or HP Palmtop computer and appropriate connection cable for storing test results

  Splitter or Switch Matrix

  RS-232 Switch

Printers Supported

The following printers are supported by the Test Software:

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

Hardware Model Differences

For many TESTs, the Test Software will operate on either the HP 8935 Series E6381A TDMA Base Station Test Set or the HP 8935 Series E6380A CDMA Base Station Test Set.

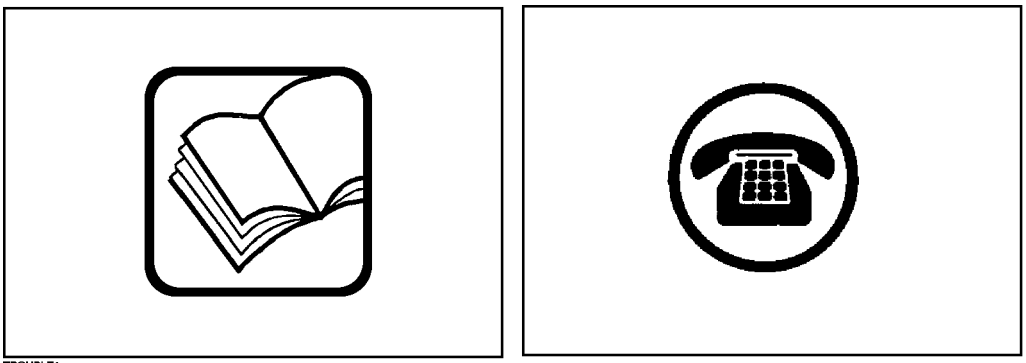
However, there are hardware differences between these two Test Sets that are significant to the Test Software. Those differences are such that a number of the Test Software TESTs, particularly the digital tests, will not run successfully on the HP 8935 Series E6380A CDMA Base Station Test Set. Those are:

- TEST_21 - TXD TDMA Power
- TEST_22 - TXD TDMA Adjacent Channel Power
- TEST_23 - TXD TDMA Modulation Accuracy
- TEST_26 - RX Quick Tests (some individual tests will run, but not the digital tests for 1900-MHz Base Stations)
- TEST_28 - TXD Standard Tests
- TEST_31 - RXA Bit Error Rate (BER)
- TEST_32 - RXB Bit Error Rate (BER)
- TEST_33 - RXA Bit Error Rate (BER) Screen
- TEST_34 - RXB Bit Error Rate (BER) Screen
- TEST_35 - RX and RXD Quick Tests (Some individual tests will run, but not the digital tests.)
- TEST_36 - RXD Quick Tests (Some individual tests will run, but not the digital tests.)

If your cell site test plan requires any of these TESTs, you must use the HP 8935 Series E6381A TDMA Base Station Test Set.

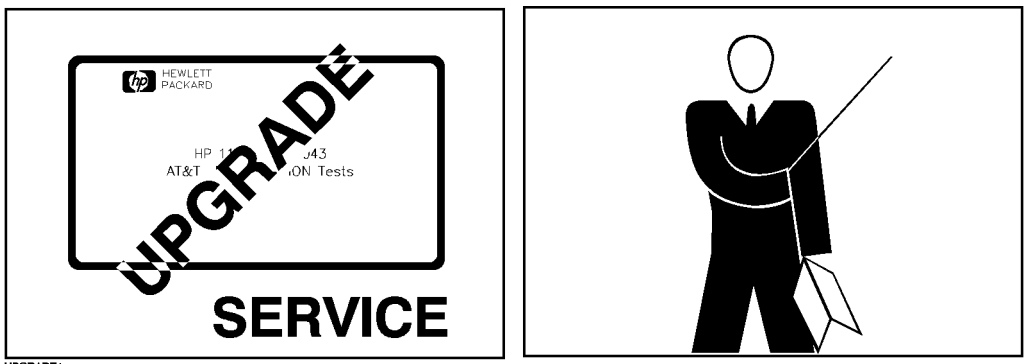
Additional Services Available

For information on services, see the *HP 8935 Series E6381A TDMA Test Set Assembly Level Repair Guide* or the *HP 8935 Series E6380A CDMA Test Set Assembly Level Repair Guide* (as appropriate), or call the HP 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

2

Introduction to Testing

This chapter provides information on loading the Test Software, setting up the Test Software, starting the test, and the appropriate user responses to Test Software actions.

Overview

The Test Software is designed for both ease of use and comprehensive testing. Operating the Test Software consists basically of a four-part process:

1. Loading the Test Software, which consists of turning on the Test Set, inserting the Test Software card, and selecting a procedure.
2. Setting up the Test Software for test operations.
3. Initiating the tests.
4. Responding to Test Set and Test Software actions.

This process is described in detail in the following sections.

Loading the Test Software

Before you can begin testing, you must load the Test Software into the Test Set's internal memory. The Test Software loading process is accomplished in ten steps as outlined in the following paragraphs.

The following illustration (see **figure 1**) outlines the first four steps, which consist of turning on the Test Set's power, inserting the Test Software PC card into the card slot on the Test Set's front panel, and initializing the Test Set.

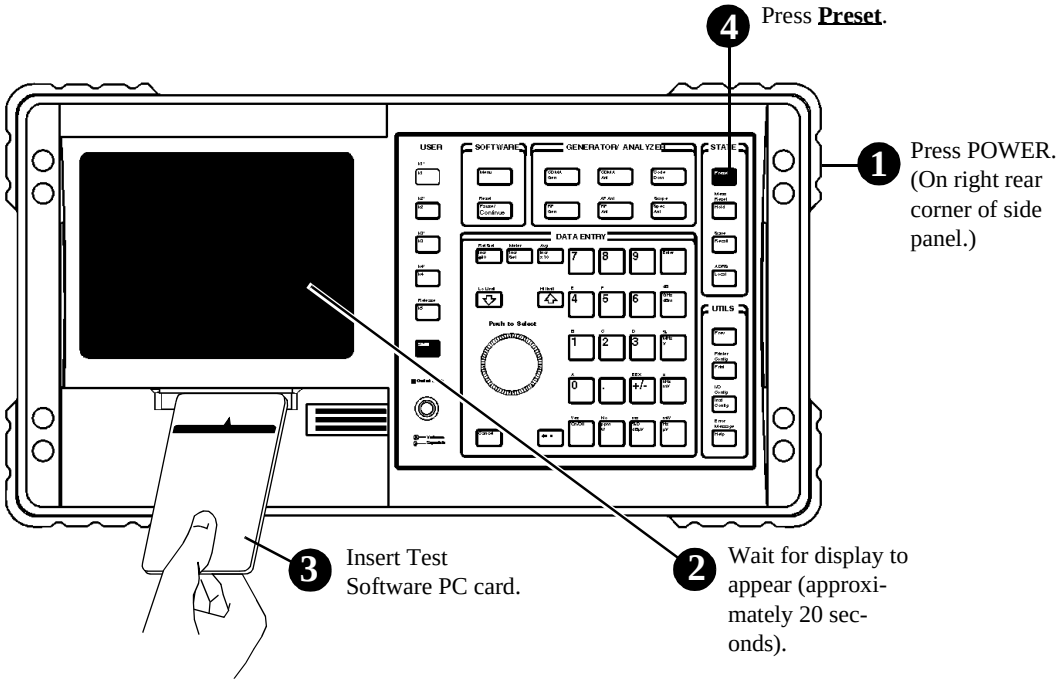


Figure 1 **Preparing for Loading the Test Software**

The following illustration (see **figure 2 on page 36**) outlines the next six steps, which consist of operating the Test Set's internal program to select and load the Test Software, select and load a test procedure, then run the Test Software.

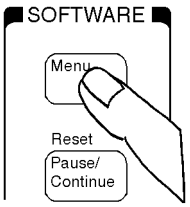
When you insert the Test Software PC card and select a procedure for the first time, the Test Software is not actually loaded into the Test Set's memory until you select **Run Test** or press the k1 (**Run Test**) key. Loading the Test Software for the first time will require approximately 15 seconds. The Test Software will remain in the Test Set's memory (power for which is backed up by a battery) after a power-off/power-on cycle unless it is deleted manually or a new program is loaded.

On the Test Software PC card are 11 preprogrammed procedures. Each procedure contains a particular setting of testing order, parameter, and pass/fail limit defaults. Briefly, the procedures are as follows:

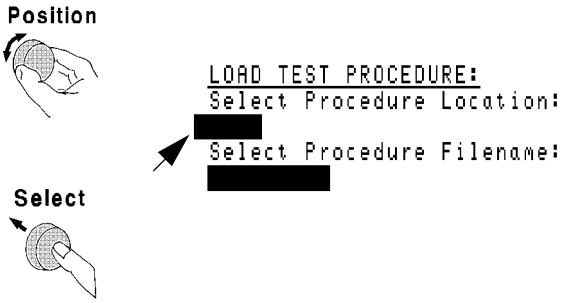
- PROCEDURE_01 NT_SHLF -- This procedure performs RF parametric measurements at the receiver shelf and the PA shelf, and is intended for periodic maintenance. Only the radios on the shelf that is being tested are affected. Service to the rest of the cell site is unaffected.
- PROCEDURE_02 NT_RMC -- This procedure performs RX and TX measurements at the receive multi-coupler (RMC) and the transmit combiner. The antennas for the cell site must be disconnected. Service to the entire cell site is interrupted.
- PROCEDURE_03 QCK_SHLF -- This procedure performs analog quick measurements at the receiver shelf and PA shelf. Only the radios on the shelf that is being tested are affected. Service to the rest of the cell site is unaffected.
- PROCEDURE_04 QCK_RMC -- This procedure performs RX and TX quick measurements at the receive multi-coupler (RMC) and transmit combiner. The antennas for the cell site must be disconnected. Service to the entire cell site is interrupted.
- PROCEDURE_05 TDMASHLF -- This procedure performs RX and TX measurements at the receiver shelf and PA shelf of a TDMA Base Station. Only the radios on the shelf that is being tested are affected. Therefore, service to the rest of the cell site is unaffected.
- PROCEDURE_06 TDMA_RMC -- This procedure performs RX and TX measurements at the receive multi-coupler (RMC) and transmit combiner of a TDMA Base Station. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.
- PROCEDURE_07 TST_SHLF -- This procedure performs analog and digital measurements at the receiver shelf and PA shelf. Only the radios on the shelf that is being tested are affected. Service to the rest of the cell site is unaffected.

- PROCEDURE_08 TST_RMC -- This procedure performs analog and digital measurements at the receive multi-coupler (RMC) and the transmit combiner. The antennas for the cell site must be disconnected. Service to the entire cell site is interrupted.
- PROCEDURE_09 1900_LRM -- This procedure performs RX and TX measurements at the local receive module (LRM) and the duplexer for 1900-MHz macrocell sites. The antennas for the cell site must be disconnected. Service to the entire cell site is interrupted.
- PROCEDURE_10 BER_1900 -- This procedure performs bit error rate (BER) tests on 1900-MHz cell sites. The antennas for the cell site must be disconnected. Service to the entire cell site is interrupted.
- PROCEDURE_11 BER_850 -- This procedure performs bit error rate (BER) tests on 850-MHz cell sites. The antennas for the cell site must be disconnected. Service to the entire cell site is interrupted.
- PROCEDURE_12 NT_LCR_RA -- This procedure verifies that the operation of locating receiver A (RXA) is within specifications. This procedure also contains tests for received signal strength indicator (RSSI) offset and path gain.
- PROCEDURE_13 NT_LCR_RB -- This procedure verifies that the operation of locating receiver B (RXB) is within specifications. This procedure also contains tests for received signal strength indicator (RSSI) offset and path gain.

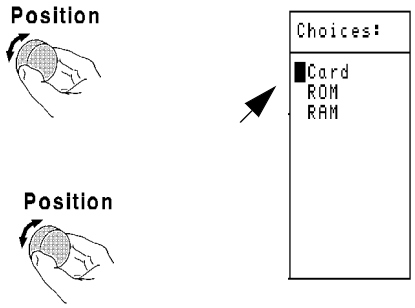
5 Press **Menu** key to display SOFTWARE MENU screen.



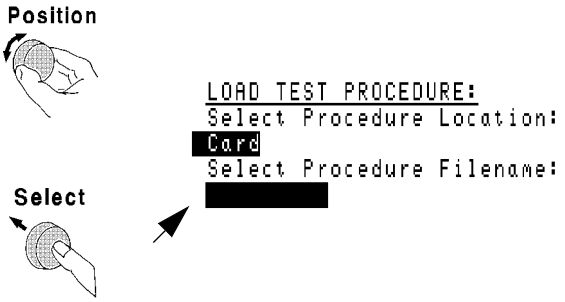
6 Position cursor at **Select Procedure Location:** and select it.



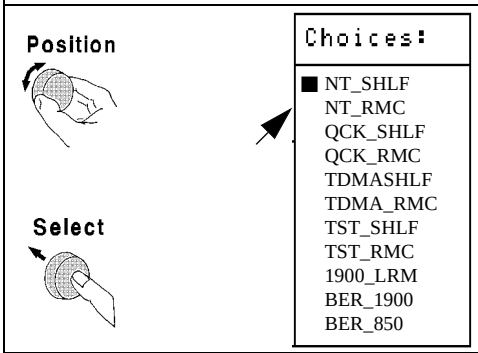
7 Position cursor at **Card** and select it.



8 Position cursor at **Select Procedure Filename:** and select it.



9 Position cursor at a name in **Choices:** list, and select it.



10 Position the cursor at **Run Test** and select it. The Software is now loading.

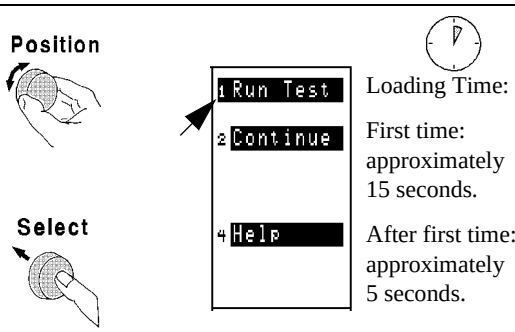


Figure 2 Loading the Test Software

If the Test Software did not load properly, check the following:

- Is the Test Set's power on?
  Is there a display?
  Is the CDMA ANALYZER screen on the display?
- Check the AC power connection. See the *HP 8935 Series E6381A TDMA Base Station Test Set Reference Guide* or the *HP 8935 Series E6380A CDMA Base Station Test Set Reference Guide*.
- Is the Test Software PC card inserted properly?
- Is the Test Software PC card firmly seated in the slot?
  It should slide in loosely, then require a firm push to seat properly.
- Was the SOFTWARE MENU screen displayed?
  Pressing the Preset key should display the CDMA ANALYZER screen.
  Pressing the Menu key should display the SOFTWARE MENU screen.

NOTE: If the Test Set displays an error message that states, "**`One or more self-tests failed.`**", there is a hardware problem. In such case, refer to the HP 8935 Series E6381A TDMA Base Station Test Set *Assembly Level Repair Guide*, or the *HP 8935 Series E6380A CDMA Base Station Test Set Assembly Level Repair Guide*, as appropriate. If the problem persists, call the HP Factory Hotline from anywhere in the USA or Canada (1-800-922-8920), 8:30 AM to 5:00 PM, Pacific time.

Setting up the Test Software

The Test Software displays the Initialization Screen (see **figure 2 on page 36**) upon initiation of the software and prior to running any procedure. All Test Software operations are started from this screen. The following sections describe the fields and the operations that are initiated from the fields.

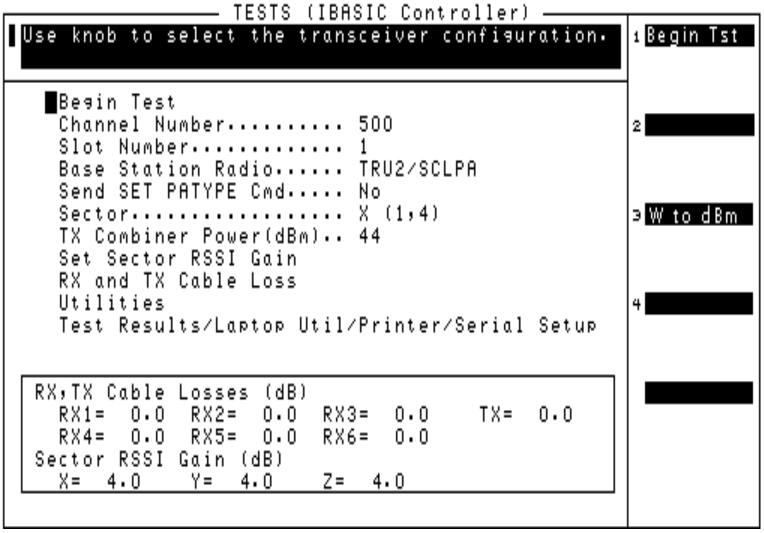


Figure 3 Initialization Screen.

Begin Test

Select the **`Begin Test`** field or press the k1 (**`Begin Tst`**) key to start the test.

Slot Number

Select the **`Slot Number`** field to enter the shelf slot number of the radio to be tested.

Slots are numbered 1 through 64, starting from the top left.

Base Station Radio

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

Various types of Northern Telecom TRU Base Stations may be tested using the Test Software, dependent upon the procedure selected in the **`Select Procedure Filename:`** field on the SOFTWARE MENU screen (see step 9 in **figure 2 on page 36**.

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

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

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

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

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

If you select PROCEDURE_09 or 10, the following list of Base Station types will appear for selection. Note that these are both 1900-MHz Base Station types.

`TRU 1900/SCLPA`
`TRU 1900/NONE`

Send SET PATYPE Cmd

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

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

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

Sector

Select the **Sector** field to enter the sector to be tested from the **Choices:** list. The sectors available in the list are dependent upon the procedure selected in the **Select Procedure Filename:** field on the SOFTWARE MENU screen (see step 9 in **figure 2 on page 36**).

If the radio selection is an 850-MHz type (that is, any but **TRU 1900/SCLPA** or **TRU 1900/NONE**), the sectors available are as follows:

```
X(1,4)
Y(2,5)
Z(3,6)
PARM(1,4)
 ALL
```

The numbers in parentheses following the selection letter represent the antennas in that selection.

In the **Parm** selection, the numbers shown in the field are not parts of the field name, but are examples only. The first number represents the setting of **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**, and the second number represents the setting of **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**. For instance, if the actual numbers shown were 1 and 4, the RXA test would check antenna 1 and the RXB test would check antenna 4. These numbers thus change as you change the parameter settings.

If the radio selection is a 1900-MHz type (that is, either **TRU 1900/SCLPA** or **TRU 1900/NONE**), the sectors available are:

X,X'
Y,Y'
Z,Z'
X,X',Y,Z'
Y,Y',X',Z
Z,Z',X,Y'

TX Shelf Power (dBm) - or - TX Combiner Power (dBm) - or - TX MCPA Power (dBm)

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

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

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

If you are not reading the maximum power from the TRU internal settings and using that reading as the reference power. This is controlled by the fact that **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0. This will be the case for PROCEDURES_02, 03, 04, 06, 08, and 09.

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

If **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 0 and **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, with any Base Station type selection in the **Base Station Radio** field, the **TX Shelf Power (dBm)** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error.

If **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 1 and **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, one of the following two display conditions will occur:

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

If a Base Station of type MCPA is selected in the **`Base Station Radio`** field, the **`TX MCPA Power (dBm)`** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error (see **table 1**).

If **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 1 and **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 1, one of the following three display conditions will occur:

If a Base Station of type MCPA is selected in the **`Base Station Radio`** field, the **`TX MCPA Power (dBm)`** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error (see **table 1**).

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

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

If **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 0 and **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 1, one of the following three display conditions will occur:

If a Base Station of type MCPA is selected, the **`TX Shelf Power (dBm)`** field will appear on the Initialization Screen. Select the field and enter the maximum power value to be used by the Test Software in calculating the power error (see **table 1**).

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

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

Table 1 Nominal Urbancell Site Per-carrier Power Level at the Duplexer Antenna Port

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

Set Sector RSSI Gain (dB)

Select the **`Set Sector RSSI Gain (dB)`** field to display the Sector RSSI Gain Menu.

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

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

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

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

The Sector RSSI Gain Menu fields are described in the following paragraphs:

Field Names: `Sector X, Sector Y, and Sector Z`

Select the **`Sector X`**, **`Sector Y`**, and **`Sector Z`** fields in turn and enter the gain value for each sector.

Field Name: `Return`

Select the **`Return`** field or press the k5 (**`Return`**) key to return to the Initialization Screen.

RX and TX Cable Loss (dB)

Select the **RX and TX Cable Loss(dB)** field to display the RX and TX Cable Loss Menu. Use this menu to edit previously entered values for the receiver cable loss and for the transmitter cable loss, as appropriate. Use this menu also to measure any cable loss values that are either unknown or suspect, or that you wish to change.

Note that this menu contains different field names, dependent upon the procedure selected in the **Select Procedure Filename:** field on the SOFTWARE MENU screen (see step in **figure 2 on page 36**).

RX1 Cable Loss (dB)
RX3 Cable Loss (dB)
RX2 Cable Loss (dB)
RX4 Cable Loss (dB)
RX5 Cable Loss (dB)
RX6 Cable Loss (dB)
TX Cable Loss (dB)

If the radio selection is an 850-MHz type (that is, any but **TRU 1900/SCLPA** or **TRU 1900/NONE**), the field names are as follows:

If the radio selection is a 1900-MHz type (that is, either **TRU 1900/SCLPA** or **TRU 1900/NONE**), the sectors available are:

NOTE: If an external Splitter, Switch Matrix, or some other device is to be used in the signal path to be tested, the loss through that device must be considered when entering the total loss value.

The RX fields contain the receiver cable loss values stored during the cable loss test, and may be edited on this screen. During operation, the Test Set's RF signal generator level will be compensated automatically 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.

The TX field contains the transmitter cable loss value stored during the cable loss test, and may be edited on this screen. During operation, this value will be added to the TX power measurements to compensate for the cable loss.

The RX and TX Cable Loss Menu fields are described in the following paragraphs:

Field Name: `Return`

Select the **`Return`** field in the RX and TX Cable Loss Menu screen or press the k5 (**`Return`**) key to return to the Initialization Screen.

Field Names: `RX1 Cable Loss` through `RX6 Cable Loss`

If the radio selection is an 850-MHz type (that is, any but **`TRU 1900/SCLPA`** or **`TRU 1900/NONE`**), these fields will appear. Select each of the **`RX1 Cable Loss (dB)`** through **`RX6 Cable Loss (dB)`** fields in turn to edit the receiver cable loss values.

Field Names: `X Cable Loss` through `Z' Cable Loss`

If the radio selection is a 1900-MHz type (that is, either **`TRU 1900/SCLPA`** or **`TRU 1900/NONE`**), these fields will appear. Select each of the **`X Cable Loss (dB)`** through **`Z'Cable Loss (dB)`** fields in turn to edit the receiver cable loss values.

Field Name: `TX Cable Loss`

Select the **`TX Cable Loss (dB)`** field to edit the transmitter cable loss value.

Field Name: `Measure Cable Loss`

If you do not know the loss for a particular cable or device and wish to measure it, select the **`Measure Cable Loss`** field and follow the screen prompts to make the measurement for that cable or device.

Save the value for each receiver antenna cable, RX1 through RX6 or X through Z', by selecting the appropriate **`Save RX1 =>`** through **`Save RX6 =>`** field or the appropriate **`Save X =>`** through **`Save Z'=>`** field on the Cable Loss menu. If the same value is appropriate for multiple cables, save it to each field. It is not necessary to repeat the measurement in such instances.

Save the value for the transmitter antenna cable, TX, by selecting the **`Save TX =>`** field on the same screen.

If you wish to measure multiple cables, select the **`Repeat or Test next cable`** field and repeat the measurement process as required.

Select the **`Return`** field in the Cable Loss menu or press the k5 (**`Return`**) key when finished with the cable loss measurement to return to the RX and TX Cable Loss Menu, then select the **`Return`** field in that menu or press the k5 (**`Return`**) key to return to the Initialization Screen.

Utilities

Select the **Utilities** field to display the Utilities Menu. Then, select the desired utility tool from the Utilities Menu. The Utilities Menu fields are described in the following paragraphs:

Field Name: Return

Select the **Return** field to return to the Initialization Screen.

Field Name: Measure Cable Loss

Select the **Measure Cable Loss** field to initiate the measurement. The Test Software will display the first of two cable loss test connection diagrams. Follow the screen prompts to make the measurement.

Save the value for each receiver antenna cable, RX1 through RX6, by selecting the appropriate **Save RX1 =>** through **RX6 =>** field on the Cable Loss menu. If the same value is appropriate for multiple cables, save it to each field. It is not necessary to repeat the measurement.

Save the value for the transmitter antenna cable, TX, by selecting the **Save TX =>** field on the same screen.

If you wish to measure multiple cables, select the **Repeat or Test next cable** field and repeat the measurement process as required.

Select the **Return** field or press the k5 (**Return**) key to return to the Initialization Screen. For more information, see **"Cable Loss Test" on page 134**.

Field Name: Laptop Emulator

Select the **Laptop Emulator** field to invoke the laptop emulator mode. The Test Software will display the Terminal Emulator Mode Screen. Scroll to the desired command using the cursor control knob and press the knob to send the command to the Base Station.

Press the k5 (**Return**) key, then the k2(**No**) key when finished to return to the Utility Menu screen, and then either select the **Return** field or press the k5 (**Return**) key to return to the Initialization Screen. For more information, see **"Laptop Emulator" on page 136**.

Field Name: `RF Tools`

Select the **`RF Tools`** field to initiate loading the RF tools utilities. The Test Software will display the introductory screen that explains loading the RF Tools. For more information on RF Tools, see the *HP 8935 Series E6381A TDMA Base Station Test Set Reference Guide* or the *HP 8935 Series E6380A CDMA Base Station Test Set Reference Guide.*

Field Name: `Antenna Switch Control`

Select the **`Antenna Switch Control`** field to select the method for antenna path connection. The Test Software will display a **`Choices:`** list that offers four selections: **`Off`**, **`Splitter`**, **`HP3488`**, and **`HP83202A`**.

Selecting **`Off`** indicates to the Test Software that you will make all antenna connections manually.

Selecting one of the other three items indicates to the Test Software that you will use that device. If a Switch Matrix is used, the Test Software will then command it to switch the antenna connections as appropriate to the test and will display the appropriate prompts on the Test Set's screen. If you select the HP 3488 Switch Matrix, you must enter its HP-IB address in its field.

NOTE: A Splitter is a widely available and relatively simple device that converts one signal path into multiple signal paths. All such paths are active and are not switchable.

The HP 3488 Switch Matrix is a software controllable device that switches one signal path to any of several paths. It offers the advantage of testing a complete signal path without the possibility of the effects of extraneous signals.

The HP 83202A Switch Matrix is another software controllable device that switches one signal path to any of several paths. It offers the advantage of testing a complete signal path without the possibility of the effects of extraneous signals.

IMPORTANT CONSIDERATION: If you elect to use a Splitter and two or more receiver cables on the Base Station are mis-wired, the Test Software will not detect that fact. This is because all connections on the Splitter remain fixed and active. However, if you elect to use one of the Switch Matrix units, the Test Software will switch and test each path individually. Thus, if a pair of cables is mis-connected, the associated test will fail because of that mis-connection.

For more information on these devices, see **"Splitter or Switch Matrix" on page 129**.

Field Name: `RS-232 Switch Control`

Select the **`RS-232 Switch Control`** field to select whether the optional RS-232 Switch will be used to select and control the transceiver to be tested. When you select the field, the **`On/Off`** field will toggle.

If it is set to **`Off`** and you toggle it to **`On`**, the **`RS-232 Switch Path to`** field will appear immediately below and the RS-232 Switch will be enabled.

If it is set to **`On`** and you toggle it to **`Off`**, the **`RS-232 Switch Path to`** field immediately below will disappear and, if connected, the RS-232 Switch will be disabled.

The RS-232 Switch is an optional hardware device that provides for connecting as many as 64 transceivers and selecting and controlling any of those 64 from the Test Set under Test Software control via the Test Set Serial 10 port (see **"RS-232 Switch" on page 125**).

Field Name: `RS-232 Switch Path to`

Select the **`RS-232 Switch Path to`** field to select the slot number of the radio to be tested. The available selections are **`1`** through **`64`**. This field appears only if the **`RS-232 Switch Control`** field is set to **`On`**.

Test Results/Laptop Util/Printer/Serial Setup

Select the **Test Results/Laptop Util/Printer/Serial Setup** field to display the Test Results/Laptop Util/Printer/Serial Setup menu. The Test Results/Laptop Util/Printer/Serial Setup menu fields are described in the following paragraphs:

Field Name: Return

Select the **Return** field to return to the Initialization Screen.

Field Name: Edit Test Results Header

Select the **Edit Test Results Header** field to edit or enter the header text. Edit or add text using selections from the **Choices:** list in the lower right-hand area of the screen. The text will appear as entered in the box at the top of the screen.

Select **Done** when finished. The text that you edited or entered will then appear at the beginning of the test results.

Field Name: Use BTS Laptop Utility

The BTS Laptop Utility is a PC-based program that allows you to view and save your test results on a PC. If the utility is loaded on your PC, and you wish to send the test result to the PC, toggle this field to **Yes**. For more information on this subject, see **"Sending Test Results to a PC Using the BTS Laptop Utility" on page 97**.

Select the **Use BTS Laptop Utility** field to select whether you wish to use the utility. When you select the field, the **Yes/No** section of the field will toggle.

If it is set to **No**, and you toggle it to **Yes**, three fields will be displayed below: **Serial Port 9 Settings**, **Send Test Page to BTS Laptop Utility TR Window**, and **Echo BTS communication to**. These fields are described starting on this page.

If it is set to **Yes**, and you toggle it to **No**, six fields will be displayed below: **Send Test Results to Printer at**, **Send Test Results to**, **Serial Port 9 Settings**, **Print Setup**, **Print Test Page**, and **Echo BTS communication to**. These fields are described starting on **page 52**.

Toggle to Yes -- If you toggle the **Use BTS Laptop Utility** field to **Yes**, set the three fields as described in the following three sub-sections.

Field Name: `Serial Port 9 Settings`

For the Test Set to communicate with the PC, the SERIAL 9 port configuration on the Test Set and the PC must match. This field allows you to configure the Test Set's port to match the PC port.

Select the **`Serial Port 9 Settings`** field to configure the SERIAL 9 port. The Test Software will display the Serial Port 9 Settings menu. This menu allows you to match the configuration of the SERIAL 9 port to that of the port of the PC or similar device to which data will be transmitted. For each field, select from the **`Choices:`** list.

For **`Serial Baud`**, select **`300`** to **`115200`** baud.

For **`Parity`**, select **`None`**, **`Odd`**, **`Even`**, **`Marking`**, or **`Spacing`**.

For **`Data Length`**, select **`7 bits`** or **`8 bits`**.

For **`Stop Length`**, select **`1 bit`** or **`2 bits`**.

For **`Flow Control`**, select **`None`**, **`Xon/Xoff`**, or **`Hardware`**.

Select the **`Return`** field or press the k5 (**`Return`**) key when finished to return to the previous screen.

Field Name: `Send Test Page to BTS Laptop Utility TR Window`

Select the **`Send Test Page to BTS Laptop Utility TR Window`** field to test the connection between the Test Set and the PC that is running the BTS Laptop Utility. The Test Software will transmit one page of data to the laptop TR (test results) window as a test.

Field Name: `Echo BTS Communications to`

Select the **`Echo BTS communications to`** field to select whether the Test Software will send an echo of the commands exchanged between the Test Set and the Base Station, and, if so, the destination of that information. The Test Software will display a drop-down **`Choices:`** list that offers five choices.

If you select **`Off`**, the Test Software will not echo the commands to another destination.

If you select **`Serial 9`**, **`Parallel 15`**, or **`HP-IB 701`**, the Test Software will echo the commands to the respective port.

If you select **`Display`**, the Test Software will echo the commands to the Test Set's screen and display those commands along with the test results.

Toggle to No -- If you toggled the **`Use BTS Laptop Utilities`** field to **`No`**, set the six fields as described in the following six sub-sections.

Field Name: `Send Test Results to Printer at`

Test results are always displayed on the Test Set's screen. In addition, you may direct the Test Software to send the results to a printer.

Select the **`Send Test Results to Printer at`** field to indicate to the Test Software the port address of the printer connection. Select the address from the **`Choices:`** list. If you select **`Off`**, no port will be used for transmitting test results to a printer. If you select **`Serial 9`**, **`Parallel 15`**, or **`HP IB`**, the selected port will be used for transmitting test results to a serial, parallel, or HP-IB printer, respectively. If you select the HP-IB printer, you must enter its address in the field. For more information, see **"Sending Test Results to a Serial Printer" on page 111**, **"Sending Test Results to a Parallel Printer" on page 113**, and **"Sending Test Results to an HP-IB Printer" on page 115**.

Field Name: `Send Test Results to`

In addition to test results being displayed on the Test Set's screen, those results may be saved on an SRAM card or sent to a PC connected to the SERIAL 9 port. If you wish to send the results to a printer and also to a PC, this will require the use of a PC communication program such as Procomm (a product of DataStorm Technologies, Inc.).

Select the **`Send Test Results to`** field to indicate to the Test Software the destination to which you wish to send test results. Select the destination from the **`Choices:`** list.

If you select **`Off`**, the Test Software will assume no destination (other than the Test Set's screen) for test results.

If you select **`Serial 9`**, the Test Software will transmit the test results to a device connected to the SERIAL 9 port. For more information, see **"Sending Test Results to a PC" on page 100**.

If you select **`PC Card`**, the test results will be sent to an SRAM card. In such case, you must insert an initialized SRAM card into the Test Set's card slot. For more information, see **"Sending Test Results to an SRAM Card" on page 105**.

Field Name: `Serial Port 9 Settings`

Select the **`Serial Port 9 Settings`** field to configure the SERIAL 9 port. See the earlier description of this field.

Field Name: `Print Setup`

Select the **`Print Setup`** field to set the print configuration. The Test Software will display the Print Setup menu.

Enter the desired value for the **`Lines/Page`** field.

Set the toggles appropriately for the **`Form Feed at Start of Page`** and **`Form Feed at End of Page`** fields.

Select the **`Printer Model`** field to choose the printer model from the **`Choices:`** list.

Select the **`Return`** field or press the k5 (**`Return`**) key to return to the previous screen.

Field Name: `Print Test Page`

Select the **`Print Test Page`** field to check the connection between the Test Set and the printer before a test. The Test Software will send one page of data to the printer as a test.

A printer must be connected to a Test Set port and set up for printing, and the **`Send Test Results to Printer at`** field must be set to the port to which the printer is connected in order to print a test page.

Field Name: `Echo BTS Communication to`

Select the **`Echo BTS Communication to`** field to select whether the Test Software will send an echo of the commands between the Test Set and the Base Station, and, if so, the destination of the information. See the earlier description of this field.

Cable Loss and Sector Gain Information Box

Across the bottom of the Initialization Screen is a text box that includes two classes of information:

In the upper section (**RX, TX Cable Losses (dB)**), receiver and transmitter cable losses are shown for each of the six receive antennas and for the transmit antenna.

If the radio selection is an 850-MHz type (that is, any but **TRU 1900/SCLPA** or **TRU 1900/NONE**), the losses are shown for the receive antennas (**RX1** through **RX6**) and for the transmit antenna (**TX**).

If the radio selection is a 1900-MHz type (that is, either **TRU 1900/SCLPA** or **TRU 1900/NONE**), the losses are shown for the receive antennas (**X**, **X'**, **Y**, **Y'**, **Z**, and **Z'**) and for the transmit antenna (**TX**).

In the lower section (**Sector RSSI Gain (dB)**), the gain is shown for each of the sectors (**X**, **Y**. and **Z**).

NOTE: The values shown for these items will change under either of two conditions:

1. As you make changes in the associated control fields (**RX1 Cable Loss** through **RX6 Cable Loss**, and **TX Cable Loss**; or **X Cable Loss** through **Z' Cable Loss**, and **TX Cable Loss**) in the RX and TX Cable Loss Menu, which is called from the **RX and TX Cable Loss** field in the Initialization Screen.

or

2. As you measure cable losses in the procedure called from the **Measure Cable Loss** field in either the RX and Tx Cable Loss Menu or the Utilities Menu, either of which may be reached from the Initialization Screen.

Initiating Testing

After setting all relevant fields on the Initialization Screen to appropriate values, initiate testing by either selecting the **`Begin Test`** field or pressing the k1 (**`Begin Tst`**) key. If a test has been run before, the Test Software probably will still be in the Test Set's internal memory, and it will run. If not, the Test Set will load the Test Software, including the procedure previously selected on the SOFTWARE MENU screen, into its internal RAM, and then run the Test Software.

Responding to Test Set and Test Software Actions

This section provides information on actions that you might be required to perform during the testing process.

Test Flow

When you select the **`Begin Test`** field or press the k1 (**`Begin Tst`**) key, the Test Software will establish communications with the Base Station. Once communications are established, the Test Software will control the Base Station so that it operates in the various modes required for efficient testing. During operation in each mode, the Test Software will control the Test Set to measure the required RF and audio characteristics of the Base Station.

At appropriate points in the testing process, the Test Software will pause, then prompt you to perform some required action or actions. These prompts may require that you turn the Base Station on or off, make or change connections, or perform adjustments.

At the end of a test sequence, the Test Software will display a summary of the test results, showing the number of data points at which the test passed and the number at which the test failed.

Also, at the end of a test sequence, the Test Software will display the time elapsed during the test.

Dependent upon your testing regimen, you might wish to perform certain tests again to obtain more complete information on tests that failed, or you might wish to perform the entire test sequence again.

Actions if a Test Fails

If **PARAMETER_04 GN Stop Test if Results Fail [0=no 1=yes]** is set to 1, the Test Software will prompt you to press one or more of the following keys.

Proceed Key

Press the k1 (**Proceed**) key to continue test operations after a pause.

Repeat Key

Press the k2 (**Repeat**) key to perform a test again.

Abort Key

If it is displayed, press the k4 (**Abort**) key at any time during the testing process to stop the test sequence. The Test Software will stop the test properly, close any files saved to the PC card, end communication with the Base Station, and display a summary of the testing to the point of stoppage.

Laptop Key

If it is displayed, press the k5 (**Laptop**) key to invoke the Laptop Emulator Mode. You may use this mode at any point during the testing process that you wish to send a command to the Base Station to cause it to perform some specific action. For more information on this mode, see **"Laptop Emulator" on page 136**.

Actions if Adjustment Is Required

At points at which adjustment is required, the Test Software will prompt you to press one or more of the following keys.

No Retest Key

Press the k1 (**`No Retest`**) key when you do not wish to have the Test Software repeat the test after an adjustment.

Retest Key

Press the k2 (**`Retest`**) key when you wish to have the Test Software repeat the test after an adjustment.

Not Set Key

Press the k3 (**`Not Set`**) key when the adjustment cannot be performed.

Tns loud/Tns quiet/Tns off Key

Press the k4 (**`Tns loud`**/**`Tns quiet`**/**`Tns off`**) key to set the level of the audible signals produced by the Test Set's audio tone generator during pauses for adjustments. The tone may be set to loud, quiet, or off. Press the key repeatedly until the desired audio level is obtained.

Laptop Key

If it is displayed, press the k5 (**`Laptop`**) key to invoke the Laptop Emulator Mode. You may use this mode at any point during the testing process that you wish to send a command to the Base Station to cause it to perform some specific action. For more information on this mode, see **"Laptop Emulator" on page 136**.

3

Connections

This chapter provides information on equipment required for Base Station testing, and connections for cell site equipment, serial port, printer, and switch control.

Equipment Required

The following equipment is required for testing:

- Cellular Site Base Station to test.
- HP 8935 Series E6381A TDMA Base Station Test Set
  or
  HP 8935 Series E6380A CDMA Base Station Test Set.
- Remember that TESTs 21, 22, and 23 will not run successfully on the HP 8935 Series E6380A CDMA Base Station Test Set (see**"Hardware Model Differences" on page 28**).
- HP 8935 Northern Telecom Base Station Connection Kit. (Recommended, but not required.)

Accessory Kit Cables, Connectors, and Small Accessories

The cables, connectors, and small accessories listed in **table 2 on page 61** may be purchased together in the HP 8935 Northern Telecom Base Station Connection Kit (HP Part Number: E8302-61001) or separately through a local vendor.

The Test Set and other equipment in this test system are susceptible to damage 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 selected and accomplished carefully to reduce the risk of damage to the equipment.

The HP 8935 Northern Telecom Base Station Connection Kit contains items that are used in both TRU and P-Series Base Station testing.

Table 2 Cables and Adapters in Connection Kit

Description	Purpose	Quantity	Part Number
Cable, DB25(m)-to-DB9(f), 15 ft	Connects control signals, Test Set to P-Series Base Station.	1	E8302-61005
Cable, BNC(m)-to-BNC(m), RG400, 20 ft	Accessory.	2	E8302-61003
Cable, N(m)-to-N(m), RG214, 20 ft	Connects Test Set's RF IN/OUT connector to Base Station's TX output connector. Connects Test Set's DUPLEX OUT connector to Base Station's RX input connector.	2	08921-61056
Cable, N(m)-to-N(m), RG214, 2 ft	Acts as cable loss test reference cable.	1	E8300-61005
Cable, DB25(f)-to-Bantam	Connects control signals, Test Set to P-Series Base Station.	1	08921-61034
Cable, BNC(m)-to-Bantam	Connects forward and reverse audio signals, Test Set to Base Station.	2	8120-8745
Cable, RJ45(m)-to-RJ45(m), 4 ft	Connects control signals, Test Set to TRU Base Station.	1	8120-6343
Cable, DB9(f)-to-DB9(f), null, 10 ft	Connects Test Set to PC.	1	5182-4794

Table 2 Cables and Adapters in Connection Kit (Continued)

Description	Purpose	Quantity	Part Number
Cable, SMA(m)-to-SMA(m)	Strain-relief cable.	2	83204-61011
Attenuator, N(m)-to-N(f), 6 dB	Accessory, cable loss test.	2	0955-0819
Adapter, N(f)-to-BNC(m)	Adapts N-to-N cable to RX shelf input connector.	1	1250-0077
Adapter, N(f)-to-N(f)	Connects reference cable to cable or device under test in cable loss test.	2	1250-0777
Adapter, N(f)-to-SMA(f)	Adapts N-to-N cable to TRU Base Station's TX connector.	2	1250-1404
Adapter, BNC(m)-to-Banana(f), single	Connects Test Set's AUDIO IN HI/LO connector to dual banana adapter.	2	1250-2164
Adapter, N(f)-to-TNC(m)	Accessory.	1	1250-2361
Adapter, N(f)-to-TNC(f)	Accessory.	1	1250-2362
Adapter, BNC(m)-to-Dual Banana(m)	Connects Test Set's AUDIO IN HI/LO connector to balanced line input.	1	1251-2277
Adapter, DB25(f)-to-RJ45(f)	Connects control signals to TRU Base Station.	1	08921-61027

Cell Site to Test Set Connections

Many arrangements of test equipment and cell site equipment are possible. In this manual, two of these possibilities are presented:

- Performing transmitter tests at the PA shelf and receiver tests at the receiver shelf.

  This method will affect service at that shelf only.

- Performing transmitter tests at the duplexer or combiner and receiver tests at the receive multi-coupler (RMC) output.

  This method will affect the whole cell site.

After you set up the system, you must calibrate some system components before initiating testing. After calibration, tests must be performed with the equipment connected in the same way that it was connected when calibrated.

See **figure 4 on page 64** for an overall system block diagram, **figure 5 on page 65** and **figure 6 on page 66** for connections to the PA shelf and receiver shelf, and **figure 7 on page 67**, **figure 8 on page 68**, and **figure 9 on page 69** for connections to the receive multi-coupler output and duplexer output.

Dependent upon your selection of optional switch equipment, testing might require much or little cable disconnection and reconnection. For example, the use of an external Splitter reduces repetitive disconnection and reconnection of receiver cables significantly under some receiver test conditions, but it does not offer much test flexibility. The use of a Switch Matrix (HP 83202A or HP 3488) instead of a Splitter also reduces the cable disconnection and connection effort, but reduces test time and offers more testing flexibility through the capability of remote receiver selection. As another example, the use of an RS-232 Switch reduces repetitive transceiver control cable disconnection and reconnection and also reduces test time and offers more flexibility through remote transceiver selection and control.

For more information on the use of a Splitter or either Switch Matrix, see **"Splitter or Switch Matrix" on page 129**. For more information on the use of an RS-232 Switch, see **"RS-232 Switch" on page 125**.

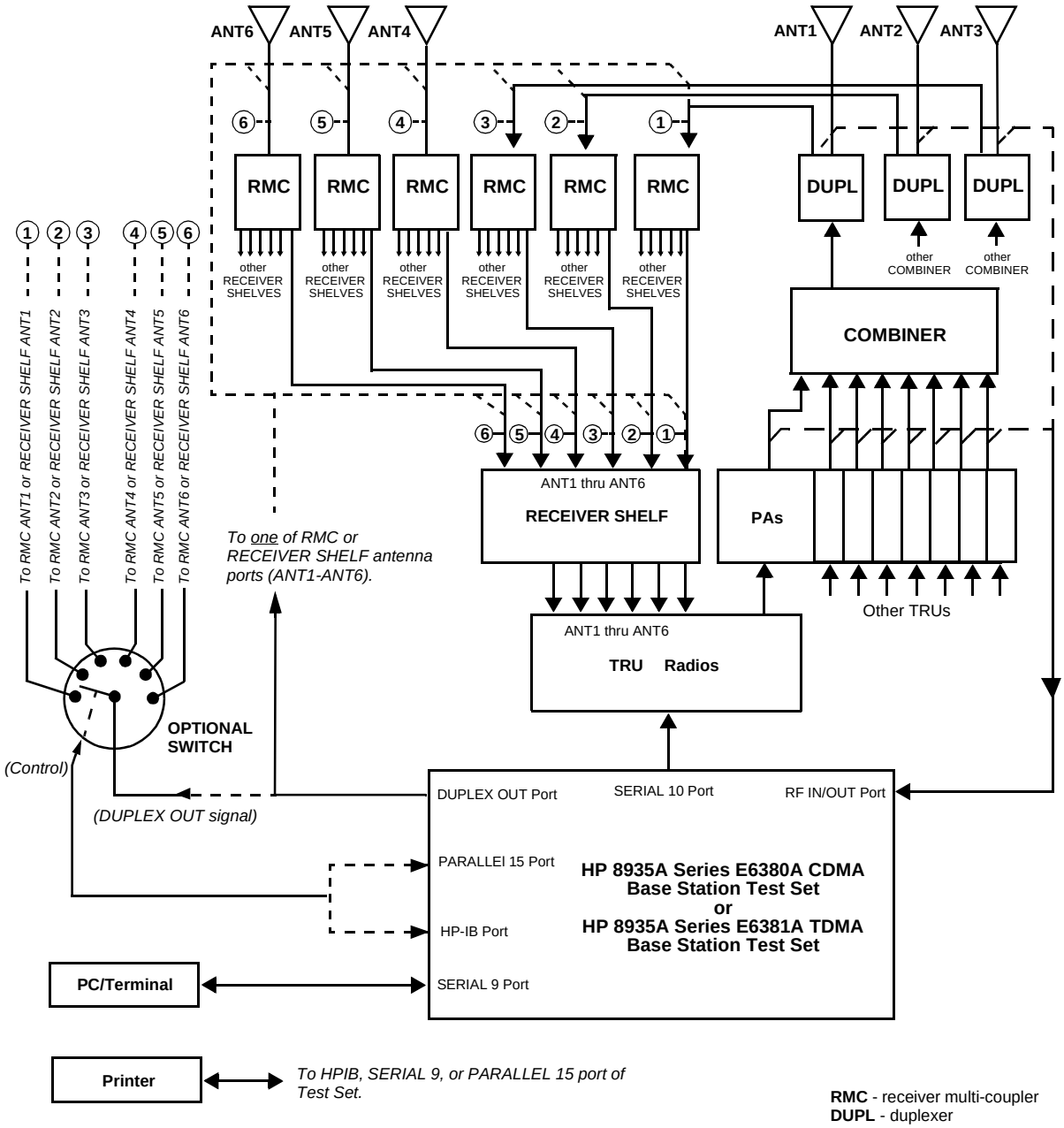


Figure 4 **Overall 850-MHz System Block Diagram**

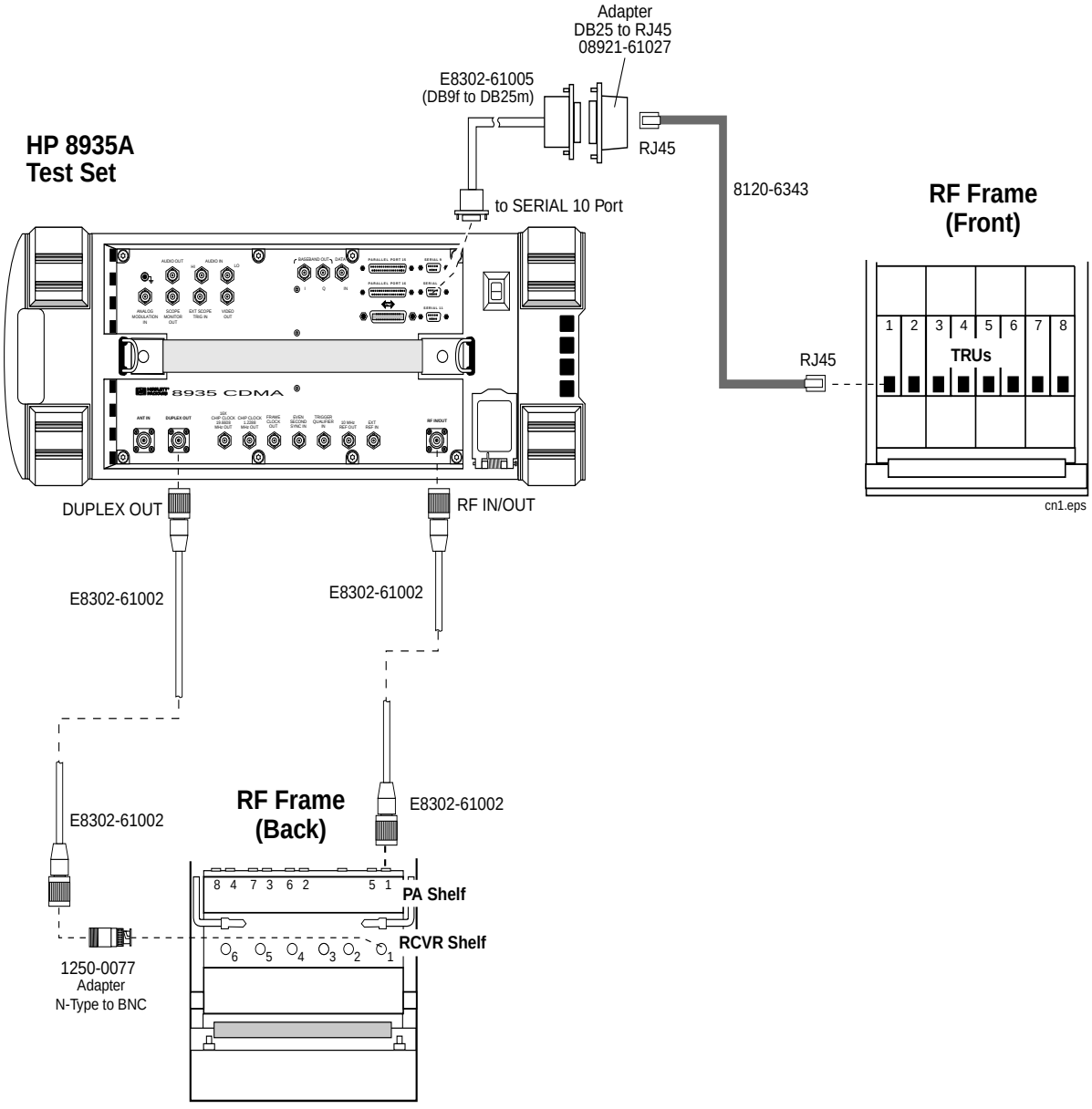


Figure 5 **Connecting the Test Set to the 850-MHz Macrocell Receiver Shelf and PA Shelf**

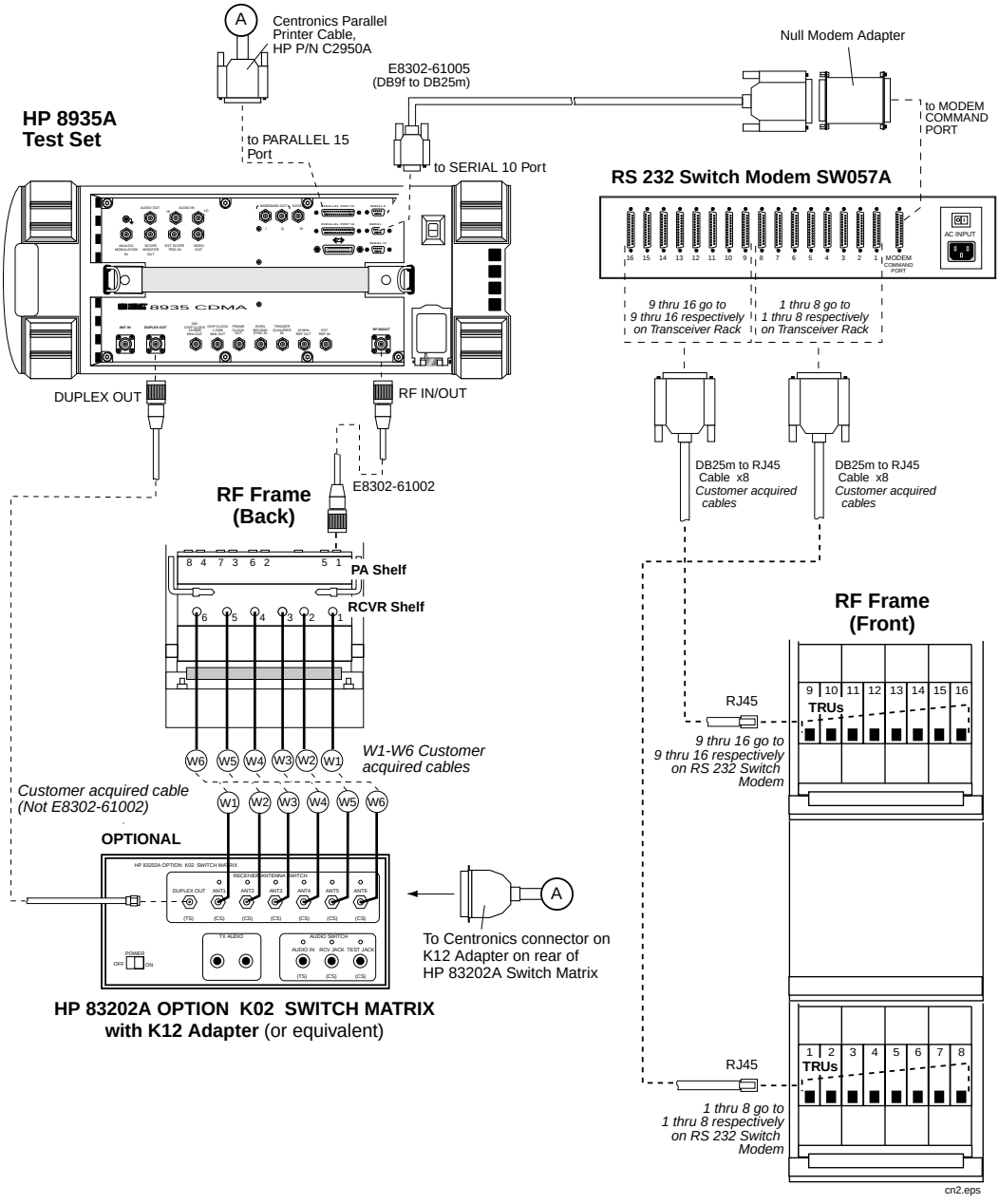


Figure 6 **Connecting the Test Set to the 850-MHz Macrocell Receiver Shelf and PA Shelf with Switches**

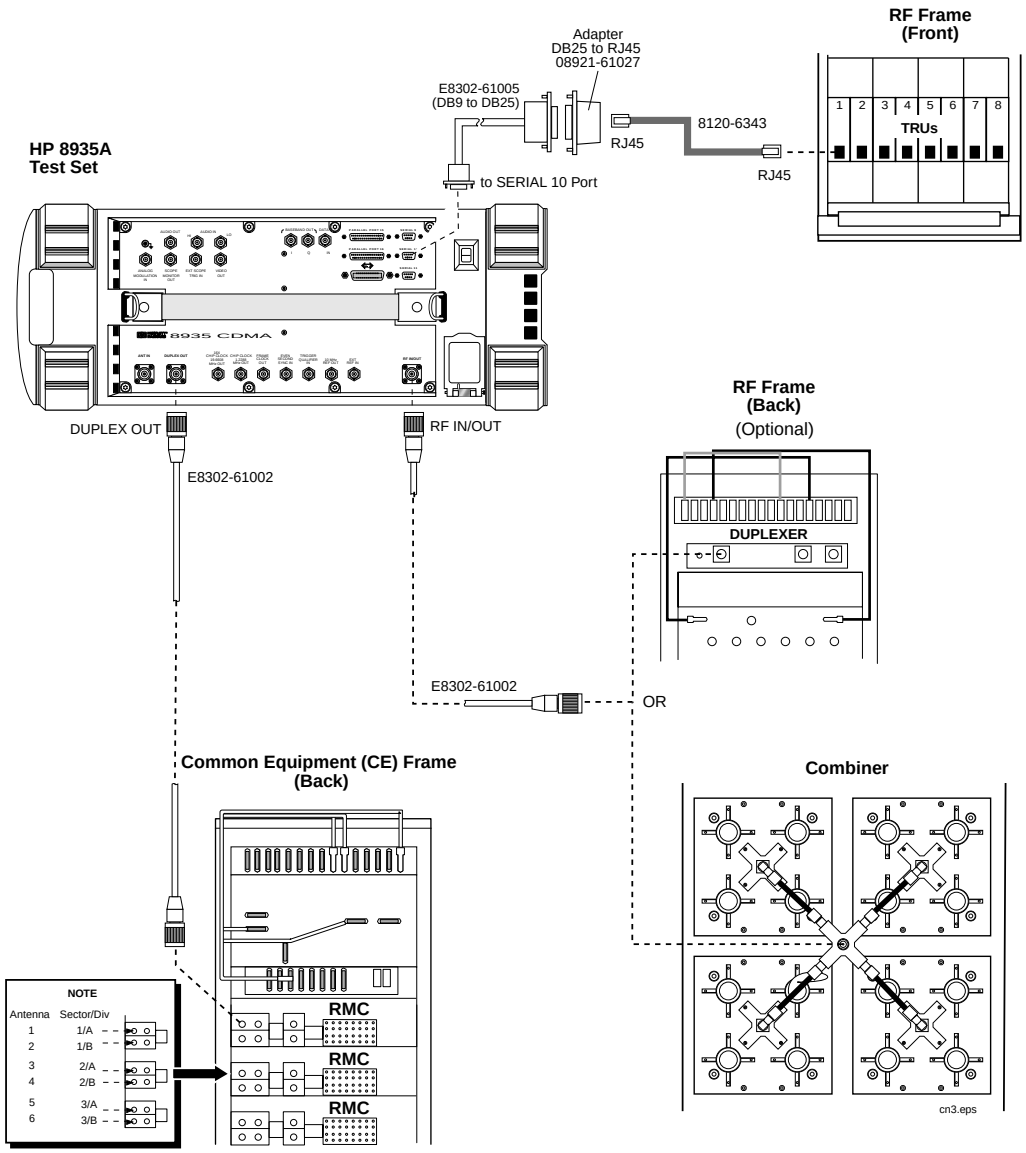
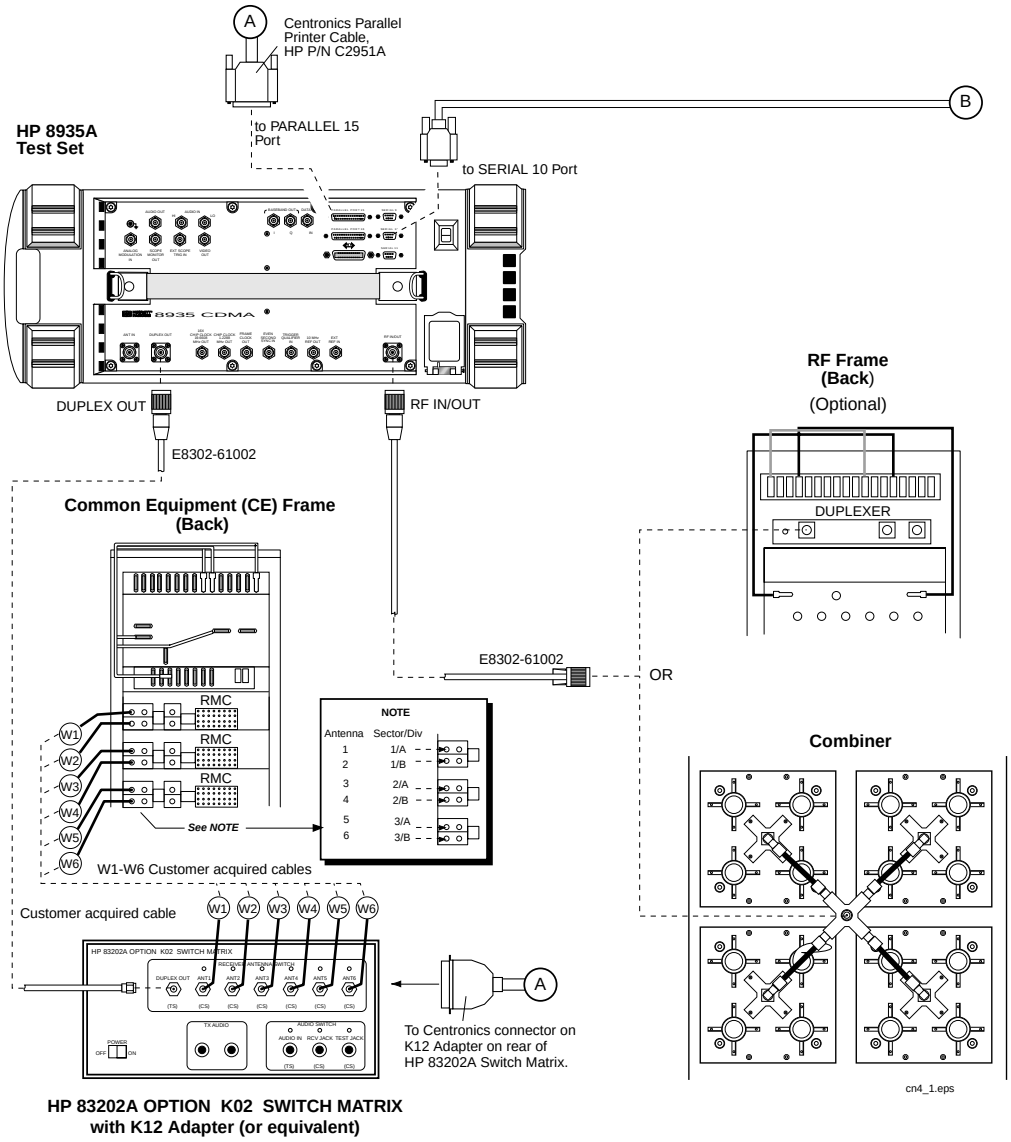


Figure 7 **Connecting the Test Set to the 850-MHz Macrocell Receive Multi-Coupler Input and Duplexer Output**



HP 83202A OPTION K02 SWITCH MATRIX with K12 Adapter (or equivalent)

Figure 8 **Connecting the Test Set to the 850-MHz Macrocell Receive Multi-Coupler Input and Duplexer Output with Switches (Part 1 of 2)**

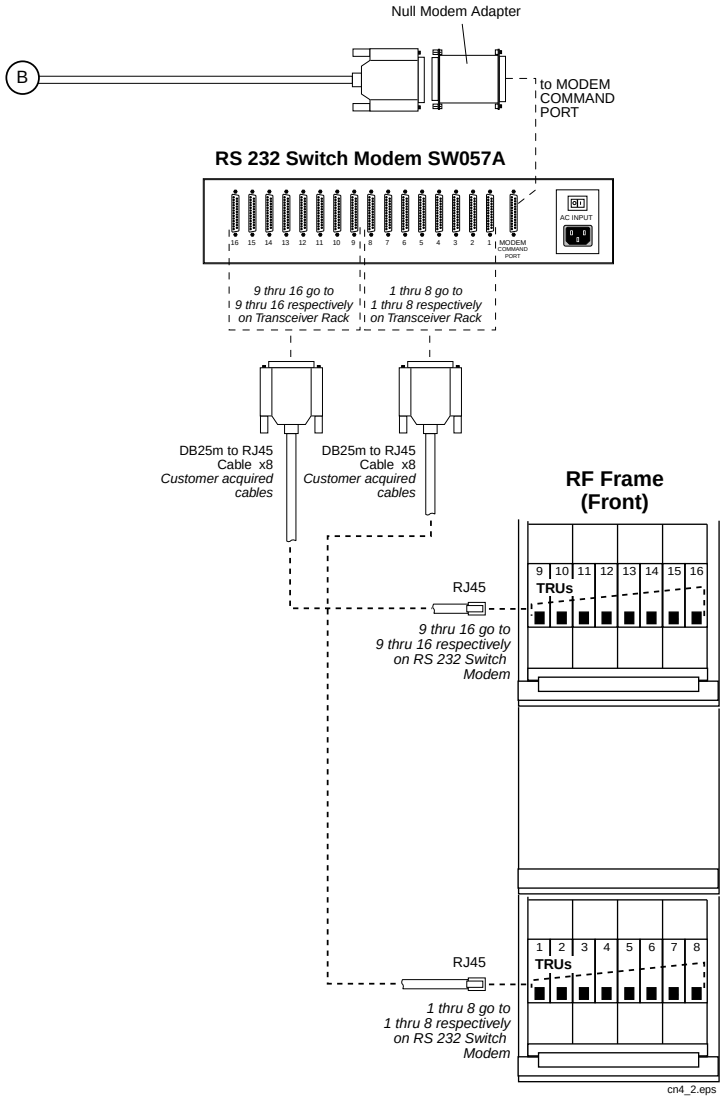


Figure 9 **Connecting the Test Set to the 850-MHz Macrocell Receive Multi-Coupler Input and Duplexer Output with Switches (Part 2 of 2)**

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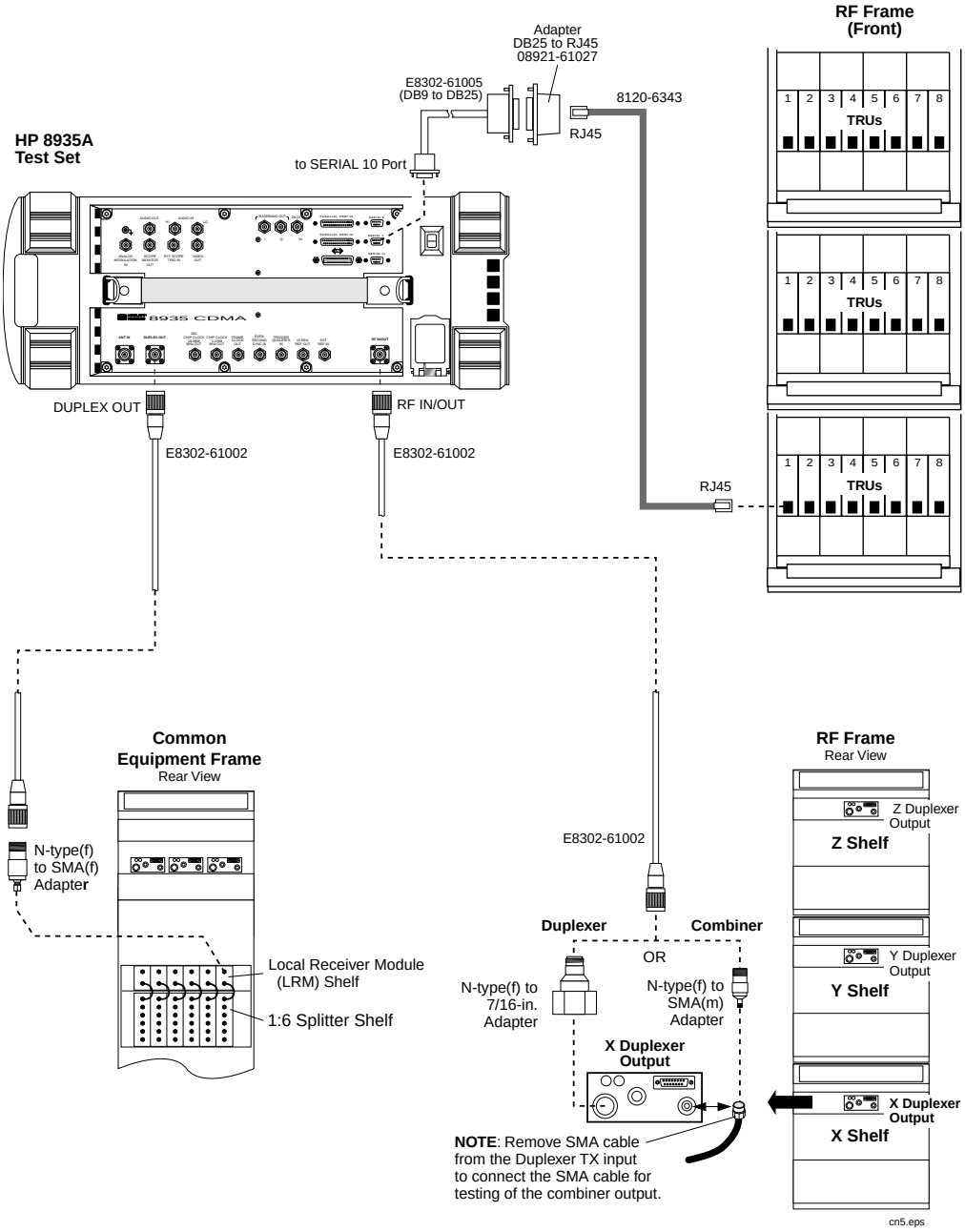


Figure 10 **Connecting the Test Set to the 1900-MHz Local Receive Module Input and Duplexer Output**

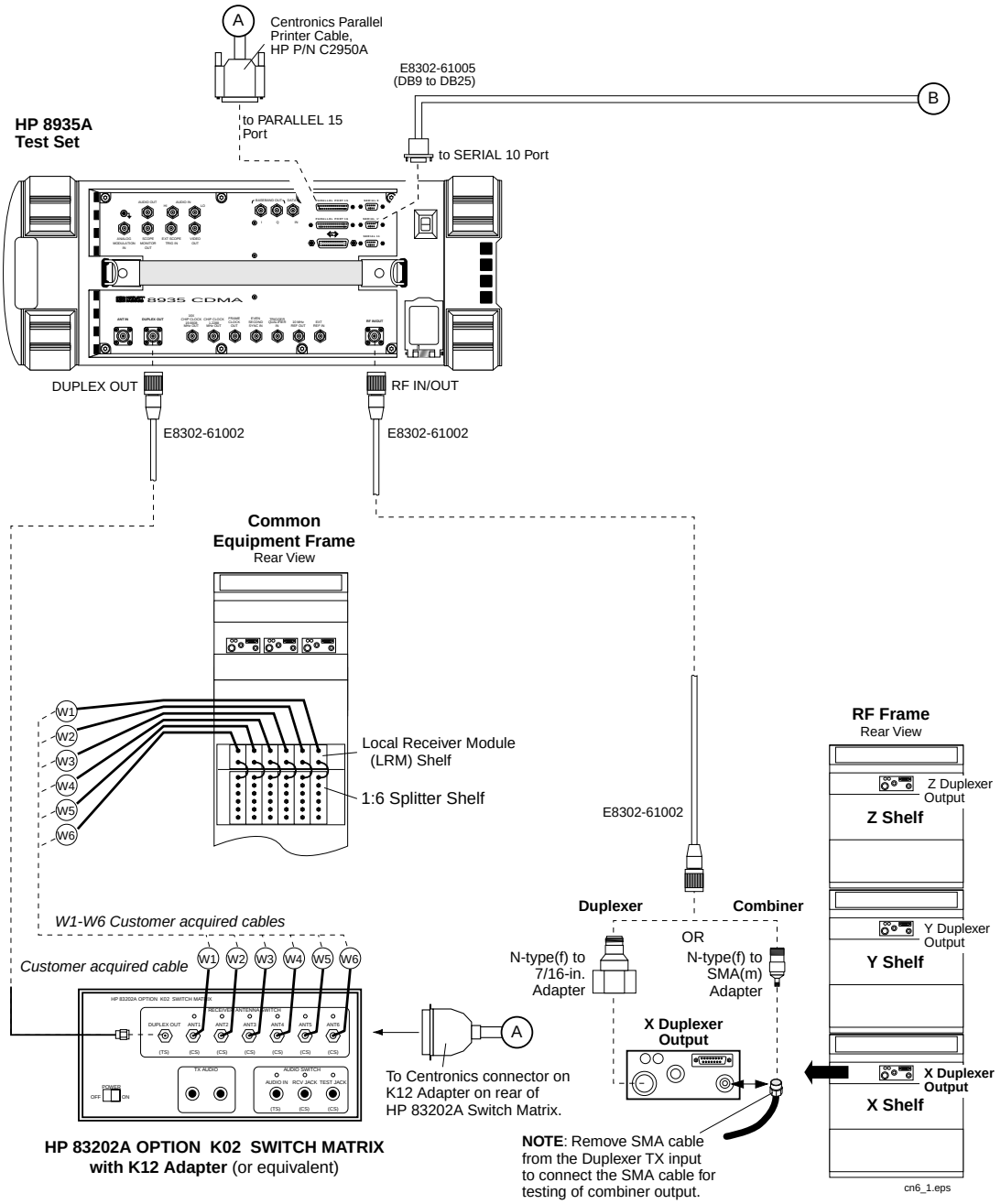


Figure 11 **Connecting the Test Set to the 1900-MHz Local Receive Module Input and Duplexer Output with Switches (Part 1 of 2)**

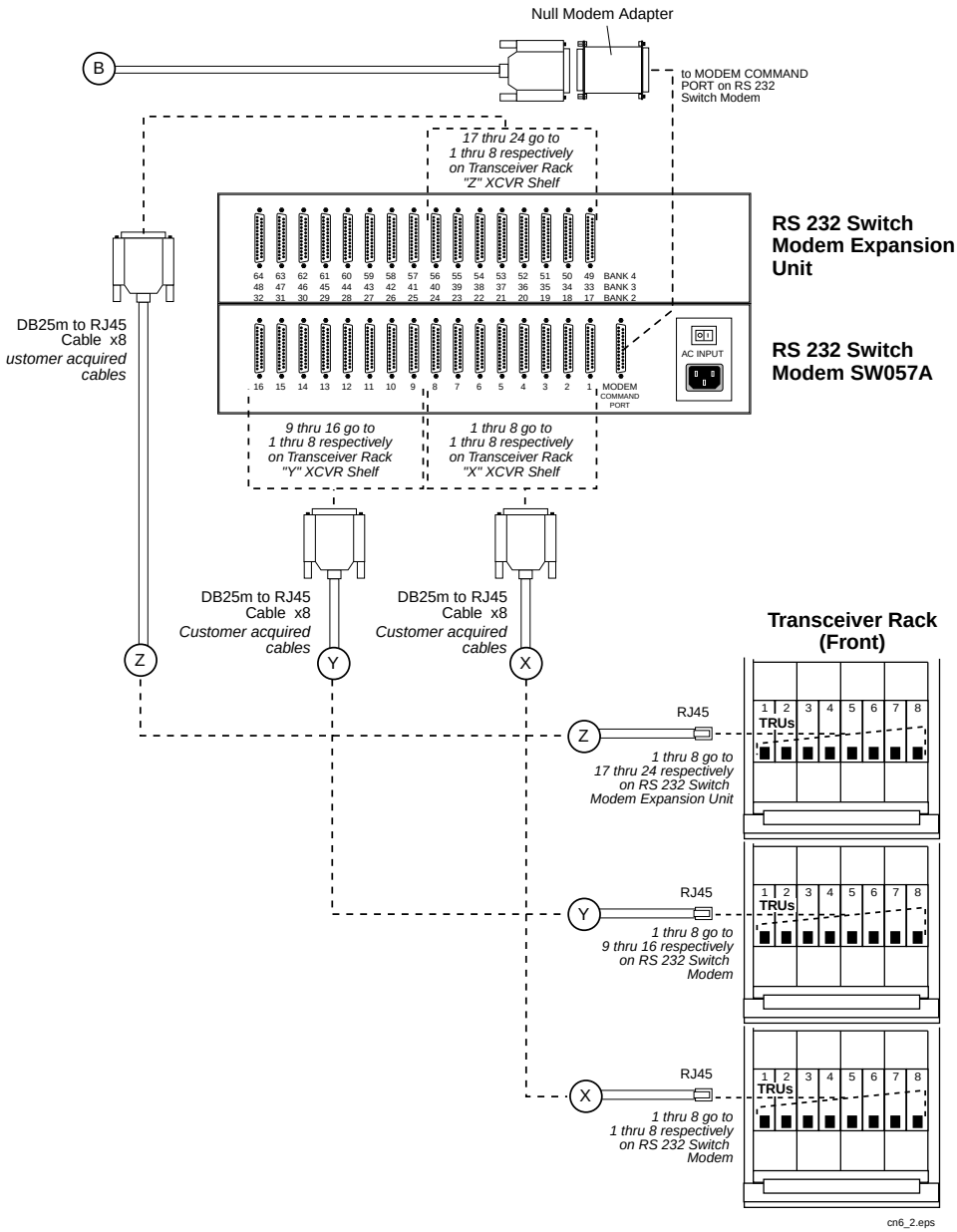


Figure 12 **Connecting the Test Set to the 1900-MHz Local Receive Module Input and Duplexer Output with Switches (Part 2 of 2)**

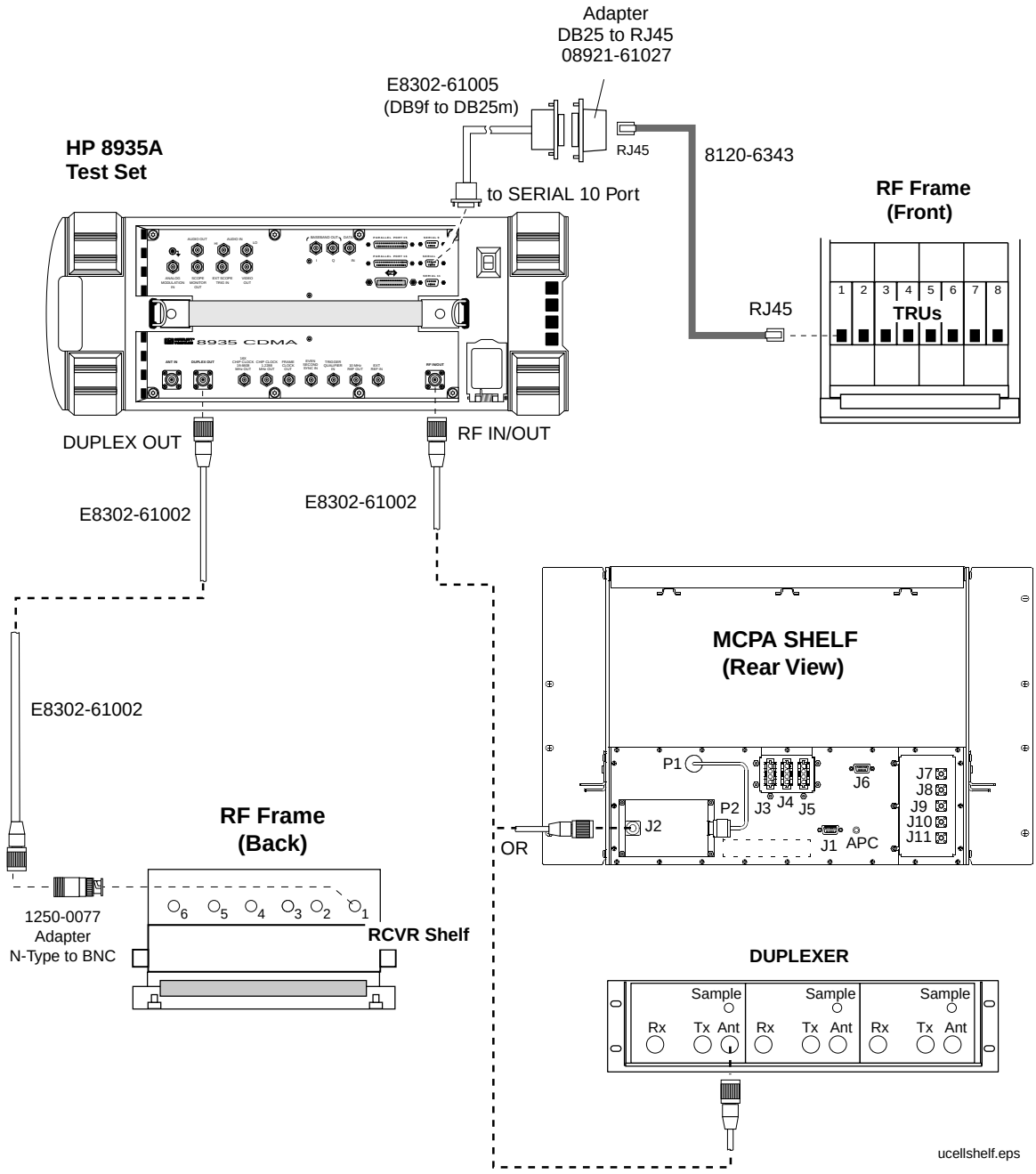


Figure 13 **Connecting the Test Set to the 850-MHz Urbancell Receiver Shelf and MCPA Output or Duplexer Antenna Output**

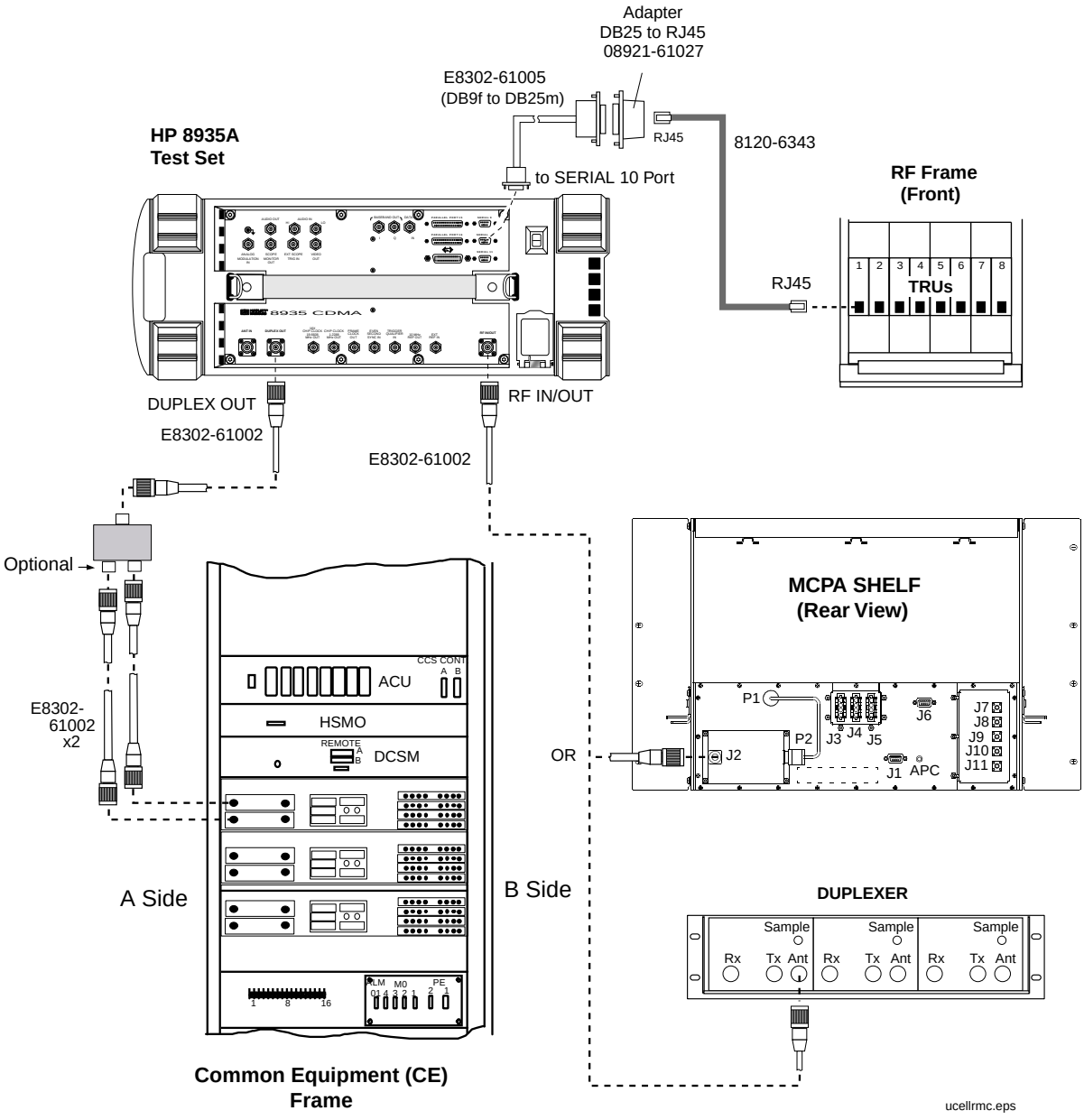


Figure 14 **Connecting the Test Set to the 850-MHz Urbancell Receive Multicoupler Input and MCPA Output or Duplexer Antenna Output Using an Optional Splitter on the Receive Path**

Receiver RF

As shown in **figure 5 on page 65**, **figure 6 on page 66**, **figure 7 on page 67**, **figure 8 on page 68**, **figure 9 on page 69**, **figure 10 on page 71**, **figure 11 on page 72**, **figure 12 on page 73**, **figure 13 on page 74**, and **figure 14 on page 75**, an RF cable is used to connect the RX shelf input or receive multi-coupler (RMC) input (or the LRM input in the case of a 1900-MHz Base Station) to the Test Set's DUPLEX OUT connector. The Test Software will display a prompt at each point in testing at which a connection must be changed.

You may connect the Test Set's DUPLEX OUT connector to the various receiver antenna connectors in several ways:

- Make the connections individually when prompted by the Test Software.
- Use a Splitter and connect all of the antennas at once (see **"Splitter or Switch Matrix" on page 129**).
- Use a Switch Matrix to switch the Test Set's DUPLEX OUT connector to the various receiver antenna connectors under Test Software control (see **"Splitter or Switch Matrix" on page 129**).

CAUTION: The application of RF power greater than approximately 60 milliwatts can damage the Test Set's DUPLEX OUT port. Make certain that signals greater than 60 milliwatts are never applied. As an extra safeguard, the Test Set includes an over-power relay in the port circuit. If an RF signal greater than approximately 60 milliwatts is inadvertently applied, this relay will trip. To resume operations, remove the problem signal, and press the Shift, then the Hold (Meas Reset) keys, or turn the Test Set power off and back on to reset it.

Transmitter RF

As shown in **figure 5 on page 65**, **figure 6 on page 66**, **figure 7 on page 67**, **figure 8 on page 68**, **figure 9 on page 69**, **figure 10 on page 71**, **figure 11 on page 72**, **figure 12 on page 73**, **figure 13 on page 74** and **figure 14 on page 75**, the PA shelf outputs or combiner/duplexer output (or the MCPA output/duplexer output in the case of an Urbancell) are connected to the Test Set's RF IN/OUT connector. Use a low-loss cable with Type N connectors. Type RG-214 cable may be used. The Test Software will display a prompt at each point in testing at which the connection must be changed.

RS-232 Transceiver Control

The Test Software controls the transceiver automatically through the Test Set's SERIAL 10 port and the transceiver's front panel RJ45 connector.

As shown in **figure 5 on page 65**, **figure 6 on page 66**, **figure 7 on page 67**, **figure 8 on page 68**, **figure 9 on page 69**, **figure 10 on page 71**, **figure 11 on page 72**, **figure 12 on page 73**, **figure 13 on page 74**, and **figure 14 on page 75**, the Test Set communicates with the transceiver for control and messaging signals via a test cable. The Test Software will display a prompt at each point in testing at which a connection must be changed.

You may connect the Test Set's SERIAL 10 port to the transceiver's RJ45 connector in either of two ways:

Manually:

In manual operation, you make the connections individually when prompted by the Test Software. If you use the items supplied in the Accessory Kit, connect the Test Set's SERIAL 10 port to the transceiver's DATA connector using the supplied DB9-to-DB25 cable, a DB25-to-RJ45 adapter, and an RJ45-to-RJ45 cable, connected together.

Automatically:

In automatic operation, you use the optional RS-232 Switch and connect to all transceivers at once.

Through the optional RS-232 Switch, the Test Software can select and control automatically any one of as many as 64 transceivers at a site to be tested. There are two types of switch units: Master and Expansion. A Master RS-232 Switch unit is always used for the first 16 transceivers at a site. An Expansion RS-232 Switch unit may be added for each 16 additional transceivers, to a total of 3 expansion units and 64 transceivers. For more information, see **"RS-232 Switch" on page 125**.

The Test Set communicates with the RS-232 Switch via the Test Set's SERIAL 10 port and a null modem cable. This cable is not supplied as a unit, but can be constructed simply by adding an ordinary null modem adapter to the supplied DB9 to DB25 cable. Refer to the *Test Set*, *DB9*, and *MODEM Port* columns of **table 3** for the pinout of this cable. Connect this cable to the Test Set's SERIAL 10 port and to the MODEM connector on the Master RS-232 Switch, as shown in **figure 6 on page 66**, **figure 8 on page 68**, **figure 9 on page 69**, **figure 11 on page 72**, and **figure 12 on page 73**.

The RS-232 Switch communicates with the transceivers via the switch ports (1 through 16) and a special cable, one of which is required for each transceiver. Such cables are not supplied, but may be constructed using readily available parts. Refer to the *Port 1 -- 16* and *TRU, RJ45* columns in **table 3** and to **figure 15** for the pinout of these special cables. Connect these cables to the RS-232 SWitch and the transceivers as shown in **figure 6 on page 66**, **figure 8 on page 68**, **figure 9 on page 69**, **figure 11 on page 72**, and **figure 12 on page 73**.

Table 3 Special Test Cable Pinout

		RS-232 Switch, DB25 -- DB25					
Test Set, DB9		MODEM Port		PORTS 1 -- 16		TRU, RJ45	
Pin	**Description**	**Pin**	**Description**	**Pin**	**Description**	**Pin**	**Description**
2	DATA IN	2	DATA OUT	2	DATA IN	2	DATA OUT
3	DATA OUT	3	DATA IN	3	DATA OUT	3	DATA IN
7	GROUND	7	GROUND	7	GROUND	7	GROUND

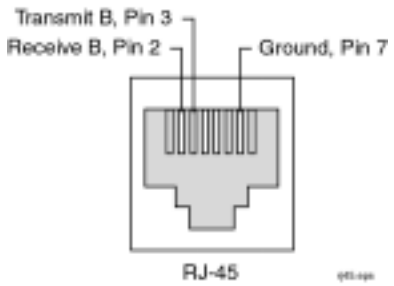


Figure 15 RJ45 Adapter Connection for TRU

PC and Printer Connections

This section provides information on PC and printer connections for data collecting and recording.

PC

The Test Software includes the capability to transfer test results to an external PC. This may be done quickly and easily by running the BTS Laptop Utility on a laptop or other computer to save the information.

Connect the Test Set's SERIAL 9 port to the PC's serial port using a DB9-to-DB9 null modem cable (see **figure 16**).

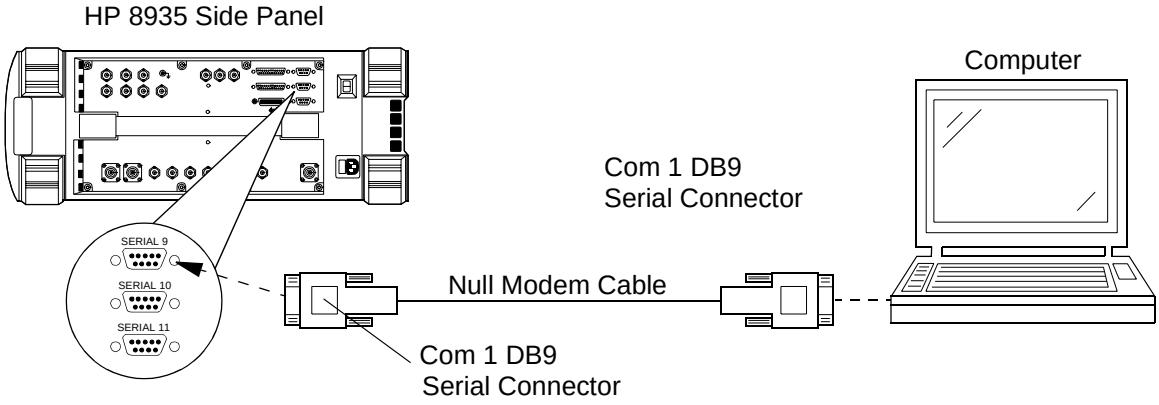


Figure 16 Test Set to PC Serial Connection

Serial Printer

Connect the Test Set's SERIAL 9 port to the serial printer using a standard serial (DB9-to-DB9) cable (see **figure 17**).

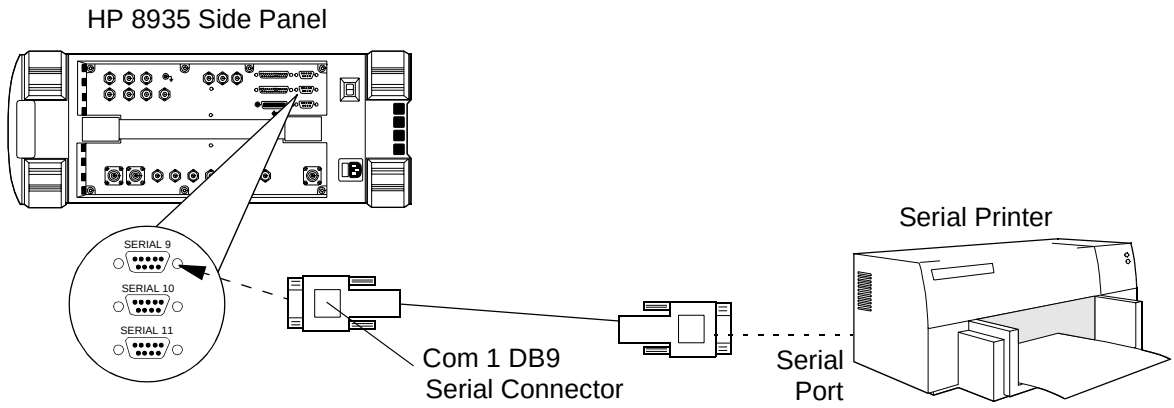


Figure 17 **Test Set to Serial Printer Connection**

Parallel Printer

Connect the Test Set's PARALLEL 15 port to the printer using a standard parallel printer cable (see **figure 18**).

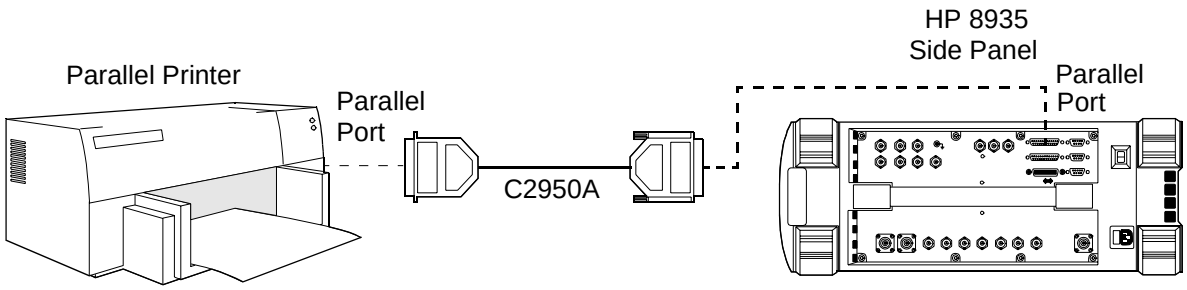


Figure 18 **Test Set to Parallel Printer Connection**

HP-IB Printer

Connect the Test Set's HP-IB port to the printer using a standard HP-IB printer cable (see **figure 19**).

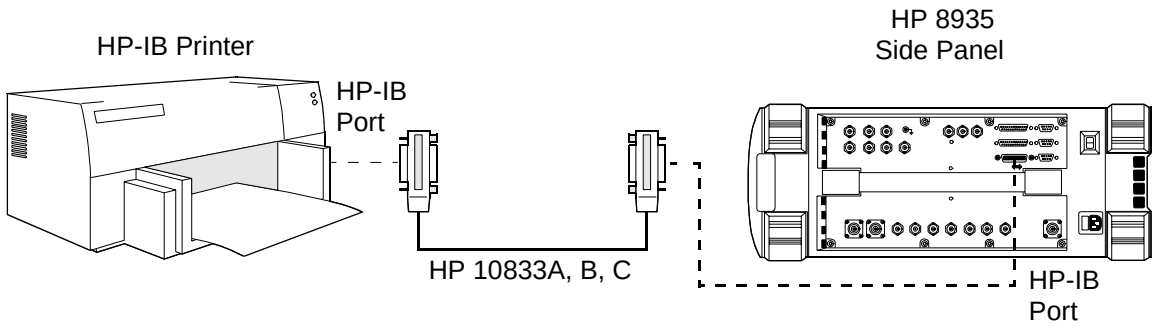


Figure 19 **Test Set to HP-IB Printer Connection**

4

Reference

This chapter provides detailed descriptions of the general features and functions of the Test Software. Topics are arranged alphabetically for quick and easy reference.

Customizing Test Procedures

Customizing test procedures is accomplished from the SOFTWARE MENU screen (**figure 20**).

The fields listed under CUSTOMIZE TEST PROCEDURE: are used to customize the software for various testing needs.

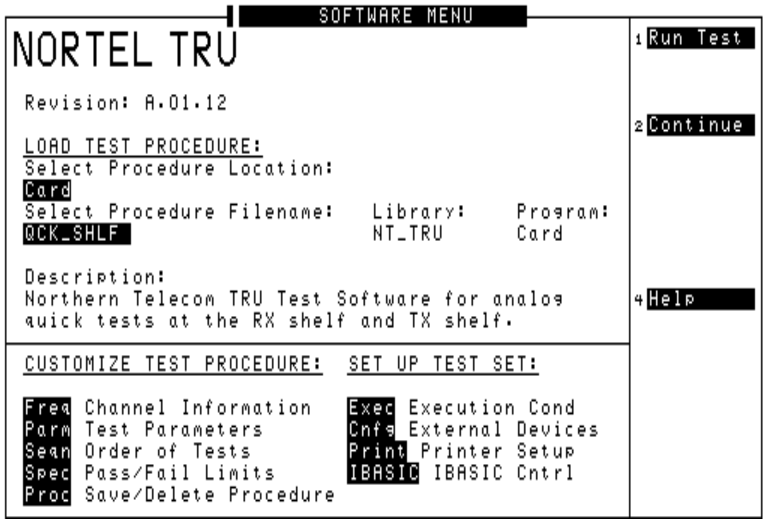


Figure 20 **SOFTWARE MENU Screen**

Test Procedures have been designed so that changes may be made easily from the Test Set's front panel. For example, tests may be inserted or deleted and, after running the tests, you may change the pass/fail limits or test different channels. You may store your customized procedure on an SRAM card so that you may use it in the future (**"Saving/Deleting Procedures to/from a Card" on page 91**).

Changing Pass/Fail Limits

Changing pass/fail limits is accomplished from the TESTS (Pass/Fail Limits) screen (**figure 21**).

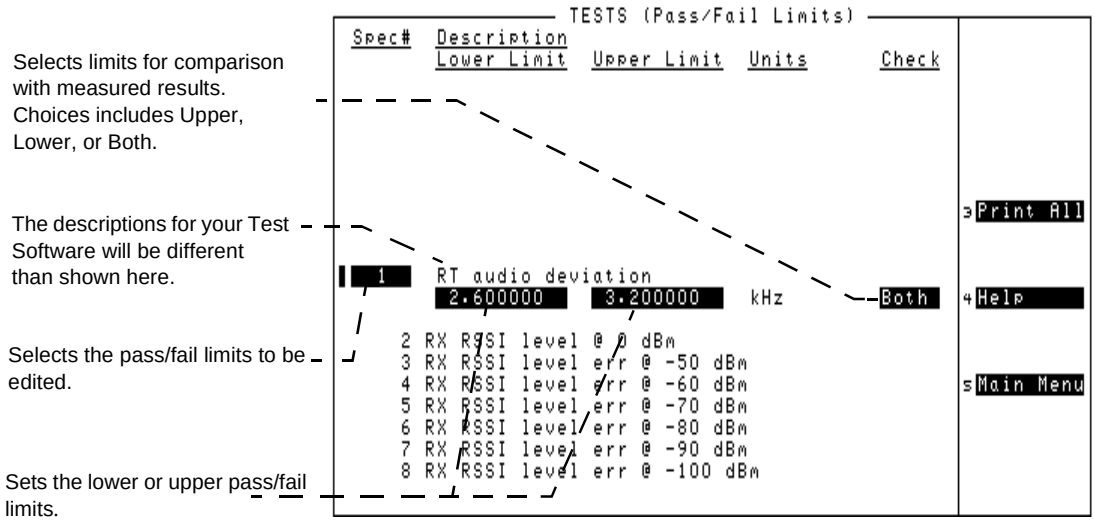
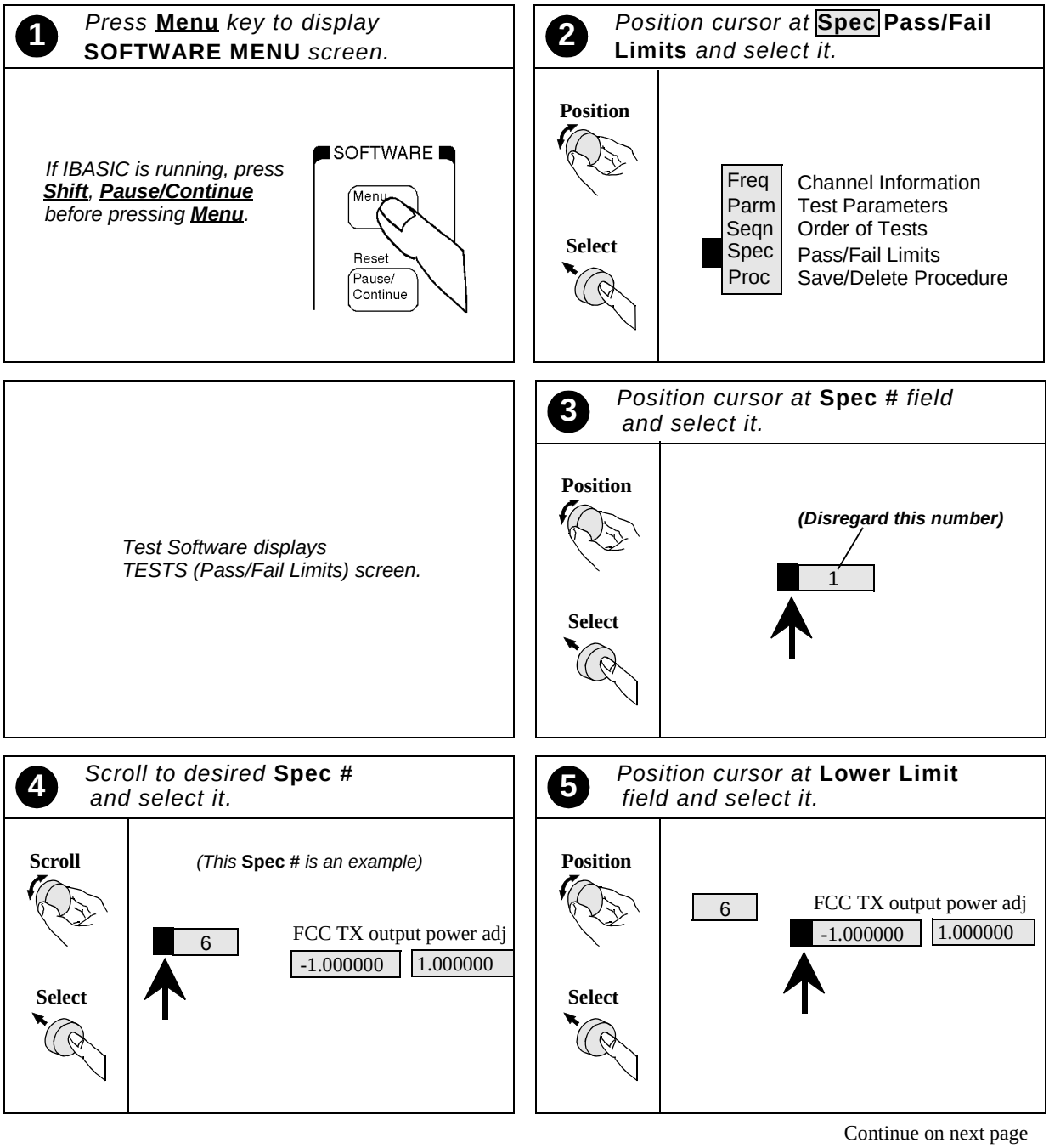


Figure 21 **Changing Pass/Fail Limits**

Pass/Fail limits define the values a measurement result is compared against to determine if the system under test meets specified standards. Default values are set in the Test Software. These default values may be changed to meet the requirements of the particular application.

The procedure shown in **figure 22** and **figure 23** describes the process for changing pass/fail limits through the TESTS (Pass/Fail Limits) screen to optimize your testing conditions. For information on saving customized pass/fail limits, see **"Saving/Deleting Procedures to/from a Card" on page 91**.



Continue on next page

Figure 22 Changing Pass/Fail Limits Specifications

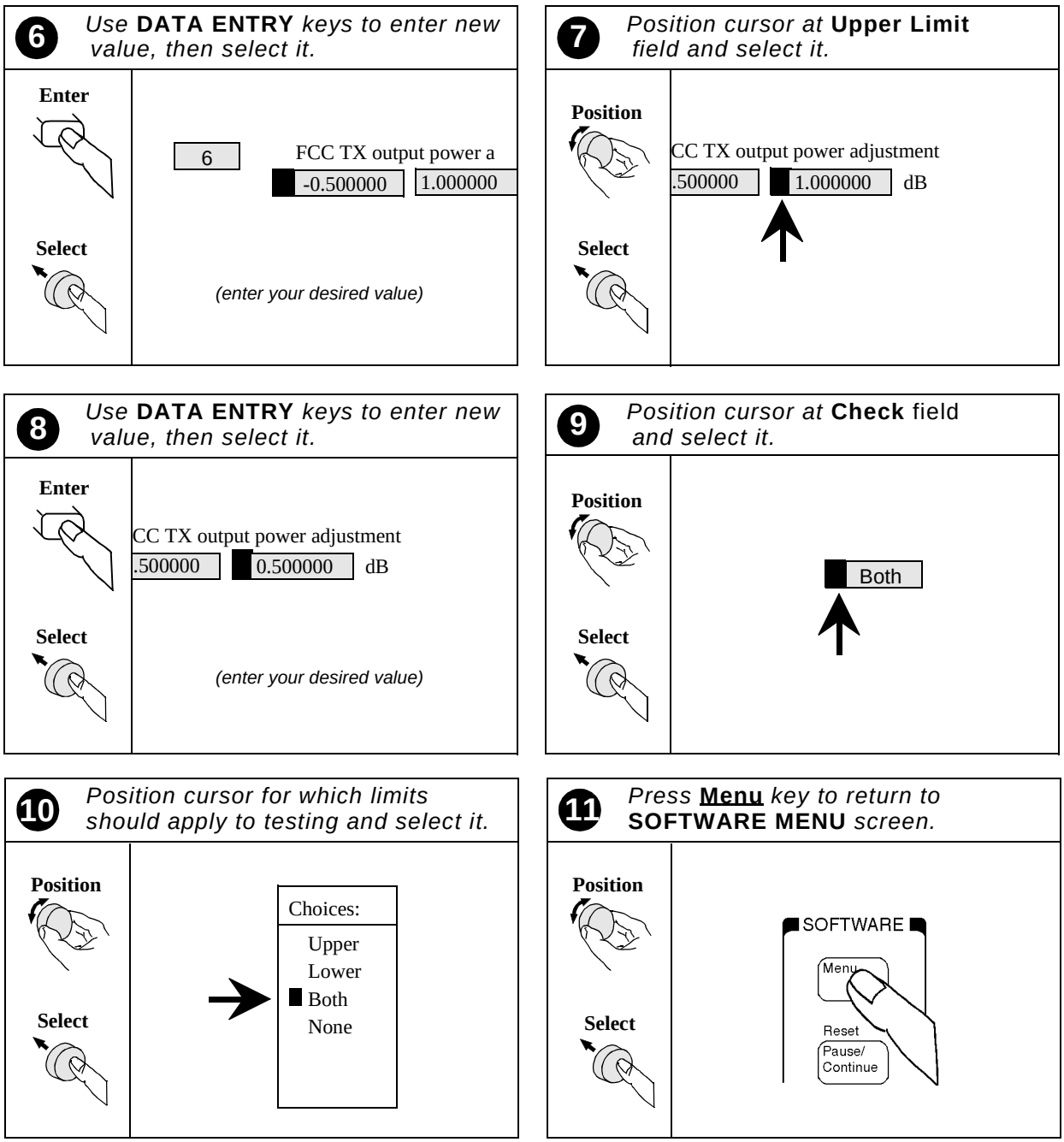


Figure 23 Changing Pass/Fail Limits Specifications (continued)

Changing Test Parameters

Changing test parameters is accomplished from the TESTS (Test Parameters) screen (**figure 24**).

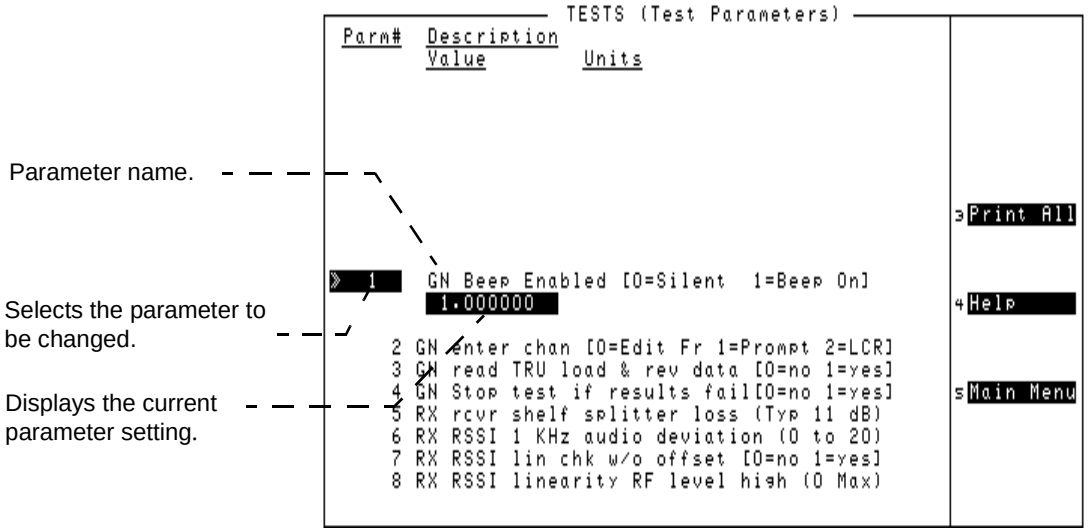


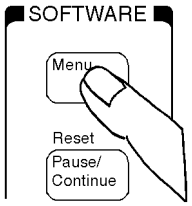
Figure 24 **TESTS (Test Parameters) Screen**

The Software uses parameters to optimize the test environment and conditions for the testing application. The default test parameters were determined by examining test requirements and specifications from the equipment manufacturer. The Test Software comes with default settings for all test parameters.

The procedure shown in **figure 25** and **figure 26** describes the process for changing test parameters through the TESTS (Test Parameters) screen to optimize your testing conditions. For information on saving customized test parameters, see **"Saving/Deleting Procedures to/from a Card" on page 91**.

1 *Press* **Menu** *key to display* **SOFTWARE MENU** *screen.*

If IBASIC is running, press ***Shift***, ***Pause/Continue*** *before pressing* ***Menu***



2 *Position cursor at* **Parm** **Test Parameters...** *and select it.*

Position

Select

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

Test Software displays TESTS (Test Parameters) screen.

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

Continue on next page

Figure 25 Changing Test Parameters

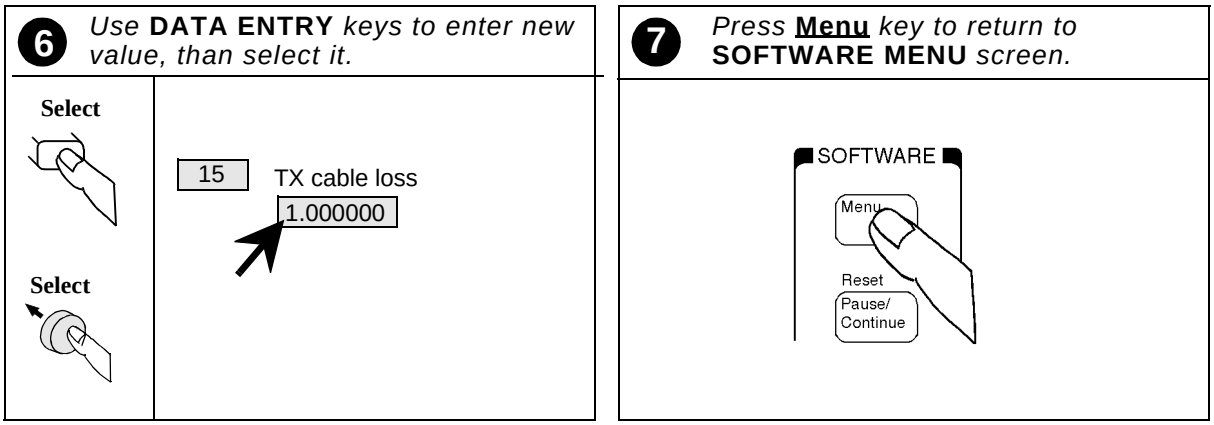


Figure 26 Changing Test Parameters (continued)

Saving/Deleting Procedures to/from a Card

Saving procedures to an SRAM card and deleting procedures from a card are accomplished from the TESTS (Save/Delete Procedure) screen (**figure 27**).

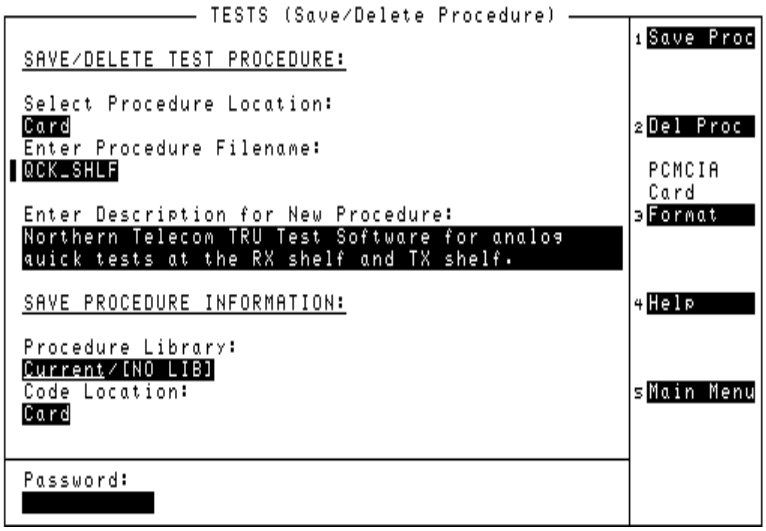


Figure 27 **TESTS (Save/Delete Procedure) Screen**

A test procedure is a collection of channel information, test parameters, testing order, and pass/fail limits saved in a file. This file might be one of the default procedures that is supplied on the Test Software PC card, or it might be an application specific procedure that customizes the Test Software to a specific application. Ordinarily, custom procedures are saved on an SRAM card.

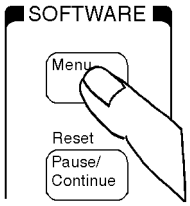
When you save a custom procedure, it consists of channel information, test parameters, pass/fail limits, and testing order, plus a library that contains the names of all test parameters, pass/fail limits, and tests that are resident in the Test Software. The library file comes from the Test Software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

The procedure shown in **figure 28**, **figure 29**, and **figure 30** describes the process for saving or deleting a procedure through the TESTS (Save/Delete Procedure) screen.

Delete a procedure using the same process, except for step 13. To delete a procedure, select the **`Del Proc`** field or press the **k2** (**`Del Proc`**) key.

1 *Press* **Menu** *key to display* **SOFTWARE MENU** *screen.*

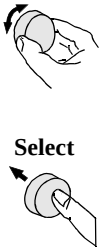
If IBASIC is running, press ***Shift***, ***Pause/Continue*** *before pressing* ***Menu*****.**



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

Position

Select



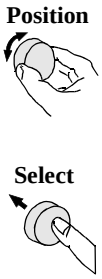
Freq	Channel Information
Parm	Test Parameters
Seqn	Order of Tests
Spec	Pass Fall Limits
Proc	Save/Delete Procedure

Test Software displays TESTS (Save/Delete Procedure) screen.

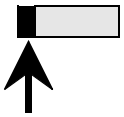
3 *Position cursor at* **Select Procedure Location:** *and select it.*

Position

Select

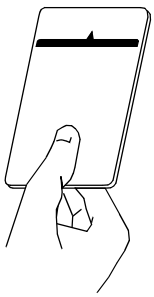


Select Procedure Location:



4 *Insert initialized SRAM* ***card.***

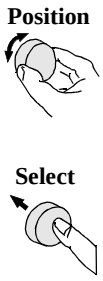
To initialize an SRAM card, press the **k3** (**Format**) key and follow the prompts on the TESTS (Save/Delete Procedure) screen.



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

Position

Select

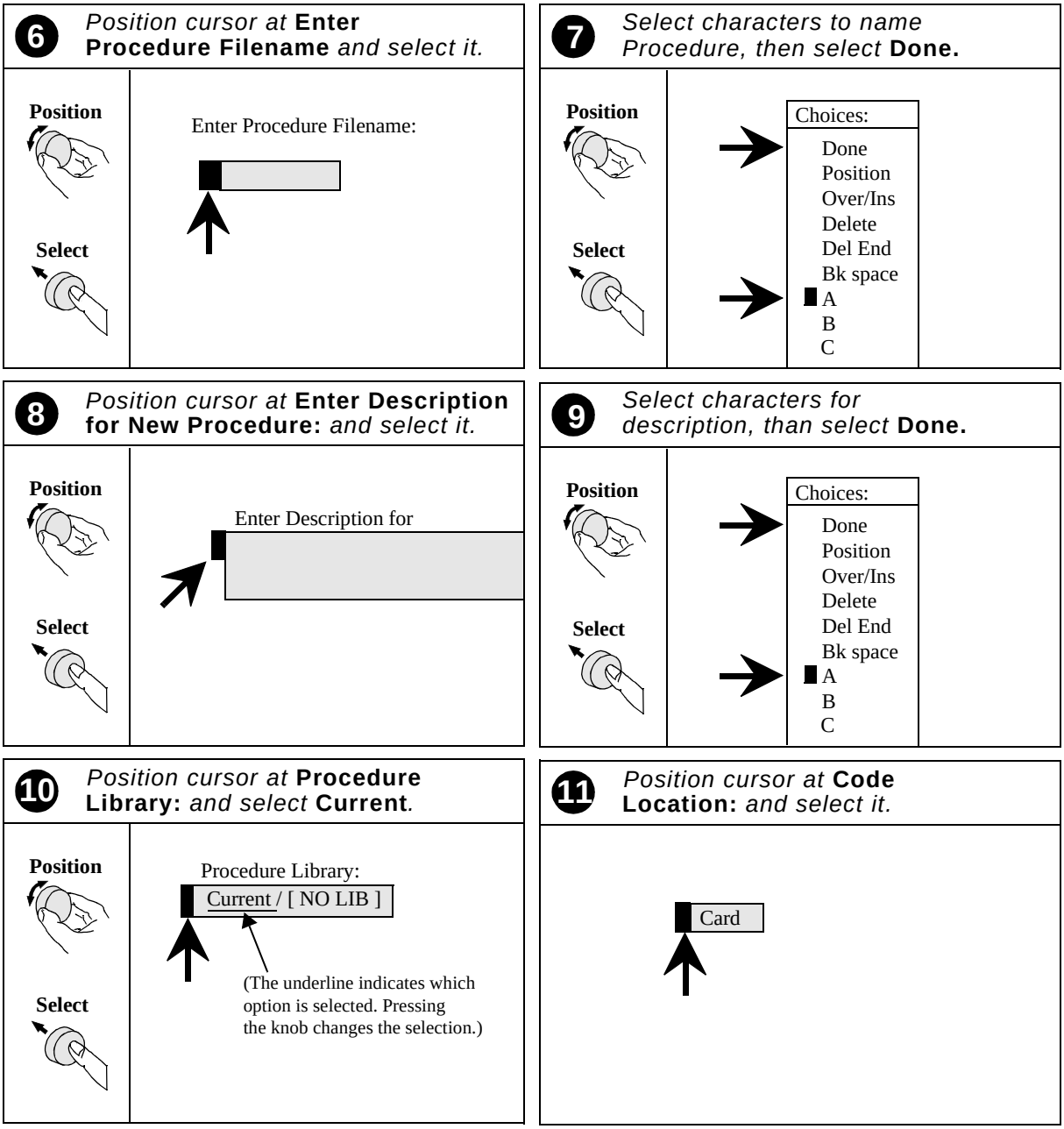


Choices:
- Card
- RAM

(You may also save procedures to an internal RAM disk).

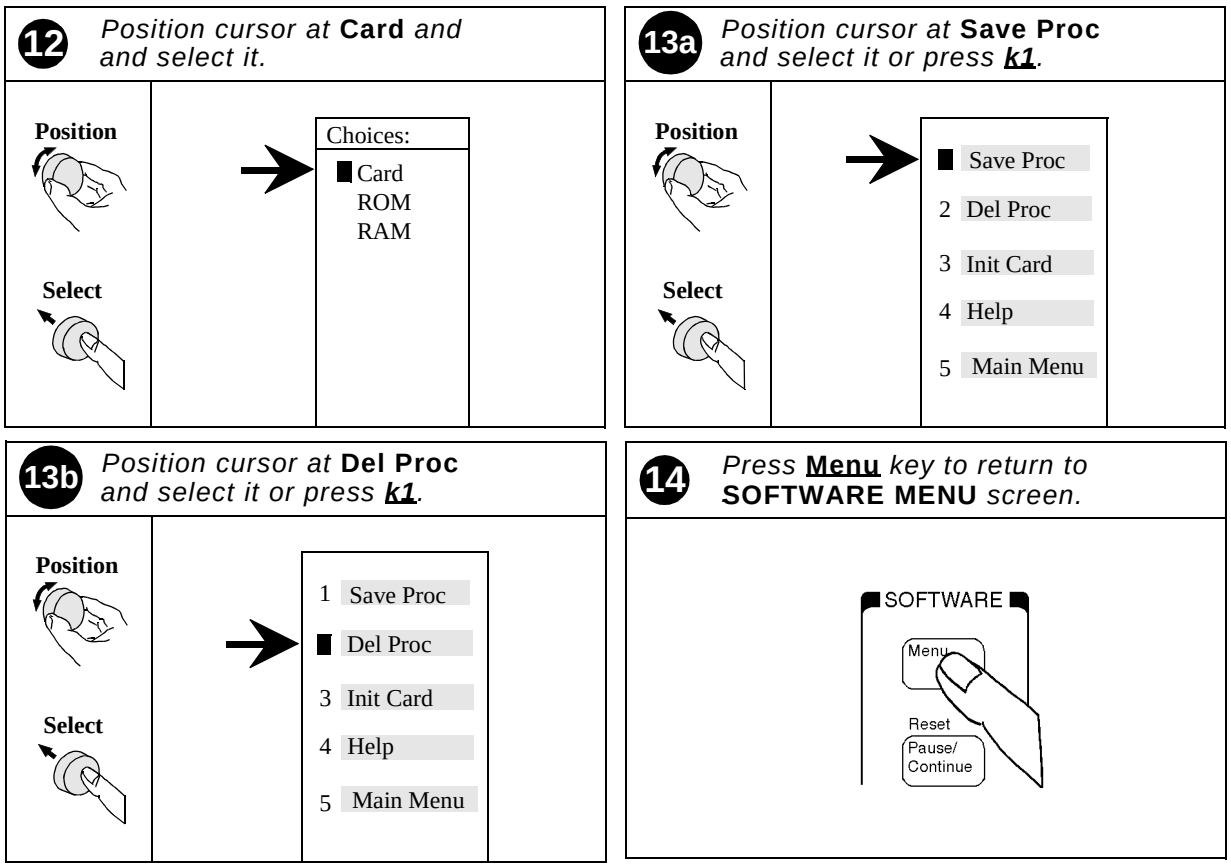
Continue on next page

Figure 28 Saving or Deleting a Procedure



Continue on next page

Figure 29 **Saving or Deleting a Procedure (continued)**



15 *Run saved procedure as follows:*

1) Insert the SRAM Card with your saved procedure.

2) On the SOFTWARE MENU screen, a) select Select Procedure Location: then select Card, b) select Select Procedure Filename:, then select your saved file name.
3) Remove the SRAM Card, then insert the original Test Software PC card.
4) Press Run Test.

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

Figure 30 Saving or Deleting a Procedure (continued)

Saving/Deleting Procedures to/from Internal RAM

Saving procedures to Test Set's internal RAM and deleting procedures from internal RAM are accomplished from the TESTS (Save/Delete Procedure) screen (**figure 27**) much as shown in **figure 28**, **figure 29**, and **figure 30**, except for the following:

1. In **figure 28**, step 4, initialize the RAM disk as outlined in **"Initializing a RAM Disk" on page 117**.
2. In **figure 28**, step 5, select **RAM** instead of **Card**.
3. In **figure 30**, step 15, sub-step 1 is not applicable.
4. In step 15, sub-step 2, select **RAM** instead of **Card**.
5. In step 15, sub-step 3, if the Test Software PC card is not inserted in the Test Set's front panel card slot, do so.

Frequency Table

The frequency table, shown in the TESTS (Channel Information) screen, is used to enter and store channel numbers and transceiver slot location numbers (for example, location 1-8). Procedures may be set up to test consecutively 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.

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 may 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_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]** allows you to choose whether the software should read frequency information from the frequency table (set parameter to 0), or from the Initialization Screen (set parameter to 1). Setting this parameter to 1 will allow you to test one channel at a time. The default setting is 1. You must change it to 0 if you wish to use the frequency table.

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Select the **`Freq Channel Information`** field from the **`SET UP TEST SET:`** list. The Test Set will display the TESTS (Channel Information) screen.
3. Select the **`Channel#`** field.
4. Using the DATA ENTRY keys, enter the channel number and select it.
5. Select the **`Slot# (1-8)`** field.
6. Using the DATA ENTRY keys, enter the slot number (position on the shelf, 1-8), and select it.
7. Select the **`Test?`** field.
8. Press the knob to toggle the field to the desired response (**`Yes`** or **`No`**).
9. Press the **Menu** key or press the **k5** (**`Main Menu`**) key to return to the SOFTWARE MENU screen.

Handling Test Results

It is often desirable to record test results for future reference or evaluation. The Test Software provides the capability to save test results to a variety of destination devices. These are:

- A PC
- An SRAM card
- A serial printer
- A parallel printer
- An HP-IB printer

The capability to save test results remains on until you turn it off.

Sending Test Results to a PC Using the BTS Laptop Utility

Test results can be supplied directly to a PC through the Test Set's SERIAL 9 port (**figure 31**) using a laptop computer running the HP BTS Laptop Utility.

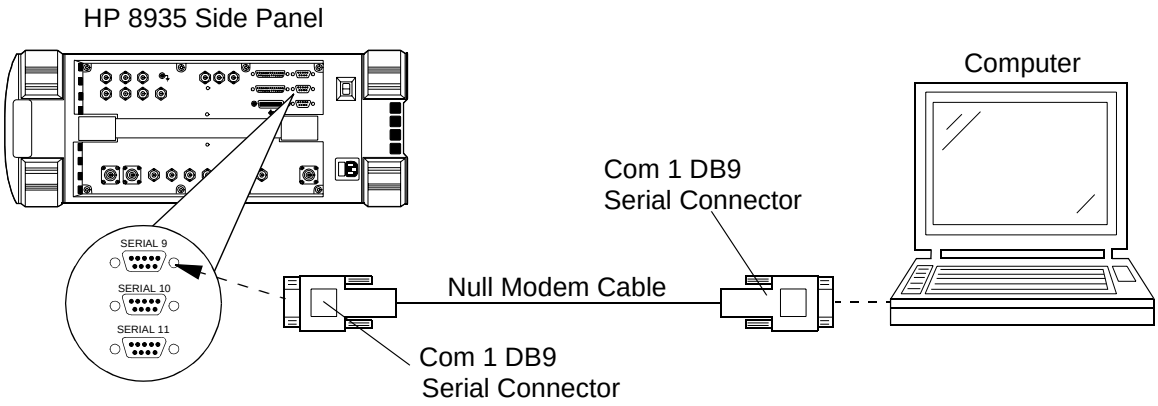


Figure 31 Test Set to PC Serial Connection

The requirements to save test results to a PC are as follows:

- The Test Set's SERIAL 9 port must be connected to the PC using a null modem cable.
- The configured BTS Laptop Utility must be running on the PC.
- The **`Use BTS Laptop Utility`** field in the Test Results/Laptop Util/Printer/ Serial Setup menu must be set to **`Yes`**.
- The Test Set's SERIAL 9 port communications parameters must be configured to match the communications parameters of the PC.

Configuring the PC Terminal Program.

Sending test results to a PC requires starting the BTS Laptop Utility on the PC, then setting the Test Software to use the utility.

Perform the setup as follows:

1. From the PC, start the BTS Laptop Utility program (**figure 32**).

Figure 32 **Starting the BTS Laptop Utility Program**

2. On the PC screen, click on the **`TR`** button to display the window in which the test results will be displayed (**figure 33**).

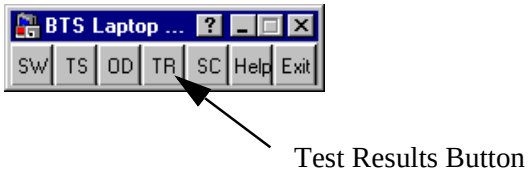


Figure 33 **Selecting the Test Results Window**

NOTE: The Test Software does not use communications with the Switch for testing purposes. Thus, you might find it advantageous to turn off the SW button in the BTS Laptop Utility tool bar. To do this, select the File Properties window in the BTS Utility, then add **-NoSwitch** at the end of the Shortcut Tab in the Target field.

3. On the PC screen, click on the **Preferences** field, then click on the **Comm Parameters** field to display the Comm Port Setup screen (**figure 34**).

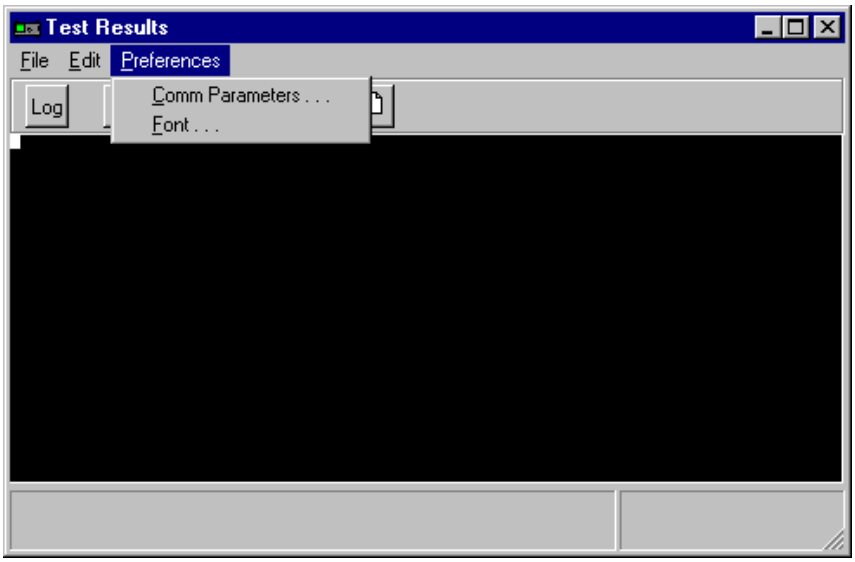


Figure 34 **Comm Port Setup Screen**

4. On the Comm Port Screen, set the Test Set's port to the serial port to which the null modem cable is connected on the Test Set (SERIAL 9).
5. On the Comm Port Setup screen, set the Test Set's baud rate to match the baud rate of the PC.

NOTE: If the rate is higher than 19200 baud, the Test Set's SERIAL 9 port flow control must be set to **Hardware**.

6. On the Comm Port Setup screen, set the Switch Port to **No Port**.

NOTE: The Test Software does not use communications with the Switch for testing. If you have already set the Shortcut Tab as shown in the note in step 2, step 6 will not be required. The **No Port** selection will not appear.

7. On the Comm Port screen, click on the **OK** button.

Sending the Results

To send test results to a PC, you must enable sending test results within the software. Do this as follows:

1. Connect the PC to the Test Set's SERIAL 9 port using a null modem cable.
2. On the Test Set, press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
3. On the Test Set, press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Initialization Screen.
4. On the Test Set, select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
5. On the Test Set, select the **`BTS Laptop Utility`** field so that the choice field toggles to **`Yes`**.

NOTE: If the Test Software does not change the field to **`Yes`**, see the BTS Laptop Utility help tool for hardware flow control. Also, make certain that you have completed all steps of this procedure correctly.

6. On the PC, start the BTS Laptop Utility program.
7. On the Test Set, select the **`Serial 9 Port Settings`** field. Verify that the communications parameters match those of the BTS Laptop Utility program.

The Test Set will send test results to the PC using the BTS Laptop Utility until you set the **`Use BTS Laptop Utility`** field to **`No`** in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Sending Test Results to a PC

Test results can be supplied directly to a PC (with a communications program) through the Test Set's SERIAL 9 port (**figure 35**). A variety of devices may be used to receive the data. An HP Palmtop computer, PC, laptop, or terminal may be used. A terminal emulator may be used to write the test results directly to a file. Examples of terminal emulator programs are Microsoft Windows Terminal and ProComm (a product of DataStorm Technologies, Inc.).

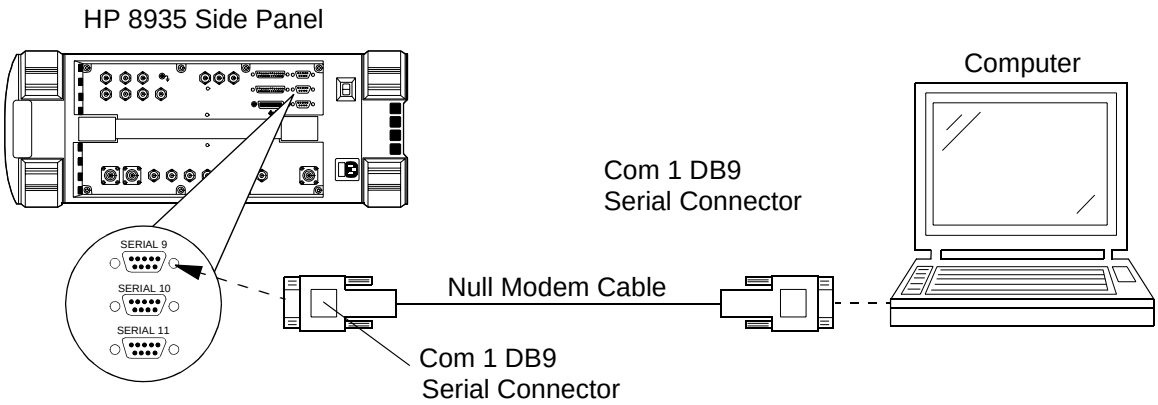


Figure 35 **Test Set to PC Serial Connection**

The requirements to save test results to a PC are as follows:

- The Test Set's SERIAL 9 port must be connected to the PC.
- A configured terminal program must be running on the PC.
- The Send Test Results to Serial 9 function must be activated in the Software.
- The Test Set's SERIAL 9 port communications parameters must be configured to match the communications parameters of the PC.

Configuring the PC Terminal Program

Sending test results to a PC requires that a configured terminal emulator be running while sending test results is enabled. See **figure 36** and **figure 37** for the detailed procedures required to configure a terminal program for saving test results to a PC.

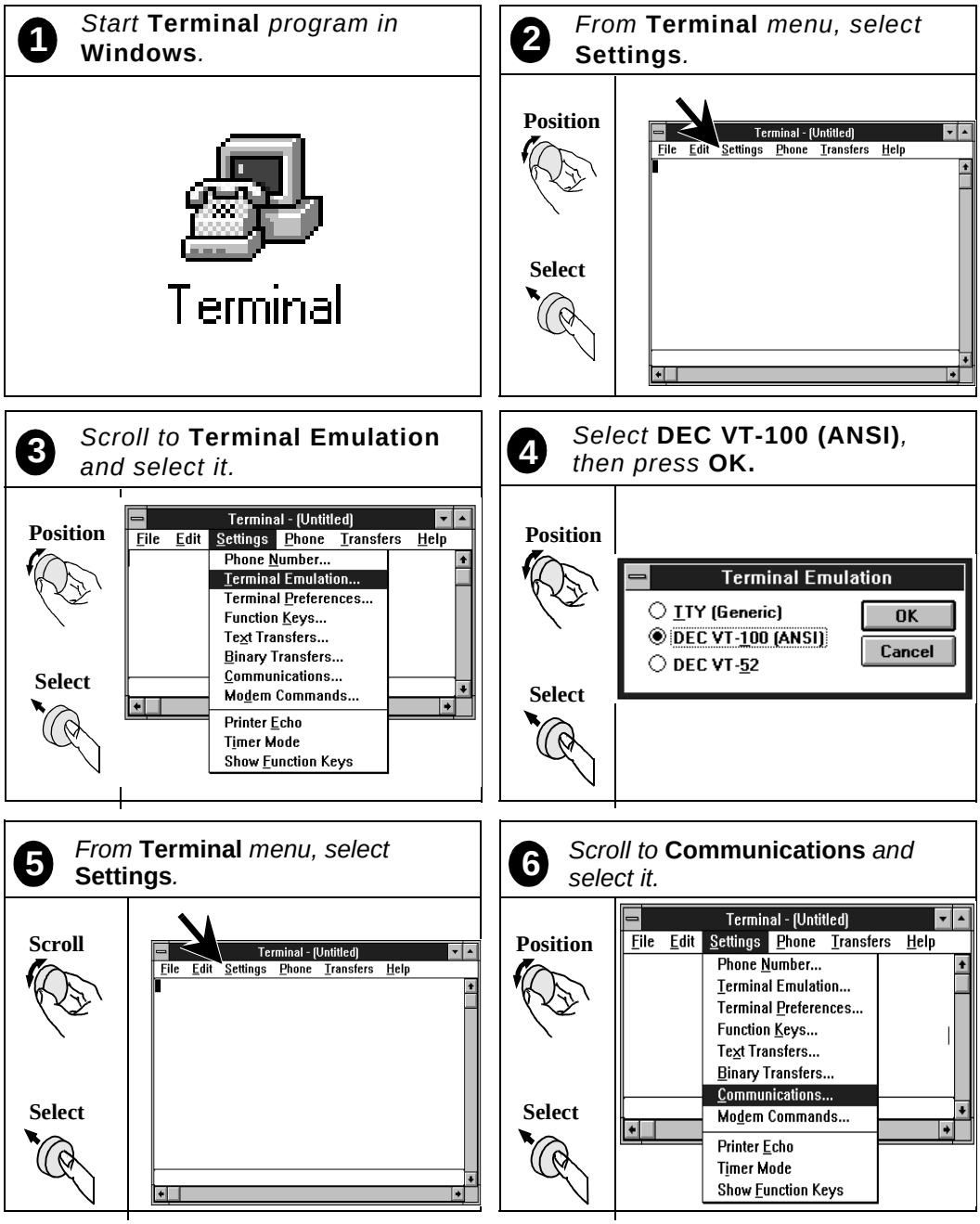
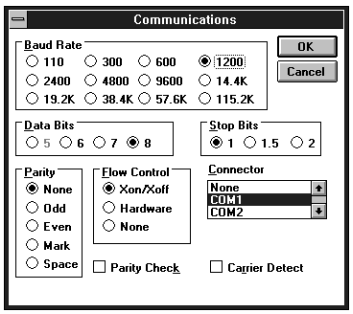


Figure 36 **Configuring a Terminal Program for Sending Test Results to a PC**

7 *Edit menu to match Test Set settings on* **IO CONFIGURE** *screen.*

Enter

Select



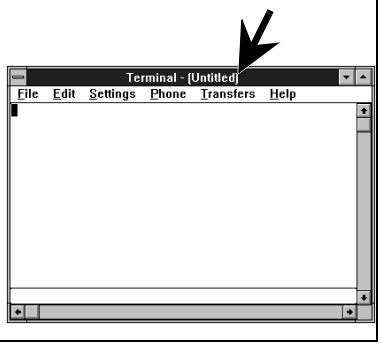
Example Communications Setup:

Connector: COM1 (remember to use your own settings!)
Baud Rate: 9600
Data Bits: 8
Parity: None
Flow Control: Xon/Xoff
Stop Bits: 1
Parity Check and Carrier Detect: both unchecked

8 *From Terminal menu, select* **Transfers**.

Enter

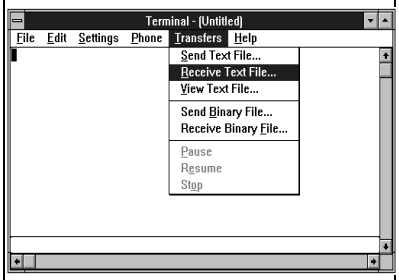
Select



9 *Scroll to* **Receive text file...** *and select it.*

Enter

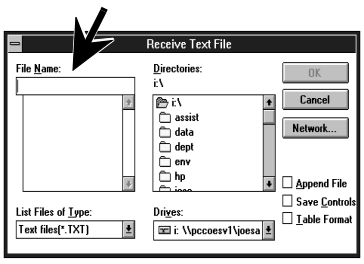
Select



10 *Enter path and filename of file that you wish to save.*

Enter

Select



After configuring the personal computer to receive the measured data, you must turn on Test Results in the Test Set and verify that the I/O Configuration screen communications parameters match those of the Windows terminal.

Figure 37 Configuring a Terminal Program for Sending Test Results to a PC (continued)

Sending the Results

To send test results to a PC, you must enable sending test results within the software. Do this as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Initialization Screen.
3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
4. Verify that the **Use BTS Laptop Utility** field is toggled to **No**.
5. Select the **Send Test Results to** field, then select **Serial 9** from the **Choices:** list.
6. Start the terminal program.
7. Select the **Serial 9 Port Settings** field. Verify that the communications parameters match those of the terminal program.

NOTE: When you have configured the Test Set to send the data to a PC, you must remember to activate the communication package and specify a file in which to save the data. The Test Set will not issue an error message if the PC communications application is not running or configured properly.

The Test Set will send test results to the PC until you turn off the **Send Test Results to** field in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Sending Test Results to an SRAM Card

To send test results to an SRAM card, you must enable the Sending Test Results to a PC Card function within the software. The Test Set will create test result files on the SRAM card automatically, based on the name that you enter at the start of testing. The Test Software will append ".txt" to your file name so that the files will be recognized on the SRAM card.

NOTE: Do not remove the card or stop the test during testing operations while sending test results to an SRAM card. If you do so, the files will not be closed properly and the test results will be lost.

Once testing is complete and the test results are in files on the SRAM card, perform the procedure outlined in **"Retrieving Data from an SRAM Card" on page 106** to transfer the data to a PC or printer.

NOTE: Before attempting to send test results to an SRAM card, verify that the card is not write-protected. The write-protect switch should not be set toward the edge of the card.

Send test results to an SRAM card as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Initialization Screen.
3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
4. Insert an SRAM card into the front panel card slot. If the card is uninitialized, see **"Initializing a PC Card" on page 118**.
5. Select the **`Send Test Results to`** field, then select **`PC Card`** from the **`Choices:`** list.
6. The Test Set will display a message asking for a file name under which to store the test results. Enter a name using the characters from the **`Choices:`** list. Select **`Done`** when finished.

The Test Set will send test results to the SRAM card until you turn off the **`Send Results to`** field in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

When the test is completed, the Test Set will close the file on the SRAM card and will change the Send Test Results to field in the Test Results/Laptop Util/Printer/Serial Setup menu screen from PC Card to Off. Thus, each time you run the test and wish to record the results to the SRAM card, you must open the Test Results/Laptop Util/Printer/Serial Setup menu and enter a new file name as outlined above.

Retrieving Data from an SRAM Card

Use the software utility (FILE_XFER), which is included in the Test Set to transfer data files from the memory card to a serial printer, an HP-IB printer, or a PC.

NOTE: Loading and running the utility to perform these procedures will replace any software and procedures in the Test Set's internal RAM. Thus, the Test Software must be reloaded when this procedure is complete. This requires that you have the Test Software PC card with you on-site.

Transferring Data to a Printer Via the SERIAL 9 Port or the HP-IB Port

Transfer data to a printer via the SERIAL 9 port or HP-IB port as follows:

1. If the Test Software is running, exit it from the Initialization Screen by pressing the **Shift** and **Pause/Continue (Reset)** keys, then the **k5** (**`Main Menu`**) key.
2. Make certain that the printer is turned on and set up to print when the data is sent to the Test Set's SERIAL 9 port or HP-IB port.
3. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
4. Select the **`Select Procedure Location:`** field. The Test Set will display a **`Choices:`** list containing the following items: **`Card`**, **`ROM`**, and **`RAM`**.
5. Select **`ROM`**. This allows the loading of various utility programs resident in the Test Set.

NOTE: In the following step, the items in the **`Choices:`** list are as shown on the printing date of this manual. However, this list could change in later versions of the Test Software.

6. Select the **`Select Procedure Filename:`** field. The Test Set will display a **`Choices:`** list containing the following items: **`SERVICE4`**, **`RFTOOLS`**, **`IB_UTIL`**, **`LISTOPTS`**, **`ST_PLT`**, and **`DEMO`**.
7. Select **`IB_UTIL`**.
8. Press the **k1** (**`Run Test`**) key to run the utility software. The Test Set will display a the IB_UTIL menu on the TESTS (IBASIC Controller) screen.
9. Select the **`FILE_XFER`** field. The Test Set will prompt you to insert the SRAM card that contains the test result files.

10. Insert the card and select the **`Continue`** field. The Test Set will display the file transfer menu.
11. If using a serial printer, select the **`Output Port`** field and press the knob to select **`Serial Port, 9600 baud`**. This configures the Test Set to send the data via the SERIAL 9 port at 9600 baud.

    If using an HP_IB printer, select the **`Output Port`** field and press the knob to select **`HPIB, Addr 7xx`**. This configures the Test Set to send the data via the HP_IB port.
12. Scroll down the list of file names to the file that you wish to transfer and select it. An asterisk (*) will appear next to the name. You may send more than one file at a time. Scroll to and select any other files that you wish to transfer.

NOTE: All files on the SRAM card are displayed, not just the test result files. If you attempt to transfer files that are not test result data, unexpected results at the printer might occur. Also, transferring code files can result in many pages of code being printed. Look for files with ".txt" appended to the name, which indicates test result files.

13. When all files to be transferred have been selected, select the **`Start Transfer`** field. The data will be sent to the printer via the SERIAL 9 or HP-IB port.
14. When printing is complete, you may select other files to transfer or exit the software utility by selecting the **`Exit Data-Collection-File-Transfer`** field.
15. To return to the Test Software again, press the **k1** (**`Run Test`**) key from the SOFTWARE MENU screen.

Transferring Data to a PC Via the SERIAL 9 Port

Transfer data to a PC via the SERIAL 9 port as follows:

1. If the Test Software is running, exit it from the Initialization Screen by pressing the **Shift** and **Pause/Continue (Reset)** keys, then the **k5** (**Main Menu**) key.
2. Connect the Test Set to your PC using the SERIAL 9 port and a null modem cable.
3. Load a PC software utility for communicating on the PC's serial port such as Microsoft Windows Terminal.
4. Configure the PC software to prepare the PC to receive a text file via the serial port.
5. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
6. Select the **Select Procedure Location:** field. The Test Set will display a **Choices:** list containing the following items: **Card**, **ROM**, and **RAM**.
7. Select **ROM**. This allows the loading of various utility programs resident in the Test Set.
8. Select the **Select Procedure Filename:** field. The Test Set will display a **Choices:** list containing the following items: **SERVICE4**, **RFTOOLS**, **IB_UTIL**, **LISTOPTS**, **ST_PLT**, and **DEMO**.
9. Select **IB_UTIL**.
10. Press the **k1** (**Run Test**) key to run the utility software. The Test Set will display a the IB_UTIL menu on the TESTS (IBASIC Controller) screen.
11. Select the **FILE_XFER** field. The Test Set will display a prompt to insert the SRAM card that contains the test result files.
12. Insert the card and select the **Continue** field. The Test Set will display the file transfer menu.
13. Select the **Output Port** field and press the knob to select **Serial Port, 9600 baud**. This configures the Test Set to send the data via the SERIAL 9 port at 9600 baud.

14. Scroll down the list of file names to the file that you wish to transfer and select it. An asterisk (*) will appear next to the name. You may send more than one file at a time. Scroll to and select any other files that you wish to transfer.

NOTE: All files on the SRAM card are displayed, not just the test result files. If you attempt to transfer files that are not test result data, unexpected results at the printer might occur. Also, transferring code files can result in many pages of code being printed. Look for files with ".txt" appended to the name, which indicates test result files.

15. When all files to be transferred have been selected, select the **`Start Transfer`** field. The data will be sent to the PC via the serial port.

16. When data transfer is complete, you may select other files to transfer or exit the software utility by selecting the **`Exit Data-Collection-File-Transfer`** field.

17. To return to the Test Software again, press the **k1** (**`Run Test`**) key from the SOFTWARE MENU screen.

Stop Sending Test Results to a PC or an SRAM Card

Stop sending test results to a PC or SRAM card as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Initialization Screen.
3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
4. Select the **`Send Test Results to`** field, then select **`Off`** from the **`Choices:`** list.

Sending Test Results to a Serial Printer

Test results may be sent directly to a printer through the Test Set's SERIAL 9 port. To do so, you must enable sending test results to the printer within the software.

Send test results to a serial printer as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Initialization Screen.
3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
4. Select the **`Send Test Results to Printer at`** field, then select **`Serial 9`** from the **`Choices:`** list.
5. Connect the serial printer to the Test Set's SERIAL 9 port (see **figure 38 on page 111**).

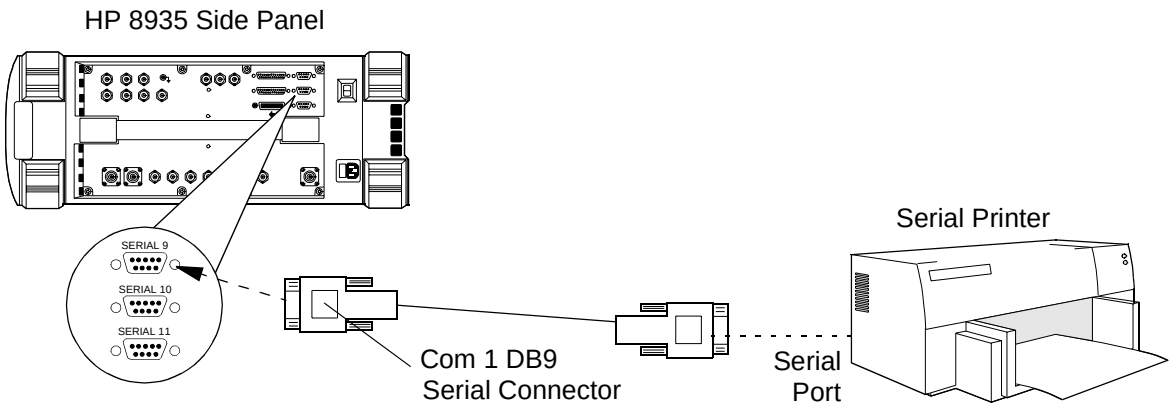


Figure 38 **Test Set to Serial Printer Connection**

6. Select the **`Print Setup`** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

7. Set the following parameters:
   - Lines/Page
   - Form Feed (Start and End)
   - Printer Model

The Test Set will send test results to the serial printer connected to the SERIAL 9 port until you turn off the **`Send Test Results to Printer at`** field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Sending Test Results to a Parallel Printer

Test results may be sent to a parallel printer through the Test Set's PARALLEL 15 port. To do so, you must enable sending test results to the printer within the software.

NOTE: Because a parallel printer and an HP 83202A Switch Matrix both receive information from the Test Set via the PARALLEL 15 port, it is not possible to use the two devices at the same time. If your test plan requires both the Switch Matrix and printed test results data, you might use either a serial or an HP-IB printer, or collect the data to a PC for later printing.

Send test results to a parallel printer as follows:

1. Press the Menu key. The Test Set will display the SOFTWARE MENU screen.
2. press the k1 (**`Run Test`**) key to start the Test Software. The Test Software will display the Initialization Screen.
3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
4. Select the **`Send Test Results to Printer at`** field, then select **`Parallel 15`** from the **`Choices:`** list.
5. Connect the parallel printer to the Test Set's PARALLEL 15 port (see **figure 39**).

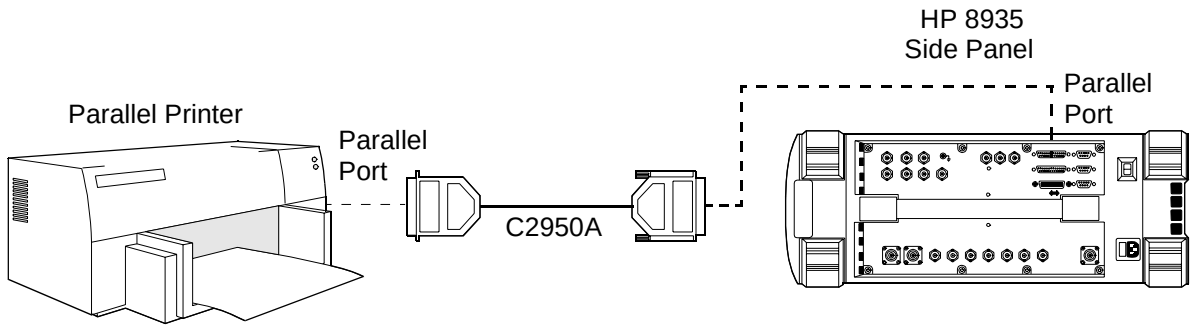


Figure 39 **Test Set to Parallel Printer Connection**

6. Select the **`Print Setup`** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

7. Set the following parameters:
   - Lines/Page
   - Form Feed (Start and End)
   - Printer Model

The Test Set will send test results to the parallel printer connected to the PARALLEL 15 port until you turn off the **`Send Test Results to Printer at`** field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Sending Test Results to an HP-IB Printer

Test results may be sent to an HP-IB printer through the Test Set's HP-IB port. To do so, you must enable sending test results to the printer within the software.

Send test results to an HP-IB printer as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Initialization Screen.
3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
4. Select the **`Send Test Results to Printer at`** field, then select **`HP-IB 701`** from the **`Choices:`** list. Edit the three-digit HP-IB address (the default is 701) in the address field at the right of **`HP-IB`**.
5. Connect your HP-IB printer to the Test Set's HP-IB port (see **figure 40**).

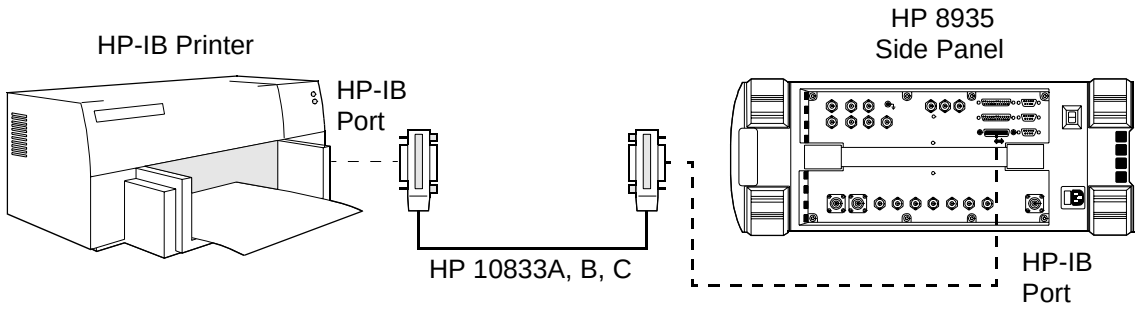


Figure 40 **Test Set to an HP-IB Printer Connection**

6. Select the **`Print Setup`** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.
7. Set the following parameters:
   - Lines/Page
   - Form Feed (Start and End)
   - Printer Model

The Test Set will send test results to the HP-IB printer connected to the HP-IB port until you turn off the **Send Test Results to Printer at** field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Stop Sending Test Results to a Printer

Stop sending test results to a printer as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Initialization Screen.
3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.
4. Select the **Send Test Results to Printer at** field, then select **Off** from the **Choices:** list.

Initializing a RAM Disk

RAM disk is a section of Test Set's internal memory that acts much like a flexible disk. Programs in this area of memory may 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 may 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 TESTS (IBASIC Controller) screen, enter the following:

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

NOTE: Any existing programs or formatting on RAM is erased if you use the RAM_MANAGER program to initialize a RAM disk. Therefore, you should use RAM disks only for short-term storage of files.

Each RAM disk volume must be initialized before it can be used. Volume 0 can be initialized using the RAM_MANAGER program from the IB_UTIL menu. Volumes 1, 2, and 3 must be initialized from the TESTS (IBASIC Controller) screen.

NOTE: Use only Volume 0 for storing procedures.

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

Initialize volumes 1, 2, or 3 as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Select the **IBASIC IBASIC Cntrl** field from the **SET UP TEST SET:** list.
3. Position the cursor to the data entry field at the top of the screen and select it.
4. From the list of characters in the **Choices:** list, enter the following command:

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

   Select **Done** when finished.
5. Press the **k1** (**Run**) key.

Initializing a PC Card

A new PC card or a card from which the battery has been removed and replaced must be initialized before it may be used. This section provides information on the initialization procedure.

Initialize a card as follows:

1. Insert the card into the Test Set's card slot.
2. Press the **Shift** key then the **Inst Config (I/O Config)** key. The Test Software will display the I/O CONFIGURE screen.
3. Select the **`Format Card`** field. The Test Software will display the message: **`Erase and format the PCMCIA Card? (YES/NO)`**.
4. If you wish to format the card, press the DATA ENTRY **Yes On/Off** key. The Test Set will format the card. Formatting is complete when the cursor stops blinking.

   If you do not wish to format the card, press the DATA ENTRY **No ppm W** key.

Operating the Test Set

This section provides information that will help you to operate the Test Set easily and efficiently. It includes a basic overview of the functions of groups of the more commonly used functions. It does not include detailed operation information on those functions. For detailed information on the operation of the display and the various keys and other controls, see the *HP 8935 Series E6381A TDMA Base Station Test Set Reference Guide* or the *HP 8935 Series E6380A CDMA Base Station Test Set Reference Guide*, as appropriate.

NOTE: Some Test Set's keys include a second title printed in blue above the key. This indicates a *shift* function. Press the blue **Shift** key, then the subject key to activate the title function. For instance, the title "Reset" appears above the **Pause/Continue** key. To reset the Test Software, press the **Shift** key, then the **Pause/Continue (Reset)** key.

Screens

The various operation screens of the Test Software are accessible through several methods, as described in the following paragraphs.

Access the screens to modify test procedures from the **CUSTOMIZE TEST PROCEDURE:** list in the lower section of the SOFTWARE MENU screen. These screens are:

- TESTS (Channel Information) -- Access this screen to verify or change the information in the frequency table.
- TESTS (Test Parameters) -- Access this screen to verify or change the values of parameters used in the TESTs.
- TESTS (Order of Tests) -- Access this screen to verify or change the TESTs complement or order in which TESTs will be performed.
- TESTS (Pass/Fail Limits) -- Access this screen to verify or change the values of pass/fail limits used in the TESTs.
- TESTS (Save/Delete Procedure) -- Access this screen to save procedures to the Test Set's internal RAM or an SRAM card, or delete procedures from those same locations.

For more information on these screens, see **"Frequency Table" on page 96** and **"Customizing Test Procedures" on page 84**.

NOTE: Four additional screens are ordinarily used to configure and set up the Test Set for operation from the **SET UP TEST SET:** list in the lower section of the SOFTWARE MENU screen. These screens are:

TESTS (Execution Conditions)
TESTS (External Devices)
TESTS (Printer Setup)
and
TESTS (IBASIC Controller)

These screens **are not used** in the Test Software. All relevant functions in these screens are set by other means, such as parameters, in the Test Software.

Access the Initialization Screen, from which all operations inside the Test Software are invoked, from the SOFTWARE MENU screen by selecting the **Run Test** field or pressing the **k1** (**Run Test**) key. For detailed information on this screen, see **"Setting up the Test Software" on page 38**.

NOTE: If you select the screen title bar at the top of the SOFTWARE MENU screen the Test Software will display a menu listing the ancillary operation screens. These screens are not used by the Test Software.

SOFTWARE Keys

The SOFTWARE keys (see **figure 41**), Menu and Pause/Continue (Reset), control the basic start/pause/stop functions of the Test Set and Test Software.

Press the **Menu** key to display the SOFTWARE MENU screen, which is the screen from which all Test Set operations start.

Press the **Pause/Continue** key to pause the Test Set's or Test Software's operation, then press it again to re-start the operation at the same place.

Press the **Shift** key, then the **Pause/Continue (Reset)** key to reset the Test Set or Test Software.

NOTE: The Test Software cannot be "continued" after the **Shift** and **Pause/Continue (Reset)** keys have been pressed. Press these keys only if the Test Software must be stopped and pressing the **Pause** key does not do so.

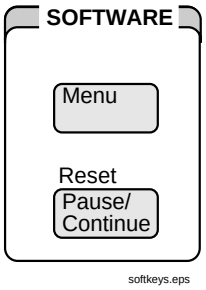


Figure 41 SOFTWARE Keys

USER Keys

The five USER keys, **k1** through **k5** (see **figure 42**), are programmable and control various functions according to current activities in the Test Software. The keys are listed along with the programmed functions in the right-hand section of appropriate screens. Only appropriate keys are shown in each screen instance. You may use these keys for more efficient operation instead of positioning the cursor to an item and pressing the knob.

NOTE: Each USER key includes a second title printed in blue above the key. This *shifted* function is part of the key programmability. However, currently, no USER key *shifted* functions are used in the Test Software.

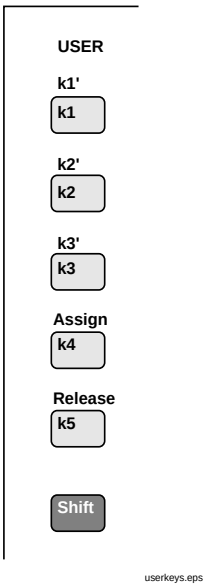


Figure 42 USER Keys

DATA ENTRY Keys

The DATA ENTRY keys include the **0** through **9** number keys plus the associated keys required for entering number values and the various characteristics of those values **figure 43**. (Note that a number of the DATA ENTRY keys are *shifted* keys.)

Although it is obviously not a key, the cursor control/entry knob is also located in the DATA ENTRY section of the Test Set's front panel for convenience. Turn the knob to position the cursor, then press the knob to select the item indicated by the cursor.

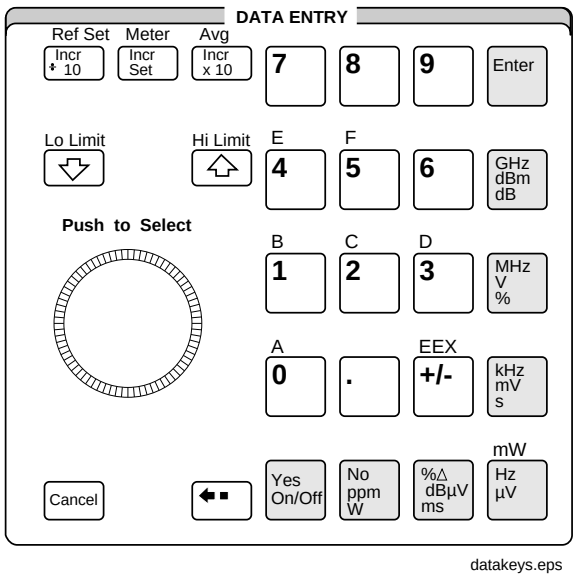


Figure 43 **DATA ENTRY Keys**

GENERATOR/ANALYZER Keys

The GENERATOR/ANALYZER keys invoke the various testing tools, and are not used by the Test Software.

NOTE: Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results could occur.

STATE Keys

The STATE keys allow user control over certain Test Set operational states, and are not used by the Test Software.

NOTE: Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results could occur.

UTILS Keys

The UTILS keys provide the means to reach certain functions that control utilitarian aspects of Test Set operation, and are not used by the Test Software.

Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results could occur.

RS-232 Switch

To reduce the time required for measurements, you might elect to use the optional RS-232 Switch. (The RS-232 Switch is produced by Black Box Corporation, of Pittsburgh, PA.) Through this switch, the Test Software can select and control automatically any one of as many as 64 transceivers at a site to be tested. This section describes the switch units and provides information on using the units.

There are two types of RS-232 Switch units: Master and Expansion. A Master RS-232 Switch unit (Black Box Corporation part number: SW056A) can select and provide control among as many as 16 transceivers and is always used for the first 16 transceivers at a site. For a site with as many as 32 transceivers, an Expansion RS-232 Switch unit (Black Box Corporation part number: SW057A) is added as a slave to the master unit. For a site with as many as 48 transceivers, a second expansion unit is added. For a site with as many as 64 transceivers, a third expansion unit is added. This expansion arrangement provides for sites with any number of 1 through 16, 1 through 32, 1 through 48, or 1 through 64 transceivers.

The Master RS-232 Switch uses code-based switching to ensure proper acceptance of control functions and data. When the selection switches on the unit are set properly for the application, secure remote control is effected by the Test Software.

For proper operation, the switches must be set to select the following operating parameters:

- **Prefix Code Repetition** – 1
- **Broadcast Mode** – Off
- **Baud Rate Select** – 9,600 bps
- **Prefix Code** – SYN (Ctrl V)
- **Parity** – No parity

With these settings, the RS-232 Switch will react on the first receipt of the prefix code SYN, in single transceiver mode, with a baud rate of 9,600 bps, and with no parity. For more information on the RS-232 Switch and its settings, see the *Code Operated Switch - 16 (Master and Expansion) manual* from Black Box Corporation.

The Test Set communicates with the RS-232 Switch via the Test Set's SERIAL 10 port and a null modem cable. The RS-232 Switch communicates with each of the transceivers via a special test cable. Connections are as shown in **figure 8 on page 68** and **figure 9 on page 69**.

Using an RS-232 Switch

To use an RS-232 Switch, connect a null modem cable between the Test Set's SERIAL 10 port and the MODEM connector on the RS-232 Switch, and connect the special transceiver cables to the PORT 1 through PORT 16 connectors on the switch, as shown in **figure 6 on page 66**, **figure 8 on page 68**, **figure 9 on page 69**, **figure 11 on page 72**, and **figure 12 on page 73**. See **table 3 on page 78** for the pinout of the null modem and special cables. If the site includes more than 16 transceivers, use an Expansion RS-232 Switch (or two, or three, Expansion RS-232 Switches) so as to test as many as 32, 48, or 64 transceivers. Connect each expansion unit to the Master RS-232 Switch and connect the transceiver cables to the appropriate PORT connectors on the expansion unit or units.

All cables will remain connected during the test process, and the Test Software will command the RS-232 Switch unit to switch the signals as required.

NOTE: Using an RS-232 Switch requires cables that you must supply. These are:

One selection/control cable for connecting the Test Set to the RS-232 Switch.

One special test cable for each transceiver. If you wish to connect 16 transceivers, 16 special test cables will be required.

See **"RS-232 Switch" on page 125** for pinout and other information that may be used to construct these cables.

AC power must be supplied to the RS-232 Switch. Plug the supplied power cord into any standard AC power receptacle, then turn on the power switch on the rear of the unit.

Procedure for Using the RS-232 Switch

To use the RS-232 Switch, you must configure the Test Software to recognize the device. The Test Software will then control the transceivers automatically, as required during testing.

Configure the Test Software for operation with the RS-232 Switch as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Select the **Select Procedure Location:** field, then select **Card** from the **Choices:** list.
3. Select the **Select Procedure Filename:** field and select the desired procedure.
4. Select the **Freq Channel Information** field. The Test Software will display the TEST (Channel Information) screen.
5. Enter the appropriate channel and slot numbers.
6. Press the k5 (**Main Menu**) key to return to the SOFTWARE MENU screen.
7. Select the **Parm Test Parameters** field. The Test Software will display the TEST (Test Parameters) screen.
8. Select **Parm# 2** and set the value to 0.
9. If you wish to test at the combiner so that you need not disconnect and reconnect the transmitter antenna cable, select **Parm# 42** and set the value to 1.
10. The Test Software default mode is to stop on a failure. If you do not wish for it to stop on failure, select **Parm# 4** and set the value to 0.
11. Press the k5 (**Main Menu**) key to return to the SOFTWARE MENU screen.
12. Press the **k1** (**Run Test**) key. The Test Software will display the Initialization Screen.
13. Select the **Utilities** field. The Test Software will display the Utilities Menu.
14. Check the **RS-232 Switch Control** field. If it is set to **Off**, press the knob to toggle it to **On**. The **RS-232 Switch Path to** field will appear immediately below.
15. Select the **RS-232 Switch Path to** field. The slot number selected on the Initialization Screen should appear in the field to the right. If you wish to verify that the RS-232 Switch has been connected correctly and is operating properly, you may turn the knob until the slot number of another transceiver appears in the field immediately to the right. Press the knob to select that transceiver and observe the indicators on the RS-232 Switch. After checking switch operation, make certain to set this field to the same transceiver as set on the Initialization Screen.

NOTE: The purpose of this field is to check the operation of the RS-232 Switch only. It is not to select the transceiver to test. It is good practice to verify that the RS-232 Switch is connected properly. Use this field for that purpose.

16. Select the **`Return`** field. The Test Software will display the Initialization Screen again.

17. Verify that all settings on this screen are correct.

18. Press **k1** (**`Begin Tst`**). The Test Software will initiate the tests.

Splitter or Switch Matrix

To reduce the number of cable connections and reduce the time required for measurements, you might elect to use any of three optional devices: a Splitter, the HP 83202A Switch Matrix, or the HP 3488 Switch Matrix. Any of these may be used to connect to all six receiver antenna connectors at once. This section provides detailed information on using a Splitter or Switch Matrix.

Using a Splitter

To use a Splitter, simply connect it as shown in **figure 4 on page 64**, **figure 5 on page 65**, and **figure 7 on page 67**. All cables will remain connected during the test process, and all signals will be applied at all times.

Using an HP 83202A Switch Matrix

NOTE: If you wish use an HP 83202A Switch Matrix (HP Part Number: 83202A K02), make certain that you also have available the Switch Matrix Adapter (HP Part Number: 83202A K12) and the DB25-to-Centronics control cable (HP Part Number: C2951A)to allow the Test Set to control the Switch Matrix.

To use the HP 83202A Switch Matrix, connect the DB25-to-Centronics switch control cable between the Switch Matrix and the Test Set's PARALLEL 15 port, and connect the Base Station cables as shown in **figure 4 on page 64**, **figure 5 on page 65**, and **figure 7 on page 67**. All cables will remain connected during the test process, and the Test Software will switch the signals as required.

DC power must be supplied to the Switch Matrix. The Switch Matrix Adapter supplied with the Switch Matrix converts AC line voltage to the DC level (24 volts) required by the Switch Matrix. Connect the 24-volt plug to the Switch Matrix power connector and insert the AC power plug into any standard AC power receptacle.

Using an HP 3488 Switch Matrix

To use an HP 3488 Switch Matrix, connect the HP-IB switch control cable (supplied with the Switch Matrix) between the Switch Matrix and the Test Set, and connect the Base Station cables as shown in **figure 4 on page 64**, **figure 5 on page 65**, and **figure 7 on page 67**. All cables will remain connected during the test process, and the Test Software will switch the signals as required.

AC power must be supplied to the Switch Matrix. Plug the supplied power cord into any standard AC power receptacle.

Procedure for Using the Splitter or Switch Matrix

To use the Splitter or Switch Matrix, you must configure the Test Software to recognize the device. If you are using a Splitter, the connections remain fixed and the Test Software will handle the testing accordingly. If you are using a Switch Matrix, the Test Software will change the antenna connections automatically, as required during testing.

Configure the Test Software for operation with the Splitter or Switch Matrix as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Select the **`Select Procedure Location:`** field, then select **`Card`** from the **`Choices:`** list.
3. Select the **`Select Procedure Filename:`** field and select the desired procedure.
4. Press the **k1** (**`Run Test`**) key. The Test Software will display the Initialization Screen.
5. Select the **`Utilities`** field. The Test Software will display the Utility Menu.

6. Select the **Antenna Switch Control** field, then select the desired connection method from the **Choices:** list.

   If you wish to use a Splitter, select the **Splitter** field, then select the **Return** field. The Test Software will display the Initialization Screen again so that you may run the test. No further actions are necessary regarding the Splitter.

   If you wish to use the HP 83202A Switch Matrix, select the **HP83202A** field. The Test Software will display an information prompt that indicates the Switch Matrix setting and allows you to change it if you wish. Proceed to the next step.

   If you wish to use the HP 3488 Switch Matrix, select the **HP3488 709** field, then insert the HP-IB address into the field immediately to the right. The Test Software will display a prompt regarding Test Set control. Follow the on-screen instructions. Proceed to the next step.

7. Select the **Return** field. The Test Software will display the Initialization Screen again.

8. Press **k1** (**Begin Tst**). The Test Software will initiate the tests.

Securing/Unsecuring Procedures

This section describes the processes for securing and un-securing a procedure.

NOTE: If a procedure is located in the Test Set's RAM, securing that procedure will result in initializing a section of the RAM. See **"Initializing a RAM Disk" on page 117**.

NOTE: Loading and running the utility to perform these procedures will replace any software and procedures in the Test Set's internal RAM. Thus, the Test Software must be reloaded when this procedure is complete. This requires that you have the Test Software PC card with you on-site.

Securing a Procedure

After you have set up your Test Software with a testing order, channel information, test parameters, and pass/fail limits, thereby creating a procedure, you may wish to secure it. This will prevent the viewing and changing of those functions. In this process, you may select the items that you wish to secure. Use the IBASIC SECURE_IT program in the Test Set's ROM to do this.

You might wish to secure the procedure that is supplied with the Test Software. It is shipped unsecured.

Secure a Procedure as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Select the **`Select Procedure Location:`** field. The Test Set will display a **`Choices:`** list.
3. Select **`ROM`**.
4. Select the **`Select Procedure Filename:`** field. The Test Set will display a **`Choices:`** list.
5. Select **`IB_UTIL`**.
6. Press the **k1** (**`Run Test`**) key. The Test Set will display the IB_UTIL menu.
7. Select the **`SECURE_IT`** field. The Test Set will display a menu containing two possible locations (**`Card`** or **`RAM`**).
8. Select the location of the procedure that you wish to secure.

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 a RAM Disk" on page 117**.

9. Proceed with the on-line instructions. You might wish to secure only one of the items, such as pass/fail limits.
10. When prompted to enter the pass number (password), enter any sequence of 9 or less numerals using the DATA ENTRY keys. The numerals may be 0 through 9 in any order.

Unsecuring a Procedure

After you have secured a procedure, you may unsecure it. In this process, you may select the items that you wish to unsecure. Use the IBASIC SECURE_IT program in the Test Set's ROM to do this. To unsecure a procedure, you must know the pass number.

Unsecure a procedure as follows:

1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.
2. Select the **`Select Procedure Location:`** field. The Test Set will display a **`Choices:`** list.
3. Select **`ROM`**.
4. Select the **`Select Procedure Filename:`** field. The Test Set will display a **`Choices:`** list.
5. Select **`IB_UTIL`**.
6. Press the **k1** (**`Run Test`**) key. The Test Set will display the IB_UTIL menu screen.
7. Select the **`SECURE_IT`** field. The Test Set will display a menu containing two possible locations (**`Card`** or **`RAM`**).
8. Select the location of the procedure that you wish to unsecure.
9. Enter the name of the procedure that you wish to unsecure.

NOTE: If the procedure includes any item that is secured, you will be prompted for the **`pass number`**.

10. Proceed with the on-line instructions. Select the items that you wish to unsecure.
11. When prompted, enter the pass number using the DATA ENTRY keys.

Utilities

The Test Software contains utilities that are useful to both general testing and advanced testing operations. These utilities are described in this section.

Cable Loss Test

The accuracy of RF power measurements and receiver sensitivity measurements is affected by the losses in cables, Switch Matrixes, attenuators, and other such items that connect the transceiver and the Test Set. The cable loss test allows the Test Set to measure and store the loss associated with the cables and other devices to be used during testing. The Test Set thus can provide greater accuracy by accounting for these losses in later tests.

At the start of each procedure, a text box containing cable loss information appears across the lower section of the Initialization Screen. If new or different cable loss information is available, change values as follows:

1. On the Initialization Screen, select the **RX and TX Cable Loss** field. The Test Software will display the Cable Loss Screen.
2. On the RX and TX Cable Loss Menu, select the value of interest among the following fields: **RX1 Cable Loss (dB)** through **RX6 Cable Loss (dB)** and **TX Cable Loss (dB),** and enter the new value by either using the DATA ENTRY keys or turning and pressing the knob.
3. Repeat step 2 for any other loss values to be changed.
4. Press the **k5** (**Return**) key to return to the Initialization Screen.

If new cable or other device loss information is not available, but changes are required, measure such losses as follows:

1. On the Initialization Screen, select the **RX and TX Cable Loss** field. The Test Software will display the Cable Loss Screen.
2. Select the **Measure Cable Loss** field. The Test Software will display a cable connection diagram.

NOTE: In the measurement process, you will require a cable, or perhaps two cables, to connect the device to be measured to the Test Set. This cable (or cables) is (are) referred to as the calibration cable. The Test Software must have in memory the loss value for the cable(s) so as to be able to test accurately the device to be measured.

3. Connect the calibration cable as shown on the diagram, then press the **k1** (**Proceed**) key. The Test Software will measure the calibration cable, then display another cable connection diagram that includes the addition of a cable to be tested.

NOTE: The second connection diagram depicts a cable as the device to be measured. Although a cable is the most common device to be measured, there are other devices that you might wish to measure. These include switches (including a Switch Matrix), attenuators, and such. Each device may be measured individually, or, for instance, if a cable and switch are to be used together, those items may be connected together and the Test Software will measure the loss value through the combination. You may then save that value in the appropriate field.

4. Connect the cable or other device to be measured to the calibration cable and the Test Set as shown on the diagram, then press the **k1** (**Proceed**) key. The Test Software will measure the loss of the cable or other device and display the Cable Loss (dB) menu. The loss will be displayed near the top of the menu.
5. Select the relevant cable location among the fields shown below the value and press the knob to save the value. If the same value is applicable to other fields, repeat this step for each of those.
6. To test another cable or other device, select the **Repeat or Test next cable** field from the menu and repeat steps 3 and 4. Continue until all cables and devices are measured and all values are saved.
7. Press the **k5** (**Return**) key to return to the Cable Loss Screen.
8. Press the **k5** (**Return**) key to return to the Initialization Screen.

NOTE: The cable loss test information text box will appear on the Initialization Screen any time that a procedure is selected. This serves as a procedural reminder because cable loss values are required in the testing procedure.

The cable loss values stored during this test may be changed at the start of any procedure.

Laptop Emulator

The Laptop Emulator utility provides for sending individual control commands to the Cell Site Base Station. Using the Laptop Emulator Mode, the Test Software sends the selected commands through the RS-232 interface, then displays the responses from the Base Station. This utility may be accessed also 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 **PARAMETER_04 GN Stop Test if Results Fail [0=no 1=yes]**.

Invoke the Laptop Emulator mode as follows:

1. On the Initialization Screen, select the **Utilities** field. The Test Software will display the Utility Screen.
2. On the Utility Screen menu, select the **Laptop Emulator** field. Within several seconds, the Test Software will display the Terminal Emulator Mode Screen.

The Terminal Emulator Mode screen includes the complete list of commands, and the status of each. Turn the knob to move the cursor arrow up and down the list. Note that the list of commands extends beyond the bottom of the screen. Dependent upon the cursor position, press either the **k3** (**Page Up**) key or the **k4** (**Page Down**) key to display more commands. Press the knob to select the command indicated by the cursor arrow. Press the **k5** (**Return**) key, then the **k2** (**No**) key to return to the Utility Screen. Select the **Return** field or press the **k5** (**Return**) key to return to the Initialization Screen.

In some instances, the Test Software will display a list from which you may select. In other instances, the command will toggle.

If you change a parameter in the Base Station using the Laptop Emulator Mode, the Test Software 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.

If an “error” response appears in a STATUS field, this indicates a communication problem with the Base Station. Try sending the command again. If this does not work, you might have to turn off a previous command, such as TX data. Refer to the Northern Telecom manual for a description of the commands. If everything else fails, the communication link with the Base Station might be locked. In such case, turn the Base Station off, then back on, and run the test again.

One parameter is used in Laptop Emulator Mode. It is **PARAMETER_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]**. No pass/fail limit are used.

RF Tools

For information on using the RF Tools Utilities, see the *HP 8935 Series E6381A TDMA Base Station Test Set Reference Guide* or the *HP 8935 Series E6380A CDMA Base Station Test Set Reference Guide.*

5

Test, Parameter, and Pass/Fail Limit Descriptions

This chapter offers a suggested testing philosophy, then describes each test, parameter, and pass/fail limits.

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 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 inputs 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 makes sense to test all eight transceivers as a unit. The Test Software can be set up to test the eight transceivers in this manner. This is done by creating a test procedure with the AMPS channel for each of the eight transceivers listed in the TESTS (Channel Information) screen. A procedure set up in this manner will run all of the TESTs defined in the TESTS (Order of Tests) 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 TESTS (Channel Information) screen are tested.

Once you have created a procedure with all of the channels for a particular cell site defined in the TESTS (Channel Information) 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 #`** 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_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]** to 0.

Testing Transceivers Individually

The Test Software is shipped with the default for **PARAMETER_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]** set to 1. In this state, the Test Software will read the entries in the **`Channel Number`** and **`Slot Number`** fields on the Initialization Screen at the start of each test sequence, and will test only that one channel.

Testing at the Receiver Shelf Versus the RMC

Receiver testing can be performed at either the receiver shelf or the receive multi-coupler (RMC). If testing is conducted at the shelf, the Test Software will compensate the Test Set's RF generator for cable losses and losses in the eight-way-splitter in the shelf. This will make the desired RF signal level appear to be at the receiver's input on the radio backplane. If testing is conducted at the RMC, the Test Set's RF generator will be compensated for only cable losses between the Test Set and the RMC input. 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.

RSSI Offset

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

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

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

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

PROCEDURE_02 NT_RMC can be used for this type of testing. During this procedure, the antenna must be disconnected and the signal to one diversity path of an entire sector is interrupted. A –84 dBm signal is injected into the RMC antenna port and the RSSI value is read from the TRU. A reported RSSI value of –80 dBm is expected from the TRU. If –80 dBm is not reported, a correction factor is sent to the TRU to correct for any system offsets. Again, this procedure may be performed during in-service hours with the caveat that one diversity receive path will be disrupted to all of the TRUs on the sector under test. However, note that there are six RSSI values. In an omni-directional site, only two values are required (1 and 4) as opposed to a sectored site, where all six values must be measured.

Scenario: Unscheduled In-Service Maintenance

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

Once this procedure is complete, PROCEDURE_01 NT_SHLF, can be performed to verify that alignment is satisfactory. During this procedure, a signal is applied to the TRU shelf that contains the replaced TRU. The signal is routed to all eight TRUs on that shelf through the eight-way splitter that is in the shelf with nominal loss of 11 dB. If the assumption holds true that the loss is the same to the two TRUs under test, then the reported RSSI value should be the same. The absolute value will depend on the RMC gain, but this can be determined only by disrupting one of the diversity signals to the whole sector. If the results from the two TRUs do not match, the RSSI offset may be adjusted manually.

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

Using the Stop-On-Fail Mode to Customize Testing

An additional method for customizing testing is to use the stop-on-fail Test Software mode. When enabled, this mode will pause the TEST sequence if the equipment under test fails to meet it specification limits. Once the TEST sequence is paused, you may elect to repeat the TEST, accept the failure and continue, or access the Laptop Emulator Mode to perform radio control operations. For more details on this subject, see **PARAMETER_04 GN Stop Test if Results Fail [0=no 1=yes]**.

Saving Cell Site Parameters on a PC Card for Later Use

Since the configuration of each cell site is different, customizable procedures in the Test Software are supplied to accommodate site variations. On the Test Set's screen, you may customize the procedures to correspond to each cell site configuration. You may change testing sequence, testing conditions, test channels, and pass/fail limits to conform to the system to be tested. Once you have created this customized procedure, you may save it for future maintenance of the particular cell site (see **"Saving/Deleting Procedures to/from a Card" on page 91**). You might wish to do this for each cell site.

Preprogrammed Procedures on the Test Software's PC Card

The procedures on the Test Software's PC card are set up to test omni sites. To test a sectored site, you must decide on the method for testing the receivers.

Since there are six antennas but only two receivers in each Base Station, you might wish to perform only one receiver TEST on all six antennas to verify all of the paths and then perform all of the other receiver TESTs on just two antennas to make certain that each receiver is operating properly for each TEST. Two parameters in the Test Software package allow you to do what is described above: **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]** and **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**. Selecting 1 for either 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 on each antenna, select **`All`** in the drop-down list from the **`Sector`** field on the Initialization Screen. This is a very thorough test, but it will take longer.

Read and Store TRU Parameters

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

Procedures Supplied

The Test Software is supplied on a PC card. Also on the same card are eight preprogrammed procedures. Each procedure includes a particular setting of testing order, parameter, and pass/fail limit defaults.

You may customize a procedure and save it by another name for a particular application, or you may construct your own procedure, perhaps using one of those procedures as a model.

The following sections describe each of those procedures.

PROCEDURE_01 NT_SHLF

This procedure performs RX measurements at the receiver shelf and TX measurements at the PA shelf, as depicted in **figure 5 on page 65**. It performs both analog and digital tests. Only the receivers and transmitters on the shelf that is being tested are affected. Therefore, service to the rest of the cell site is unaffected.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0, so that the RX measurements are performed at the receiver shelf.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 1, so that the TX power is referenced from the internal settings in the TRU (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 0, so that the TX power will not be adjusted.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 0, so that the TX measurements are performed at the PA shelf.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

This procedure is similar to PROCEDURE_05 TST_SHELF, except that it does not perform TEST_01 TRU Read and Store TRU Settings and TEST_29 GN PA LED Alarm and TRU Display.

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_35 - RX and RXD Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_27 - TX Quick Tests**
- **TEST_28 - TXD Standard Tests**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_02 NT_RMC

This procedure performs RX measurements at the receive multi-coupler (RMC) and TX measurements at the combiner/duplexer, as depicted in **figure 7 on page 67**. It performs both analog and digital tests. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]**is set to 2, so that the TX power will automatically be adjusted to the value entered on the Initialization Screen.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 1, so that the TX measurements are performed at the combiner.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

This procedure is similar to PROCEDURE_06 TST_RMC, except that it does not perform TEST_01 TRU Read and Store TRU Settings and TEST_29 GN PA LED Alarm and TRU Display.

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_35 - RX and RXD Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_27 - TX Quick Tests**
- **TEST_28 - TXD Standard Tests**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_03 QCK_SHELF

This procedure performs RX measurements at the receiver shelf and TX measurements at the PA shelf, as depicted in **figure 5 on page 65**. It performs analog tests only. Only the receivers and transmitters on the shelf that is being tested are affected. Therefore, service to the rest of the cell site is unaffected.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0, so that the RX measurements are performed at the receiver shelf.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 1, so that power will be adjusted on measurement failure.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 0, so that the TX measurements are performed at the PA shelf.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_26 - RX Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_27 - TX Quick Tests**

Tests are arranged in the order above to minimize testing time. See the individual TEST descriptions for a complete listing of parameters affecting this procedure (see **"Test Descriptions" on page 161**).

PROCEDURE_04 QCK_RMC

This procedure performs RX measurements at the receive multi-coupler (RMC) and TX measurements at the combiner/duplexer, as depicted in **figure 5 on page 65**. It performs analog tests only. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 1, so that power will be adjusted on measurement failure.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 1, so that the TX measurements are performed at the combiner.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_26 - RX Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_27 - TX Quick Tests**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_05 TDMASHELF

This procedure performs RX measurements at the receiver shelf and TX measurements at the PA shelf, as depicted in **figure 5 on page 65**. It performs digital tests only. Therefore, TRU3 Base Stations are included along with other TRU units. Only the receivers and transmitters on the shelf that is being tested are affected. Therefore, service to the rest of the cell site is unaffected.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0, so that the RX measurements are performed at the receiver shelf.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 1, so that the TX power is referenced from the internal settings in the TRU (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 0, so that the TX power will not be adjusted.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 0, so that the TX measurements are performed at the PA shelf.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 1, so that a TRU3 Base Station may be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_36 - RXD Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_28 - TXD Standard Tests**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_06 TDMA_RMC

This procedure performs RX measurements at the receiver shelf and TX measurements at the PA shelf, as depicted in **figure 5 on page 65**. It performs digital tests only. Therefore, TRU3 Base Stations are included along with other TRU units. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]**is set to 2, so that the TX power will automatically be adjusted to the value entered on the Initialization Screen.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 1, so that the TX measurements are performed at the combiner.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 1, so that a TRU3 Base Station may be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_36 - RXD Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_28 - TXD Standard Tests**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_07 TST_SHELF

This procedure performs RX measurements at the receiver shelf and TX measurements at the PA shelf, as depicted in **figure 5 on page 65**. It performs both analog and digital tests. Only the receivers and transmitters on the shelf that is being tested are affected. Therefore, service to the rest of the cell site is unaffected.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0, so that the RX measurements are performed at the receiver shelf.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 1, so that the TX power is referenced from the internal settings in the TRU (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 0, so that the TX power will not be adjusted.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 0, so that the TX measurements are performed at the PA shelf.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_01 - TRU Read and Store TRU Settings**
- **TEST_35 - RX and RXD Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_27 - TX Quick Tests**
- **TEST_28 - TXD Standard Tests**
- **TEST_29 - GN PA LED Alarm and TRU Display**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_08 TST_RMC

This procedure performs RX measurements at the receive multi-coupler (RMC) and TX measurements at the combiner/duplexer, as depicted in **figure 5 on page 65**. It performs both analog and digital tests. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, so that the RX measurements are performed at the RMC.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen (for calculating power error).
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]**is set to 2, so that the TX power will automatically be adjusted to the value entered on the Initialization Screen.
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 1, so that the TX measurements are performed at the combiner.
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]** is set to 0, so that a TRU3 Base Station may not be tested.

There are other parameters used in this procedure. See the individual TEST descriptions for a complete listing of such parameters (see **"Test Descriptions" on page 161**).

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_01 - TRU Read and Store TRU Settings**
- **TEST_35 - RX and RXD Quick Tests**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_27 - TX Quick Tests**
- **TEST_28 - TXD Standard Tests**
- **TEST_29 - GN PA LED Alarm and TRU Display**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_09 1900_LRM

NOTE: Because the TRU 1900-MHz Base Station is a TDMA type system, the HP E6381A TDMA Base Station Test Set should be used to perform this procedure. The HP E6380A CDMA Base Station Test Set will perform some of this procedure, but it will not perform any of the TDMA digital tests.

This procedure performs RX and TX tests on the TRU 1900-MHz macrocell. This procedure performs RX measurements by injecting the signal at the local receive module (LRM) input and TX measurements at the duplexer input or output, as depicted in **figure 8 on page 68**. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

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

- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, so that the RX measurements are performed at the LRM input.
- **PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]** is set to 2, so that the RSSI offsets are always adjusted in the RSSI/MCGAIN test.
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]** is set to 1, so that the RX tests are performed using an external splitter.
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, so that the TX measurements are performed at the output of the combiner or the output of the duplexer.
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0, so that the TX power is referenced from the value entered on the Initialization Screen.
- **PARAMETER_45 GN TRU [0=Cellular 1=PCS]** is set to 1, which causes the Test Software to display the TRU 1900-MHz Base Station selections on the Initialization Screen.
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 2, so that the TX power is always adjusted in the TX test.

There are also other parameters used in this procedure. See the individual TEST descriptions for a complete listing of parameters affecting this procedure (see **"Test Descriptions" on page 161**).

The RF levels in parameters 09, 12, 15, 18, 22, 38, and 47, and in pass/fail limit 14 for 1900-MHz Base Station testing are different from those settings for 850-MHz Base Stations.

Tests Used

- **TEST_30 - GN Standard PA and ANT Connections**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_14 - TX Frequency Error**
- **TEST_18 - TX Residual FM**
- **TEST_28 - TXD Standard Tests**
- **TEST_35 - RX and RXD Quick Tests**

In turn, TEST_28 includes the following tests:

- **TEST_23 - TXD TDMA Modulation Accuracy**
- **TEST_22 - TXD TDMA Adjacent Channel Power**
- **TEST_21 - TXD TDMA Power**

Also, in turn, TEST_35 includes the following tests:

First, on all selected antennas of Receiver A:

- **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_31 - RXA Bit Error Rate (BER)**

Then, on all selected antennas of Receiver B:

- **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_32 - RXB Bit Error Rate (BER)**

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_10 BER_1900

NOTE: This procedure must be run on the HP E6381A TDMA Base Station Test Set. The HP E6380A CDMA Base Station Test Set will not successfully perform this procedure.

This procedure performs RX bit error rate (BER) tests on 1900-MHz Base Stations, as depicted in **figure 10 on page 71**, **figure 11 on page 72**, and **figure 12 on page 73**. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

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

- **PARAMETER_45 GN TRU [0=Cellular 1=PCS]** is set to 1, so that the frequency to be tested is in the PCS band.
- **PARAMETER_47 RX BER RF Level** is set to −100 dBm, so that the BER measurement are performed at that level.

Tests Used

- **TEST_33 - RXA Bit Error Rate (BER) Screen**
- **TEST_34 - RXB Bit Error Rate (BER) Screen**

This procedure is designed to test both receivers. It first runs TEST_33 to test Receiver A, and then runs TEST_34 to test Receiver B.

For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_11 BER_850

NOTE: This procedure must be run on the HP E6381A TDMA Base Station Test Set. The HP E6380A CDMA Base Station Test Set will not successfully perform this procedure.

This procedure performs RX bit error rate (BER) tests on 850-MHz Base Stations, as depicted in **figure 5 on page 65**, **figure 6 on page 66**, and **figure 7 on page 67**. The antennas for the cell site must be disconnected. Therefore, service to the entire cell site will be interrupted.

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

- **PARAMETER_45 GN TRU [0=Cellular 1=PCS]** is set to 0, so that the frequency to be tested is in the cellular band.
- **PARAMETER_47 RX BER RF Level** is set to –113 dBm, so that the BER measurement are performed at that level.

Tests Used

- **TEST_33 - RXA Bit Error Rate (BER) Screen**
- **TEST_34 - RXB Bit Error Rate (BER) Screen**

This procedure is designed to test both receivers. It first runs TEST_33 to test Receiver A, and then runs TEST_34 to test Receiver B.

For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_12 LCR_RA

This procedure verifies that the operation of locating receiver A (RXA) is within specifications. This procedure contains TESTs for received signal strength indicator (RSSI) offset and path gain. RSSI offset and path gain require that the TEST be configured as depicted in **figure 5 on page 65**.

During this procedure, testing of the RSSI is performed across the frequency range of all channels. Select the desired channels on the TESTS (Channel Information) screen.

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

Tests Used

- **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**

This procedure is designed to test receiver A only. To test receiver B, run PROCEDURE_08 LCR_RB.

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

PROCEDURE_13 LCR_RB

This procedure verifies that the operation of locating receiver B (RXB) is within specifications. This procedure contains TESTs for received signal strength indicator (RSSI) offset and path gain. RSSI offset and path gain require that the TEST be configured as depicted in **figure 5 on page 65**.

During this procedure, testing of the RSSI is performed across the frequency range of all channels. Select the desired channels on the TESTS (Channel Information) screen.

RSSI adjustments may be made only on the first channel tested. If, after the first channel is adjusted, other channels fail, you might wish to check the RX filter, duplexer, cables, eight-way Splitter, or the TRU.

Tests Used

- **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**

This procedure is designed to test receiver B only. To test receiver A, run PROCEDURE_07 LCR_RA.

Tests are arranged in the order above to minimize testing time. For descriptions of the specific TESTs listed above, see **"Test Descriptions" on page 161**.

Test Descriptions

Each TEST is a series of measurements. One TEST or more can constitute a procedure. 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.

The following types of analyzer settings are listed as applicable:

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

The TESTs are derived from the Northern Telecom Cellular Handbook.

The first two or three letters in the name of the TEST, parameter, or pass/fail limit indicate the classification of the item. The classifications are:

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

TEST_01 - TRU Read and Store TRU Settings

NOTE: This TEST includes functions that allow you to modify settings in the TRU. If this TEST is in your sequence, be careful not to inadvertently modify TRU settings.

The Test Software display two columns of numeric information. The first, labelled **`New Data`**, contains temporary numbers that you may change and afterward transfer to the TRU. The second contains the actual TRU settings. This column is updated at the start of the TEST and after every action that changes or reads the TRU data.

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

The following are examples of the use of TEST_01:

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

The Test Software displays lists of settings and commands after the TEST starts.

NOTE: At the start of this TEST, the Test Software will read the TRU data and load it into the column labelled **`TRU Data`**. Whatever was last set in the **`New Data`** column will remain.

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

- You may enter values into the **`New Data`** column by selecting the item and entering the desired number.
- You may enter values using the **`Use default TRU parameters for New Data`** command. In this case, the Test Software will transfer the values that you entered into the parameters on the TESTS (Test Parameters) screen into the **`New Data`** column.

The **`Upload TRU Data`** command will transfer the TRU data from the TRU to the column **`TRU Data`**. You may check the values that have been displayed.

The **Download all New Data to TRU & verify** command will transfer all of the items in the **New Data** column to the TRU. Then, the data will be read back into the **TRU Data** column. If the TRU has accepted and can correctly write back all of the new data, the two columns will contain the same values. If you have configured a printer to print TEST results, the TRU settings will be printed after exiting the TEST. See **"Handling Test Results" on page 97**.

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

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

Press the **k5** (**Exit**) key or select the **Exit** field from the list to exit this TEST. If you have changed a value in the **New Data** field, but not downloaded it to the TRU, the Test Software will display the prompt: **You have not downloaded the New TRU data. Do you want to do it now?** Press the **k1** (**Yes**) key to return to the previous screen, or press the **k2** (**No**) key to continue.

Parameters Used

- **PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)**
- **PARAMETER_28 TRU ANT2 RSSI Offset (–35 to 35, incr 0.25) (dB)**
- **PARAMETER_29 TRU ANT3 RSSI Offset (–35 to 35, incr 0.25) (dB)**
- **PARAMETER_30 TRU ANT4 RSSI Offset (–35 to 35, incr 0.25) (dB)**
- **PARAMETER_31 TRU ANT5 RSSI Offset (–35 to 35, incr 0.25) (dB)**
- **PARAMETER_32 TRU ANT6 RSSI Offset (–35 to 35, incr 0.25) (dB)**
- **PARAMETER_33 TRU Audio RX Sens (–28 to –16, incr 0.1) (dBm)**
- **PARAMETER_34 TRU Audio TX Sens (–28 to –10, incr 0.1) (dBm)**
- **PARAMETER_35 TRU PA Max Pwr (30.5 to 46.5, incr 0.25) (dBm)**
- **PARAMETER_36 TRU PA Pwr Step Size(1 to 4, incr 0.25) (dB)**

Pass/Fail Limits Used

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

TEST_02 - RXA SINAD Sensitivity

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

In the first method, the RF level into the receiver is iteratively varied until the measured SINAD is equal to the value entered into **PARAMETER_17 RX SINAD (dB)**. The RF level is checked against **PASS/FAIL LIMIT_14 RX SINAD Sensitivity RF Level (dBm)** to determine the pass/fail status.

In the second method, the RF level entered into **PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)** is applied to the receiver, and the SINAD is measured. It is compared with **PASS/FAIL LIMIT_13 RX SINAD for Set & Measure (dB)** to determine the pass/fail status.

The Test Software selects the method by checking the value in **PARAMETER_20 RX SINAD Test by Set & Meas [0=no 1=yes]**. Set this parameter to 1 if you wish to use the second (set and measure) method.

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

Both methods check the sensitivity at the inputs to the receiver shelf. Select the inputs that you wish to check by making entries into **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]** and the **`Sector`** field of the Initialization Screen. If **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]** is set to 1, the SINAD TEST will be run and all three RXA antennas will be checked, regardless of the Initialization Screen setting. Two parameters are provided so that 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's splitter loss if **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0. Enter the loss into **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

The sensitivity is measured by looping the receiver's 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_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]**
- **PARAMETER_03 GN Read TRU Load & Rev Data [0=no 1=yes]**
- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_17 RX SINAD (dB)**
- **PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)**
- **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**
- **PARAMETER_20 RX SINAD Test by Set & Meas [0=no 1=yes]**
- **PARAMETER_21 RX SINAD Test Level Deviation (kHz)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_04 GN Stop Test if Results Fail [0=no 1=yes]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_13 RX SINAD for Set & Measure (dB)**
- **PASS/FAIL LIMIT_14 RX SINAD Sensitivity RF Level (dBm)**

TEST_03 - RXB SINAD Sensitivity

This TEST is the same as **TEST_02 - RXA SINAD Sensitivity**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_04 - RXA SAT Detection

This TEST determines the supervisory audio tone (SAT) that receiver A (RXA) reports when each of the three SAT frequencies is modulated at a 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 **PARAMETER_15 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's inputs will be tested. It is unlikely that it will be required that the SAT detection TEST be performed on all of the antenna inputs.

If **PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]** is set to 1, the SAT deviation will be changed to the extremes of 1.8 kHz and 2.2 kHz and SAT detection will be performed at these points as well as at the 2 kHz deviation.

Parameters Used

- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]**
- **PARAMETER_15 RX SAT Detection RF Level (dBm)**
- **PARAMETER_16 RX SAT Test at SINAD Level [0=no 1=yes]**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**

Pass/Fail Limits Used

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

TEST_05 - RXB SAT Detection

This TEST is the same as **TEST_04 - RXA SAT Detection**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_06 - RXA ST Detection

This TEST determines the performance of the signaling tone (ST) detector in receiver A (RXA). An RF signal with a 10 kHz tone modulated at an 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_22 RX ST Detection RF Level (dBm)**.

If **PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]** is set to 1, the deviation is changed to the extremes of 7.2 kHz and 8.8 kHz and ST detection is checked.

The Test Software uses the value entered into the **`Sector`** field on the Initialization Screen to determine which of the receiver shelf's inputs will be tested. It is unlikely that it will be required that the ST detection TEST be performed on all of the receiver shelf's inputs.

Parameters Used

- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]**
- **PARAMETER_22 RX ST Detection RF Level (dBm)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**

Pass/Fail Limits Used

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

TEST_07 - RXB ST Detection

This TEST is the same as **TEST_06 - RXA ST Detection**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_08 - RXA RSSI Linearity

This TEST checks the linearity of the reported RSSI as the RF level is varied from low to high. The RF levels may be set from –110 to –50 dBm in 10 dB steps with a check at 0 dBm. The RF signal is modulated with a 6 kHz supervisory audio tone (SAT) tone at a 2 kHz deviation and a 1 kHz audio tone. The deviation of the audio tone is defined in **PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)**.

The low RF level is set by **PARAMETER_09 RX RSSI Linearity RF Level Low (–110 Min) (dB)** and the high RF level is set by **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)**. To check the level at 0 dBm, enter 0 in PARAMETER_08. This will check the –50 dBm level, then skip to the 0 dBm level. To stop at –50 dBm, enter –50 in PARAMETER_8.

The signal from the RF generator can be applied at either the receiver shelf or at the RMC. This is determined by **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**. 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 splitter loss defined in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

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

If **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, the following results will be displayed:

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

Calculate the RSSI error using the following equation:

RSSI error = Reported RSSI - Sector Gain - RF level

The RSSI error takes into account the sector gain defined by the user on the Initialization Screen. This allows the user to define different gains between sectors or cell sites and still use the same pass/fail limit. (See the note at the end of this TEST description.) If **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0, and **PARAMETER_07 RX RSSI Lin Chk w/o Offset [0=no 1=yes]** is set to 1, the following results will be displayed:

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

Calculate the RSSI without offset using the following equation:

RSSI without offset = Reported RSSI - RSSI offset

Calculate the RSSI error using the following equation:

RSSI error = Reported RSSI - RSSI offset - RF level

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

For example, suppose that the path gain is 4 dB and an RF signal of –84 dBm is applied to the RMC. Theoretically, a TRU with no internal RSSI offset will report a –80 dBm RSSI level. Since the detector in a TRU is not ideal, in some cases the internal RSSI offset is required to make the TRU report –80 dBm. Because the reported RSSI level is different from the input level, the Test Software must use the difference to properly set the RSSI offset and check the RSSI linearity level. The **`Sector Gain`** fields on the Initialization Screen indicate to the Test Software the difference between the input level and the reported level. It is possible for the receiver path gain to be increased to improve the signal strength in rural areas or decreased to reduce intermods in urban areas. In this case, the path gain is no longer 4 dB. Depending on the design of the system to be tested, it might be proper for the sector gains on the Initialization Screen to remain at 4 dB, or it might not. Consult with your engineering department to determine how to set the offsets for these areas.

It is also possible to use the sector gains to create an artificial receiver path gain or path loss (sometimes referred to as a system offset) to vary the handoff levels between sectors. To allow for sector variations, three sector gains fields (X, Y, and Z) 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_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)**
- **PARAMETER_07 RX RSSI Lin Chk w/o Offset [0=no 1=yes]**
- **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)**
- **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**
- **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_02 RX RSSI Level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_04 RX RSSI Level Err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI Level Err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI Level Err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI Level Err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI Level Err @ –100 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI Level Err @ –110 dBm (dB)**

TEST_09 - RXB RSSI Linearity

This TEST is the same as **TEST_08 - RXA RSSI Linearity**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_10 - RXA RSSI/MCGAIN Offset and Gain

This TEST allows the user to perform measurements of the received signal strength indicator (RSSI) offset and the RX path gain.

The signal from the RF generator may be applied at either the Base Station's receiver shelf or at the RMC. This is determined by **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**. 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 be compensated also for the receiver shelf splitter loss defined in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

If **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 1, and **PARAMETER_11 RX RSSI/MCGAIN Chk RMC Gain [0=no 1=yes]** is set to 1, the RX path gain TEST will be performed. The path gain TEST begins by making the measurement of path gain from the antenna to the TRU. This path gain includes the receive multi-coupler (RMC) gain, receiver shelf splitter loss, and any cable losses associated with the signal path. The TEST is performed in the following manner:

The Test Set injects an RF signal into the RMC input, which is modulated at the deviation determined by **PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)**. This value is typically 2.9 kHz. The Test Software queries the TRU for the reported RSSI level. The resulting path gain is determined by the following equation and is shown on the Test Set's display:

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

If the path gain exceeds the limits set by **PASS/FAIL LIMIT_12 RX RSSI/ MCGAIN Path Gain (dB)**, you will be given the option to adjust the RMC gain. If you select **yes**, the Test Software will display an adjustment meter. Manually adjust the RMC gain until the meter needle lies within the specification lines.

Once the adjustment has been made, may elect to repeat the measurement to verify that the adjustment was made correctly.

NOTE: It is recommended that you not 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 you to compensate for differences in path gain and detector variances in individual receivers by adjusting the internal TRU RSSI offset (MCGAIN). The Test Set injects the modulated RF signal into the RMC input or receiver shelf input. The Test Software then queries the TRU for the reported RSSI level, and calculates the RSSI error using the following equation:

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

If the resulting RSSI error exceeds the limits set by **PASS/FAIL LIMIT_11 RX RSSI/MCGAIN Offset Error (dB)**and if **PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]** is set to 1 or 2, the Test Software will adjust the TRU RSSI Gain until the reported RSSI error equals zero to minimize RSSI error. If the Test Software cannot set the offset after five attempts, you will be prompted to set the offset manually.

The last part of this 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_10 RX RSSI/MCGAIN Internal RSSI Offset (dB)** to determine if the programmed value is within acceptable limits.

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

For example, suppose that the path gain is 4 dB and an RF signal of –84 dBm is applied to the RMC. Theoretically, a TRU with no internal RSSI offset will report a –80 dBm RSSI level. Since the detector in a TRU is not ideal, in some cases the internal RSSI offset is required to make the TRU report –80 dBm. Because the reported RSSI level is different from the input level, the Test Software must use the difference to properly set the RSSI offset and check the RSSI linearity level. The **`Sector Gain`** fields on the Initialization Screen indicate to the Test Software the difference between the input level and the reported level. It is possible for the receiver path gain to be increased to improve the signal strength in rural areas or decreased to reduce intermods in urban areas. In this case, the path gain is no longer 4 dB. Depending on the design of the system to be tested, it might be proper for the sector gains on the Initialization Screen to remain at 4 dB, or it might not. Consult with your engineering department to determine how to set the offsets for these areas.

It is also possible to use the sector gains to create an artificial receiver path gain or path loss (sometimes referred to as a system offset) to vary the handoff levels between sectors. To allow for sector variations, three sector gains fields (X, Y, and Z) 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_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)**
- **PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]**
- **PARAMETER_11 RX RSSI/MCGAIN Chk RMC Gain [0=no 1=yes]**
- **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_10 RX RSSI/MCGAIN Internal RSSI Offset (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI/MCGAIN Offset Error (dB)**
- **PASS/FAIL LIMIT_12 RX RSSI/MCGAIN Path Gain (dB)**

TEST_11 - RXB RSSI/MCGAIN Offset and Gain

This TEST is the same as **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_12 - RTA Audio Level

This TEST uses RF loopback and measures the level of the TX FM deviation that results from a modulated signal applied to an RX input. The Test Set's signal generator level is set to –50 dBm and modulated at a deviation of 2.9 kHz at a 1 kHz rate. The TRU audio sensitivities are set to –18 dBm. The TX FM deviation is measured and compared to the value in **PASS/FAIL LIMIT_01 RT Audio Deviation (kHz)**.

After the TEST, the TX and RX audio sensitivities are restored to the original values.

Analyzer Settings

- IF Filter: 30 kHz bandwidth
- AF Filter 1: 300 Hz HPF
- AF Filter 2: 3 kHz LPF
- Detector: rms, or pk, or pk+, or (rms times 1.414)

Parameters Used

- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_01 RT Audio Deviation (kHz)**

TEST_13 - RTB Audio Level

This TEST is the same as **TEST_12 - RTA Audio Level**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_14 - TX Frequency Error

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

The PA power is set to level 0.

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

Analyzer Settings

- Frequency Counter Gate Time: 50 ms

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_18 TX Frequency Error (kHz)**

TEST_15 - TX Maximum Power and Power Level

This TEST checks the Power Amplifier output at each of the power levels selected in **PARAMETER_41 TX Power, Test Down to Pwr Lev (0-7)**.

Adjustment

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

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

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

If the power level is 0.

If **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 1 or 2.

If **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0.

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

If you select the FMPA type in the **`Base Station Radio`** field in the Initialization Screen, and if PARAMETER_40 is set to 1 or 2, the Test Software will display a meter and prompt you to set the power level by adjusting the FMPA+ front panel trimming potentiometer.

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

Results Output

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

Power Calculation and Display

Three outputs will be displayed for each power level tested:

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

The measured power error for power level 0 will be compared with the values entered in **PASS/FAIL LIMIT_20 TX Power Error at Power Level 0 (dB)**. The measured power error for power levels 1 through 7 will be compared with the values entered in **PASS/FAIL LIMIT_19 TX Power Error (dB)**.

The calculated power will be determined by the following equation:

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

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

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

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

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

Loss Calculation and Display

The combiner and duplexer loss will be computed by the Test Software if **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]**is set to 0 and the Base Station radio selected is not type FMPA+, MCPA, or NONE. The Test Software will display the result.

- TX combiner/duplexer loss

  or

- TX backplane loss

The combiner/duplexer and backplane loss will be compared with the value entered in **PASS/FAIL LIMIT_17 TX Combiner/Duplexer or Backplane Loss**.

This loss will be computed using the following equation:

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

or

Backplane Loss = TRU Internal Power Level –Measured Power Level

Important Considerations

The PA power will be measured using a peak detector connected to the output of a dual-diode RF detector. If there is amplitude modulation on the signal, the measured power will include the effect of the peak fluctuations of the power and will read higher than the average power. The residual AM should be checked if there is higher than expected power. (See **"TEST_17 - TX Residual AM" on page 188**.)

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

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

Parameters Used

- **PARAMETER_38 TX Duplexer/Combiner Loss**
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]**
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]**
- **PARAMETER_41 TX Power, Test Down to Pwr Lev (0-7)**
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_17 TX Combiner/Duplexer or Backplane Loss**
- **PASS/FAIL LIMIT_19 TX Power Error (dB)**
- **PASS/FAIL LIMIT_20 TX Power Error at Power Level 0 (dB)**

TEST_16 - TX SAT Frequency and Deviation

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

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

Analyzer Settings

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

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_19 TX Power Error (dB)**
- **PASS/FAIL LIMIT_23 TX SAT Deviation (kHz)**
- **PASS/FAIL LIMIT_24 TX SAT Frequency Error (Hz)**

TEST_17 - TX Residual AM

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

The PA is turned off when the TEST is complete.

Analyzer Settings

- IF Filter: 30 kHz
- AF Filter 1: 50 Hz HPF
- AF Filter 2: 15 kHz LPF
- Detector: rms

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_21 TX Residual AM Deviation (%)**

TEST_18 - TX Residual FM

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

Analyzer Settings

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

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_22 TX Residual FM (Hz)**

TEST_19 - TX Wideband Data Deviation

This TEST checks the deviation of the transmitted signal when transmitting wideband data. The wideband signal applied to the transmitter is demodulated and the positive peak excursion is measured and compared with **PASS/FAIL LIMIT_25 TX Wideband Data Deviation (kHz)**.

Analyzer Settings

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

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_25 TX Wideband Data Deviation (kHz)**

TEST_20 - TX 1 kHz Tone Generator

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

- Test Set instructs the Base Station to generate a 1 kHz tone with an 8 kHz deviation.
- Base station transmits the desired tone with deviation.
- Test Set receives and demodulates the signal sent by the Base Station.
- The demodulated signal is tested for any frequency error with respect to the expected 1 kHz. limits for the frequency error are set as indicated in **PASS/FAIL LIMIT_15 TX 1 kHz Tone Generator Audio Frequency (Hz)**.
- The deviation of the 1 kHz tone is measured and compared to the expected 8 kHz deviation limits for the deviation error are set as indicated in **PASS/FAIL LIMIT_16 TX 1 kHz Tone Generator FM Deviation (kHz)**.

Analyzer Settings

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

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_15 TX 1 kHz Tone Generator Audio Frequency (Hz)**
- **PASS/FAIL LIMIT_16 TX 1 kHz Tone Generator FM Deviation (kHz)**

TEST_21 - TXD TDMA Power

This TEST measures the TRU output power at each of the power levels selected in **PARAMETER_41 TX Power, Test Down to Pwr Lev (0-7)**. If **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 1, the maximum power is determined by reading the TRU max power from the internal settings in the TRU. If PARAMETER_40 is set to 0, the maximum power is determined by reading the value entered on the Initialization Screen.

The power error is compared to **PASS/FAIL LIMIT_36 TXD TDMA Power Error (dB)** and is displayed after the power measurement is made.

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

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

Parameters Used

- **PARAMETER_38 TX Duplexer/Combiner Loss**
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]**
- **PARAMETER_41 TX Power, Test Down to Pwr Lev (0-7)**
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_17 TX Combiner/Duplexer or Backplane Loss**
- **PASS/FAIL LIMIT_36 TXD TDMA Power Error (dB)**

TEST_22 - TXD TDMA Adjacent Channel Power

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

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

Regarding channels at which various tests are performed, there are four: channel, adjacent channel, alternate 1 channel, and alternate 2 channel. These terms are defined as follows:

- **Channel --** The assigned frequency of interest.
- **Adjacent Channel --** The channel frequency immediately above the channel of interest and the channel frequency immediately below the channel of interest.
- **Alternate 1 Channel --** The channel frequency immediately above the higher adjacent channel and the channel frequency immediately below the lower adjacent channel.
- **Alternate 2 Channel --** The channel frequency immediately above the higher alternate 1 channel and the channel frequency immediately below the lower alternate 1 channel.

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_26 TXD TDMA Adjacent Channel Power (dB)**
- **PASS/FAIL LIMIT_27 TXD TDMA Alternate 1 Channel Power (dB)**
- **PASS/FAIL LIMIT_28 TXD TDMA Alternate 2 Channel Power (dB)**

TEST_23 - TXD TDMA Modulation Accuracy

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

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

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_29 TXD TDMA Mod Acc Error Vector Mag Peak (%)**
- **PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)**
- **PASS/FAIL LIMIT_31 TXD TDMA Mod Acc EVM 10 Averages (%)**
- **PASS/FAIL LIMIT_32 TXD TDMA Mod Acc Frequency Error (Hz)**
- **PASS/FAIL LIMIT_33 TXD TDMA Mod Acc Magnitude Error (%)**
- **PASS/FAIL LIMIT_34 TXD TDMA Mod Acc Origin Offset (dBc)**
- **PASS/FAIL LIMIT_35 TXD TDMA Mod Acc Phase Error (deg)**

TEST_24 - RX Standard Tests

This is the original RX standard TEST from the HP 11807B Test Software. It is similar to **TEST_26 - RX Quick Tests** provided in this Test Software. However the total time for this TEST is considerably longer than that required for TEST_26. This TEST is included to provide backward compatibility for those users who require 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 all selected antennas of Receiver A:

- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_04 - RXA SAT Detection**
- **TEST_06 - RXA ST Detection**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_12 - RTA Audio Level**

Then, on all selected antennas of Receiver B:

- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_05 - RXB SAT Detection**
- **TEST_07 - RXB ST Detection**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_13 - RTB Audio Level**

The antennas on which each TEST is performed are determined by the **`Sector`** field on the Initialization Screen and **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**.

The first antenna will be tested completely before testing of the next antenna begins. This will minimize the cable connections, and thus 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_08 RX RSSI Linearity RF Level High (0 max) (dB)** and **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**. The primary antennas are those selected in the **`Sector`** field on the Initialization Screen.

Analyzer Settings

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

Parameters Used

- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)**
- **PARAMETER_07 RX RSSI Lin Chk w/o Offset [0=no 1=yes]**
- **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)**
- **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**
- **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**
- **PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]**
- **PARAMETER_15 RX SAT Detection RF Level (dBm)**
- **PARAMETER_16 RX SAT Test at SINAD Level [0=no 1=yes]**
- **PARAMETER_17 RX SINAD (dB)**
- **PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)**
- **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**
- **PARAMETER_20 RX SINAD Test by Set & Meas [0=no 1=yes]**
- **PARAMETER_21 RX SINAD Test Level Deviation (kHz)**
- **PARAMETER_22 RX ST Detection RF Level (dBm)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_01 RT Audio Deviation (kHz)**
- **PASS/FAIL LIMIT_02 RX RSSI Level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_04 RX RSSI Level Err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI Level Err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI Level Err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI Level Err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI Level Err @ –100 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI Level Err @ –110 dBm (dB)**
- **PASS/FAIL LIMIT_13 RX SINAD for Set & Measure (dB)**
- **PASS/FAIL LIMIT_14 RX SINAD Sensitivity RF Level (dBm)**

TEST_25 - TX Standard Tests

This is the original TX standard TEST from the HP 11807B Test Software. It is similar to **TEST_27 - TX Quick Tests** provided in this Test Software. However the total time for this TEST is considerably longer than that required for TEST_27. This TEST is included in the current version to provide backward compatibility for those users who require it.

This TEST performs the analog transmitter TESTs in the following order:

- **TEST_14 - TX Frequency Error**
- **TEST_15 - TX Maximum Power and Power Level**
- **TEST_16 - TX SAT Frequency and Deviation**
- **TEST_17 - TX Residual AM**
- **TEST_18 - TX Residual FM**
- **TEST_19 - TX Wideband Data Deviation**

Analyzer Settings

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

Parameters Used

- **PARAMETER_38 TX Duplexer/Combiner Loss**
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]**
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]**
- **PARAMETER_41 TX Power, Test Down to Pwr Lev (0-7)**
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_17 TX Combiner/Duplexer or Backplane Loss**
- **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_22 TX Residual FM (Hz)**
- **PASS/FAIL LIMIT_23 TX SAT Deviation (kHz)**
- **PASS/FAIL LIMIT_24 TX SAT Frequency Error (Hz)**
- **PASS/FAIL LIMIT_25 TX Wideband Data Deviation (kHz)**

TEST_26 - RX Quick Tests

This TEST performs all of the RX measurements in a manner similar to that of **TEST_24 - 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, with the list of tests dependent upon whether the Base Station is of the 850-MHz or 1900-MHZ type.

TESTs for 850-MHz Base Stations are performed in the following order:

First, on all selected antennas of Receiver A:

- **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_12 - RTA Audio Level**
- **TEST_04 - RXA SAT Detection** (does not check falsing)
- **TEST_06 - RXA ST Detection** (does not check falsing)

Then, on all selected antennas of Receiver B:

- **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_13 - RTB Audio Level**
- **TEST_05 - RXB SAT Detection** (Does not check falsing.)
- **TEST_07 - RXB ST Detection** (Does not check falsing.)

TESTs for 1900-MHz Base Stations are performed in the following order:

First on all selected antennas of Receiver A:

- **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_31 - RXA Bit Error Rate (BER)**

Then on all selected antennas of Receiver B:

- **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_32 - RXB Bit Error Rate (BER)**

The antennas on which each TEST is performed are determined by the **`Sector`** field on the Initialization Screen, and **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**, and **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]**.

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

To reduce testing time when RSSI linearity is selected to be tested on all antennas, the RSSI level will be checked on the primary antennas at the RF levels determined by **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)** and **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**. The primary antennas are those selected in the **`Sector`** field on the Initialization Screen.

Analyzer Settings

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

Parameters Used

- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)**
- **PARAMETER_07 RX RSSI Lin Chk w/o Offset [0=no 1=yes]**
- **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)**
- **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**
- **PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]**
- **PARAMETER_11 RX RSSI/MCGAIN Chk RMC Gain [0=no 1=yes]**
- **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**
- **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]**
- **PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]**
- **PARAMETER_15 RX SAT Detection RF Level (dBm)**
- **PARAMETER_16 RX SAT Test at SINAD Level [0=no 1=yes]**
- **PARAMETER_17 RX SINAD (dB)**
- **PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)**
- **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**
- **PARAMETER_20 RX SINAD Test by Set & Meas [0=no 1=yes]**
- **PARAMETER_21 RX SINAD Test Level Deviation (kHz)**
- **PARAMETER_22 RX ST Detection RF Level (dBm)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_46 RX BER [XXXX.YYYY X=avers Y=slot/aver]**
- **PARAMETER_47 RX BER RF Level**
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_01 RT Audio Deviation (kHz)**
- **PASS/FAIL LIMIT_02 RX RSSI Level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_04 RX RSSI Level Err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI Level Err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI Level Err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI Level Err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI Level Err @ –100 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI Level Err @ –110 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI/MCGAIN Internal RSSI Offset (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI/MCGAIN Offset Error (dB)**
- **PASS/FAIL LIMIT_12 RX RSSI/MCGAIN Path Gain (dB)**
- **PASS/FAIL LIMIT_37 RX Bit Error Rate (BER)**

TEST_27 - TX Quick Tests

This TEST performs all of the TX measurements in a manner similar to that of **TEST_25 - TX Standard Tests**. However, because of differences in the code, it runs considerably faster.

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

- **TEST_14 - TX Frequency Error**
- **TEST_16 - TX SAT Frequency and Deviation**
- **TEST_20 - TX 1 kHz Tone Generator**
- **TEST_18 - TX Residual FM**
- **TEST_19 - TX Wideband Data Deviation**

Analyzer Settings

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

Parameters Used

- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_17 TX Combiner/Duplexer or Backplane Loss**
- **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 AM Deviation (%)**
- **PASS/FAIL LIMIT_22 TX Residual FM (Hz)**
- **PASS/FAIL LIMIT_23 TX SAT Deviation (kHz)**
- **PASS/FAIL LIMIT_24 TX SAT Frequency Error (Hz)**
- **PASS/FAIL LIMIT_25 TX Wideband Data Deviation (kHz)**

TEST_28 - TXD Standard Tests

This TEST performs the digital transmitter TESTs in the following order:

- **TEST_23 - TXD TDMA Modulation Accuracy**
- **TEST_22 - TXD TDMA Adjacent Channel Power**
- **TEST_21 - TXD TDMA Power**

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

Parameters Used

- **PARAMETER_38 TX Duplexer/Combiner Loss**
- **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]**
- **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]**
- **PARAMETER_41 TX Power, Test Down to Pwr Lev (0-7)**
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_17 TX Combiner/Duplexer or Backplane Loss**
- **PASS/FAIL LIMIT_26 TXD TDMA Adjacent Channel Power (dB)**
- **PASS/FAIL LIMIT_27 TXD TDMA Alternate 1 Channel Power (dB)**
- **PASS/FAIL LIMIT_28 TXD TDMA Alternate 2 Channel Power (dB)**
- **PASS/FAIL LIMIT_29 TXD TDMA Mod Acc Error Vector Mag Peak (%)**
- **PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)**
- **PASS/FAIL LIMIT_31 TXD TDMA Mod Acc EVM 10 Averages (%)**
- **PASS/FAIL LIMIT_32 TXD TDMA Mod Acc Frequency Error (Hz)**
- **PASS/FAIL LIMIT_33 TXD TDMA Mod Acc Magnitude Error (%)**
- **PASS/FAIL LIMIT_34 TXD TDMA Mod Acc Origin Offset (dBc)**
- **PASS/FAIL LIMIT_35 TXD TDMA Mod Acc Phase Error (deg)**
- **PASS/FAIL LIMIT_36 TXD TDMA Power Error (dB)**

TEST_29 - GN PA LED Alarm and TRU Display

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

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

Parameters Used

There are no parameters used in this TEST.

Pass/Fail Limits Used

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

TEST_30 - GN Standard PA and ANT Connections

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

This TEST displays the following setup:

- RS232 Control Connections.
- Test Set's RF IN/OUT connections to the Base Station's PA # (based on the TRU # selected in the **`Slot`** field on the Initialization Screen).
- Test Set's DUPLEX OUT connection to the Base Station's ANT # (based on the value entered in the **`Sector`** field of the Initialization Screen).

Parameters Used

- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**

Pass/Fail Limits Used

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

TEST_31 - RXA Bit Error Rate (BER)

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

This TEST measures the bit error rate (BER) of the TRU receiver RXA using an RF loopback method. In this method, the Test Software configures the TRU in TDMA mode and then loops the receiver back to the transmitter. The Test Set then injects TDMA modulated RF signal with a pseudo-random bit pattern into the receiver at the RF level set by **PARAMETER_47 RX BER RF Level**.

The signal generator level will be set to account for the receiver shelf's splitter loss if **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0. Enter the loss into **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

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

The resulting BER is then compared with the specification in **PASS/FAIL LIMIT_37 RX Bit Error Rate (BER)**.

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

If the Base Station is any type except TRU3, this test may be performed on timeslot 1, 2, or 3, or on all timeslots, according to the setting of **PARAMETER_49 GN Test TRU3 [0=no 1=yes]**. If the Base Station is a TRU3 type, this test is may be performed only on timeslot 1.

More bits used in the BER measurement provide a higher confidence level in the BER measurement. Set the total number of bits used in the measurement in PARAMETER_46. See the description of **PARAMETER_46 RX BER [XXXX.YYYY X=avers Y=slot/aver]** for information on setting the number of bits.

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

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

Also, it is possible to lock the Test Set to the Base Station's 4.8-MHz time base, oscillator, but this is ordinarily not required. If you wish to use the Base Station oscillator, set **PARAMETER_44 GN Synth Ref [0=Int 0CX0 1=4.8 MHz Ext]** to 1.

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

Still further, you may reduce the number of bits measured during a single measurement by reducing the Y component (slots per average) of the bits in PARAMETER_46.

For an 850-MHz TRU, the typical level is –113 dBm. For a 1900-MHz TRU, the typical level is –100 dBm. Using these levels usually results in a BER of less than one percent.

Parameters Used

- **PARAMETER_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]**
- **PARAMETER_03 GN Read TRU Load & Rev Data [0=no 1=yes]**
- **PARAMETER_04 GN Stop Test if Results Fail [0=no 1=yes]**
- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_44 GN Synth Ref [0=Int 0CX0 1=4.8 MHz Ext]**
- **PARAMETER_46 RX BER [XXXX.YYYY X=avers Y=slot/aver]**
- **PARAMETER_47 RX BER RF Level**
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_37 RX Bit Error Rate (BER)**

TEST_32 - RXB Bit Error Rate (BER)

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

This TEST is the same as **TEST_31 - RXA Bit Error Rate (BER)**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_33 - RXA Bit Error Rate (BER) Screen

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

This TEST measures the bit error rate (BER) of the TRU receiver RXA using an RF loopback method. In this method, the Test Software configures the TRU in TDMA mode and then loops the receiver back to the transmitter. The Test Set then injects TDMA modulated RF signal with a pseudo-random bit pattern into the receiver at the RF level set by **PARAMETER_47 RX BER RF Level**.

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

If the Base Station is any type except TRU3, this test may be performed on timeslot 1, 2, or 3, or on all timeslots, according to the setting of **PARAMETER_49 GN Test TRU3 [0=no 1=yes]**. If the Base Station is a TRU3 type, this test is may be performed only on timeslot 1.

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

Average Mode

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

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

Single Mode

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

For either mode, the initial RF level is set by PARAMETER_47. However, you may change the RF level using the k4 (**`RF Level`**) key. Press the key momentarily and the Test Software will prompt you at the top of the Test Set's screen to enter the level in the **`RF Level`** field using either the knob or the DATA ENTRY keys.

The signal generator level will be set to account for the receiver shelf's splitter loss if **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0. Enter the loss into **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

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

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

Also, it is possible to lock the Test Set to the Base Station's 4.8-MHz time base, oscillator, but this is ordinarily not required. If you wish to use the Base Station oscillator, set **PARAMETER_44 GN Synth Ref [0=Int 0CX0 1=4.8 MHz Ext]** to 1.

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

Still further, you may reduce the number of bits measured during a single measurement by reducing the Y component (slots per average) of the bits in PARAMETER_46.

For an 850-MHz TRU, the typical level is –116 dBm. For a 1900-MHz TRU, the typical level is –100 dBm. Using these levels usually results in a BER of less than one percent.

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

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

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

Parameters Used

- **PARAMETER_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]**
- **PARAMETER_03 GN Read TRU Load & Rev Data [0=no 1=yes]**
- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_44 GN Synth Ref [0=Int 0CX0 1=4.8 MHz Ext]**
- **PARAMETER_46 RX BER [XXXX.YYYY X=avers Y=slot/aver]**
- **PARAMETER_47 RX BER RF Level**

Pass/Fail Limits Used

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

TEST_34 - RXB Bit Error Rate (BER) Screen

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

This TEST is the same as **TEST_33 - RXA Bit Error Rate (BER) Screen**, except that all references to receiver A (RXA) are applied to receiver B (RXB). See the previous TEST. The Test Software will use parameters with an *RXB* prefix.

TEST_35 - RX and RXD Quick Tests

This TEST performs all of the RX and RXD measurements in a manner similar to that of **TEST_26 - RX Quick Tests**.

This TEST performs the receiver TESTs in an optimum order to minimize cable connections, with the list of tests dependent upon whether the Base Station is of the 850-MHz or 1900-MHZ type.

TESTs for 850-MHz Base Stations are performed in the following order:

First, on all selected antennas of Receiver A:

- **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_12 - RTA Audio Level**
- **TEST_31 - RXA Bit Error Rate (BER)**
- **TEST_04 - RXA SAT Detection** (does not check falsing)
- **TEST_06 - RXA ST Detection** (does not check falsing)

Then, on all selected antennas of Receiver B:

- **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_13 - RTB Audio Level**
- **TEST_32 - RXB Bit Error Rate (BER)**
- **TEST_05 - RXB SAT Detection** (Does not check falsing.)
- **TEST_07 - RXB ST Detection** (Does not check falsing.)

TESTs for 1900-MHz Base Stations are performed in the following order:

First on all selected antennas of Receiver A:

- **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_02 - RXA SINAD Sensitivity**
- **TEST_31 - RXA Bit Error Rate (BER)**

Then on all selected antennas of Receiver B:

- **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_03 - RXB SINAD Sensitivity**
- **TEST_32 - RXB Bit Error Rate (BER)**

The antennas on which each TEST is performed are determined by the **`Sector`** field on the Initialization Screen, and **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**, and **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]**.

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

To reduce testing time when RSSI linearity is selected to be tested on all antennas, the RSSI level will be checked on the primary antennas at the RF levels determined by **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)** and **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**. The primary antennas are those selected in the **`Sector`** field on the Initialization Screen.

Analyzer Settings

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

Parameters Used

- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)**
- **PARAMETER_07 RX RSSI Lin Chk w/o Offset [0=no 1=yes]**
- **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)**
- **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**
- **PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]**
- **PARAMETER_11 RX RSSI/MCGAIN Chk RMC Gain [0=no 1=yes]**
- **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**
- **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]**
- **PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]**
- **PARAMETER_15 RX SAT Detection RF Level (dBm)**
- **PARAMETER_16 RX SAT Test at SINAD Level [0=no 1=yes]**
- **PARAMETER_17 RX SINAD (dB)**
- **PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)**
- **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**
- **PARAMETER_20 RX SINAD Test by Set & Meas [0=no 1=yes]**
- **PARAMETER_21 RX SINAD Test Level Deviation (kHz)**
- **PARAMETER_22 RX ST Detection RF Level (dBm)**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_46 RX BER [XXXX.YYYY X=avers Y=slot/aver]**
- **PARAMETER_47 RX BER RF Level**
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_01 RT Audio Deviation (kHz)**
- **PASS/FAIL LIMIT_02 RX RSSI Level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_04 RX RSSI Level Err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI Level Err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI Level Err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI Level Err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI Level Err @ –100 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI Level Err @ –110 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI/MCGAIN Internal RSSI Offset (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI/MCGAIN Offset Error (dB)**
- **PASS/FAIL LIMIT_12 RX RSSI/MCGAIN Path Gain (dB)**
- **PASS/FAIL LIMIT_37 RX Bit Error Rate (BER)**

TEST_36 - RXD Quick Tests

This TEST performs all of the RX and RXD measurements in a manner similar to that of **TEST_26 - RX Quick Tests**.

This TEST performs the receiver TESTs in an optimum order to minimize cable connections, with the list of tests dependent upon whether the Base Station is of the 850-MHz or 1900-MHZ type.

TESTs are performed in the following order:

First, on all selected antennas of Receiver A:

- **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**
- **TEST_08 - RXA RSSI Linearity**
- **TEST_31 - RXA Bit Error Rate (BER)**

Then, on all selected antennas of Receiver B:

- **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**
- **TEST_09 - RXB RSSI Linearity**
- **TEST_32 - RXB Bit Error Rate (BER)**

The antennas on which each TEST is performed are determined by the **`Sector`** field on the Initialization Screen, and **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]**, and **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]**.

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

To reduce testing time when RSSI linearity is selected to be tested on all antennas, the RSSI level will be checked on the primary antennas at the RF levels determined by **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)** and **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**. On the other antennas, it will be checked only at the level determined by **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**. The primary antennas are those selected in the **`Sector`** field on the Initialization Screen.

Analyzer Settings

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

Parameters Used

- **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**
- **PARAMETER_07 RX RSSI Lin Chk w/o Offset [0=no 1=yes]**
- **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)**
- **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**
- **PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]**
- **PARAMETER_11 RX RSSI/MCGAIN Chk RMC Gain [0=no 1=yes]**
- **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**
- **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]**
- **PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]**
- **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]**
- **PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]**
- **PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]**
- **PARAMETER_46 RX BER [XXXX.YYYY X=avers Y=slot/aver]**
- **PARAMETER_47 RX BER RF Level**
- **PARAMETER_49 GN Test TRU3 [0=no 1=yes]**

Pass/Fail Limits Used

- **PASS/FAIL LIMIT_02 RX RSSI Level @ 0 dBm (dB)**
- **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**
- **PASS/FAIL LIMIT_04 RX RSSI Level Err @ –60 dBm (dB)**
- **PASS/FAIL LIMIT_05 RX RSSI Level Err @ –70 dBm (dB)**
- **PASS/FAIL LIMIT_06 RX RSSI Level Err @ –80 dBm (dB)**
- **PASS/FAIL LIMIT_07 RX RSSI Level Err @ –90 dBm (dB)**
- **PASS/FAIL LIMIT_08 RX RSSI Level Err @ –100 dBm (dB)**
- **PASS/FAIL LIMIT_09 RX RSSI Level Err @ –110 dBm (dB)**
- **PASS/FAIL LIMIT_10 RX RSSI/MCGAIN Internal RSSI Offset (dB)**
- **PASS/FAIL LIMIT_11 RX RSSI/MCGAIN Offset Error (dB)**
- **PASS/FAIL LIMIT_12 RX RSSI/MCGAIN Path Gain (dB)**
- **PASS/FAIL LIMIT_37 RX Bit Error Rate (BER)**

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, and to meet specific testing requirements and conditions. Each parameter may be used in one TEST or more.

For information on editing parameters, see **"Customizing Test Procedures" on page 84**.

The list of parameters is arranged alphabetically. The first two or three 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 Beep Enabled [0=silent 1-beep on]

Enter the desired beep control choice to determine the state of the Test Set's audible action indicator. Select 0 for beep silent; select 1 for beep on.

PARAMETER_02 GN Enter Chan [0=ch info 1=prompt 2=LCR]

Enter the desired control choice to determine the source of the channel information to be read. Select 0 for the entries in the frequency table; select 1 for the entry in the **Channel** field on the Initialization Screen; or select 2 for the channel numbers from the frequency table for locating receiver (LCR) testing.

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

PARAMETER_03 GN Read TRU Load & Rev Data [0=no 1=yes]

Enter the desired control choice to determine whether the Test Software will read Base Station's information. Select 0 for no reading; select 1 for reading.

If you select 1, the Test Software will read the following information from the Base Station:

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

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

PARAMETER_04 GN Stop Test if Results Fail [0=no 1=yes]

Enter the desired control choice to determine the testing status in the event that a TEST fails. Select 0 to continue testing on failure; select 1 to stop on a failure.

If you select 1, stop on failure when testing, the Test Set's USER keys will provide choices on how to proceed. Press the associated keys for the following:

- **`Proceed`** - The Test Software will proceed with testing despite the failed data point. The next TEST of the sequence will be performed.
- **`Repeat`** - The Test Set will perform the same TEST again and post the results. If the TEST fails again, the Test Software will again offer these four options.
- **`Abort`** - The Test Software will stop the testing. If TESTs remain in the sequence, those will not be performed. A summary of the number of passed and failed TESTs will be printed and Test Software execution will halt.
- **`Laptop`** - The Test Software will display the Terminal Emulator Mode screen. This screen allows you to send control commands to the radio when such commands are required to continue testing.

PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)

Enter the value of the loss through the receiver shelf splitter. For the eight-way receiver shelf splitter, this value is typically 11 dB. Obtain the exact value for this parameter from TRU cell site documentation or from Northern Telecom.

The value in this parameter is used only if **PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]** is set to 0.

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

PARAMETER_06 RX RSSI 1 kHz Audio Deviation (0 to 20) (kHz)

Enter the deviation level of the 1 kHz audio tone to be used in **TEST_08 - RXA RSSI Linearity**, **TEST_09 - RXB RSSI Linearity**, **TEST_10 - RXA RSSI/MCGAIN Offset and Gain**, and **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**.

PARAMETER_07 RX RSSI Lin Chk w/o Offset [0=no 1=yes]

Enter the desired control choice to determine whether the received signal strength indicator (RSSI) linearity check will be conducted with or without offset. Select 0 for test with offset; select 1 for test without offset. This parameter allows the Test Software to check RSSI linearity in **TEST_08 - RXA RSSI Linearity** and **TEST_09 - RXB RSSI Linearity** without the TRU internal offset. Removing the internal offset allows a check of RSSI linearity without having to change the pass/fail limits.

PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)

Enter the value for the highest level of RF signals to be injected into the receive multi-coupler (RMC) input by the Test Set. This value is the high level to which the signal is incremented in 10 dB steps. See also **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**.

NOTE: When choosing a level to enter, make the choice in consideration of the choice that you will make for the low level that you will enter in **PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)**. Make certain that you choose a level that can be incremented in 10 dB steps from the value of PARAMETER 09.

The actual RF level will be 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 also will be corrected for the receiver shelf splitter loss in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

In **TEST_24 - RX Standard Tests** and **TEST_26 - RX Quick Tests**, only the primary antennas are tested at this range of RF levels. This is to optimize testing time. Secondary antennas are tested at the single value entered in **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**. Primary antennas are determined by the **`Sector`** field on the Initialization Screen.

PARAMETER_09 RX RSSI Linearity RF Level Low (– 110 Min) (dB)

Enter the value for the minimum level of RF signals to be injected into the receive multi-coupler (RMC) input by the Test Set. This level is incremented in 10 dB steps until it reaches the value entered in **PARAMETER_08 RX RSSI Linearity RF Level High (0 max) (dB)**.

The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen. If the signal is applied to the receiver shelf inputs, the RF level also will be corrected for the receiver shelf splitter loss in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

In **TEST_24 - RX Standard Tests** and **TEST_26 - RX Quick Tests**, only the primary antennas are tested at this range of RF levels. This is to optimize testing time. Secondary antennas are tested at the single value entered in **PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)**. Primary antennas are determined by the **`Sector`** field on the Initialization Screen.

PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]

Enter the desired control choice to determine whether the Test Software will adjust the TRU RSSI offset (MCGain) until the reported RSSI error equals zero. Select 0 for no adjustments; select 1 for adjustment under specified conditions; select 2 for adjustment under any conditions.

- If you select 1, an adjustment will be made if the RSSI offset error exceed the limits set by **PASS/FAIL LIMIT_11 RX RSSI/MCGAIN Offset Error (dB)**.
- If you select 2, an adjustment will be made regardless of the measurement results.

PARAMETER_11 RX RSSI/MCGAIN Chk RMC Gain [0=no 1=yes]

Enter the desired control choice to determine whether RMC gain will be checked during **TEST_10 - RXA RSSI/MCGAIN Offset and Gain** and **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**. Select 0 for no gain checking; select 1 for gain checking

PARAMETER_12 RX RSSI/MCGAIN Off RF level (–50 to –110) (dBm)

Enter the value of the RF level to be applied to the TRU receiver during **TEST_10 - RXA RSSI/MCGAIN Offset and Gain** and **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**. The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen.

If the signal is applied to the receiver shelf inputs, the RF level is also corrected for the receiver shelf splitter loss in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

For **TEST_24 - RX Standard Tests** and **TEST_26 - 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_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes]

Enter the desired control choice to determine the antenna ports on the receiver shelf to be checked during **TEST_10 - RXA RSSI/MCGAIN Offset and Gain** and **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**. Select 0 for not checking all antennas; select 1 for checking all antennas.

This parameter overrides the value entered in the **`Sector`** field on the Initialization Screen, for TEST_10 and TST_11 only.

PARAMETER_14 RX SAT & ST Test @ Extremes [0=no 1=yes]

Enter the desired control choice to determine whether supervisory audio tone (SAT) and signaling tone (ST) will be tested under extended test conditions. Select 0 for no testing at extremes; select 1 for testing at extremes. See the descriptions for **"TEST_04 - RXA SAT Detection" on page 167** and **"TEST_05 - RXB SAT Detection" on page 168**.

PARAMETER_15 RX SAT Detection RF Level (dBm)

Enter the value of the signal generator level to be applied to the receiver during supervisory audio tone (SAT) TESTs when the minimum detectable level must be determined.

The actual RF level will be 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 will also be corrected for the receiver shelf splitter loss in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

PARAMETER_16 RX SAT Test at SINAD Level [0=no 1=yes]

Enter the desired control choice to determine if the SAT will be checked at the same RF level as the 12 dB SINAD level. Select 0 for no test at the same level; select 1 for testing at the same level, but only if the RF level for the 12 dB SINAD has been determined with the SINAD test prior to this test.

PARAMETER_17 RX SINAD (dB)

Enter the value to be used when the SINAD set and measure method is not selected. The RF level is adjusted to the SINAD level defined by this parameter during **TEST_02 - RXA SINAD Sensitivity** and**TEST_03 - RXB SINAD Sensitivity**. Ordinarily, this value is set to 12 dB.

PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)

Enter the level to be applied to the TRU during SINAD TESTs when the set and measure method is used. This level is the minimum RF level at which the SINAD must be acceptable.

The actual RF level is corrected by the RX1 through RX6 cable loss values entered on the Initialization Screen. If the signal is applied to the receiver shelf inputs, the RF level also will be corrected for the receiver shelf splitter loss in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes]

Enter the control choice to determine whether TESTs will be conducted on all antenna ports on the receiver shelf during **TEST_02 - RXA SINAD Sensitivity** and **TEST_03 - RXB SINAD Sensitivity**. Select 0 to not check all antenna ports; select 1 to perform a SINAD check on all six antenna ports.

During the SINAD TEST, this parameter overrides the value entered in the **`Sector`** field on the Initialization Screen for TEST_02 and TEST_03 only.

PARAMETER_20 RX SINAD Test by Set & Meas [0=no 1=yes]

Enter the control choice to determines which of two methods will be used for the measurement of receiver sensitivity.

Select 0 for the first method, in which the RF level that results in a particular SINAD value will be determined through an iterative technique.

Select 1 for the second method (set and measure), in which the RF level will be set by the value in **PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)**and the SINAD will be measured and compared to **PASS/FAIL LIMIT_13 RX SINAD for Set & Measure (dB)**.

See the description for **TEST_02 - RXA SINAD Sensitivity on page 164**.

PARAMETER_21 RX SINAD Test Level Deviation (kHz)

Enter the level of the FM deviation of the RF signal generator to be used in **TEST_02 - RXA SINAD Sensitivity** and **TEST_03 - RXB SINAD Sensitivity**.

PARAMETER_22 RX ST Detection RF Level (dBm)

Enter the signal generator level that is to be applied to the receiver during signaling tone (ST) 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 also will be corrected for the receiver shelf splitter loss in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.

PARAMETER_23 RX Test w/External Splitter [0=no 1=yes]

NOTE: In some instances, it will be beneficial to use a six-way external Splitter or Switch Matrix between the Test Set's duplex output and the six antenna inputs on the receiver shelf. This will reduce the number of connections that must be made during testing.

Enter the desired control choice to determine whether receiver TESTs will be conducted using an external Splitter or Switch Matrix. Select 0 to use no Splitter or Switch Matrix in the TESTs; select 1 to use a Splitter; select 2 to use an HP 3488 Switch Matrix; or select 3 to use an HP 83202A Switch Matrix.

If you select 1, 2, or 3, the Test Software will display the correct connection diagram on the Test Set's screen.

NOTE: Make certain that you compensate for the Splitter or Switch Matrix loss by adding it to each cable loss field (**`RX1 Cable Loss`** through **`RX6 Cable Loss`**, and **`TX Cable Loss`**) in the RX and TX Cable Loss menu, which is called from the **`RX and TX Cable Loss`** field on the Initialization Screen.

PARAMETER_24 RX Tests Perform at [0=rcvr shelf 1=RMC/LRM]

Enter the point at which receiver TESTs are to be performed at the cell site. Select 0 for the receiver shelf; select 1 for receive multi-coupler (RMC) input for 850-MHz Base Stations or local receive module (LRM) input for 1900-MHz Base Stations. In 1900-MHz Base Stations, there is no receiver shelf. Thus, a selection of 0 would be meaningless, and the test would not run.

The Test Software will display prompts for the correct connection based on this parameter setting.

- If you select 0, the Test Set's RF generator will compensate for the receiver shelf splitter loss in **PARAMETER_05 RX Rcvr Shelf Splitter Loss (typ 11 dB) (dB)**.
- If you select 1, no compensation for the splitter will occur. The Test Set's RF generator output is available at the DUPLEX OUT port.

NOTE: Connecting to the RMC or LRM will affect service on the entire cell site.

PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]

Enter the control choice to determine the antenna ports of the receiver shelf that will be tested. Select 0 for no port test; select 1, 2, or 3 to test at port 1, 2, or 3 if the **`Sector`** field on the Initialization Screen is set to **`Parm`**; or select 7 to test at all three ports.

If you select 0 , the TEST sequence will skip RXA *unless* one (or both) of the following parameters is (are) set to 1:

- **PARAMETER_13 RX RSSI/MCGAIN Test All Ants [0=no 1=yes] on page 227**
- **PARAMETER_19 RX SINAD Test All Ants [0=no 1=yes] on page 229**

PARAMETER_26 RXB Test Ant [0=None 4,5,6=single 7=all]

See **"PARAMETER_25 RXA Test Ant [0=none 1,2,3=single 7=all]" on page 231**.

PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)

This parameter is used to provide a default value for the RSSI Offset (MC Gain) values you may wish to download to the TRU. The value you enter into this parameter will be placed in the column labelled **`New Data`** when you run **TEST_01 - TRU Read and Store TRU Settings** and choose the action **`Use default TRU parameters for New Data`**. See **TEST_01 - TRU Read and Store TRU Settings on page 162**.

PARAMETER_28 TRU ANT2 RSSI Offset (–35 to 35, incr 0.25) (dB)

See **PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)**.

PARAMETER_29 TRU ANT3 RSSI Offset (–35 to 35, incr 0.25) (dB)

See **PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)**.

PARAMETER_30 TRU ANT4 RSSI Offset (–35 to 35, incr 0.25) (dB)

See **PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)**.

PARAMETER_31 TRU ANT5 RSSI Offset (–35 to 35, incr 0.25) (dB)

See **PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)**.

PARAMETER_32 TRU ANT6 RSSI Offset (–35 to 35, incr 0.25) (dB)

See **PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)**.

PARAMETER_33 TRU Audio RX Sens (–28 to –16, incr 0.1) (dBm)

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

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

- Running TEST_01 allows the user to read the TRU settings and send updated settings for the audio sensitivity to the TRU. See the description of **"TEST_01 - TRU Read and Store TRU Settings" on page 162** for details.
- If you set PARAMETER_37 to 1, the value for this parameter will be downloaded to the radio at the start of testing. See the description of **"PARAMETER_37 TRU Set Audio Sens at Start [0=no 1=yes]" on page 233**.

PARAMETER_34 TRU Audio TX Sens (–28 to –10, incr 0.1) (dBm)

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

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

- Running TEST_01 allows the user to read the TRU settings and send updated settings for the audio sensitivity to the TRU. See the description of **"TEST_01 - TRU Read and Store TRU Settings" on page 162** for details.
- If you set PARAMETER_37 to 1, the value for this parameter will be downloaded to the radio at the start of testing. See the description of **"PARAMETER_37 TRU Set Audio Sens at Start [0=no 1=yes]" on page 233**.

PARAMETER_35 TRU PA Max Pwr (30.5 to 46.5, incr 0.25) (dBm)

See the description of **"PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)" on page 231**.

The value in this parameter is used in TEST_01 TRU Read and Store TRU Settings, but it is not used by the Test Software when measuring TX power. In such case, the Test Software uses the value uploaded from the TRU.

PARAMETER_36 TRU PA Pwr Step Size(1 to 4, incr 0.25) (dB)

See the description of **"PARAMETER_27 TRU ANT1 RSSI Offset (–35 to 35, incr 0.25) (dB)" on page 231**.

The value in this parameter is used in TEST_01 TRU Read and Store TRU Settings, but it is not used by the Test Software when measuring TX power. In such case, the Test Software uses the value uploaded from the TRU.

PARAMETER_37 TRU Set Audio Sens at Start [0=no 1=yes]

Enter the control choice to determine whether the Test Software will load the TX and RX audio sensitivities at the beginning of the TEST sequence.

- If you select 1, the RX and TX audio senstivity values will be downloaded to the radio when the initial communication takes place at the start of testing.
- If you select 0, you may load the TX and RX sensitivities when running **"TEST_01 - TRU Read and Store TRU Settings" on page 162**.

See also **"PARAMETER_33 TRU Audio RX Sens (–28 to –16, incr 0.1) (dBm)" on page 232** and **"PARAMETER_34 TRU Audio TX Sens (–28 to –10, incr 0.1) (dBm)" on page 232**.

PARAMETER_38 TX Duplexer/Combiner Loss

Enter the value to be added to TX power measurements when **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 1 and **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]** is set to 1.

If PARAMETER_39 is set to 0 and PARAMETER_42 is set to 1, this parameter is used to compensate the default setting of the **`TX Combiner Power (dBm)`** field on the Initialization Screen. For example, under those conditions, the compensated power default setting would be 46.5 dBm minus the value entered in this parameter for an MPA. As other examples, the setting would be 47 for an SCLPA, and 30 for a NONE.

NOTE: The **`TX Combiner Power (dBm)`** field will appear on the Initialization Screen only if **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0; except if the power amplifier is type FMPA+ or MCPA, in which case, the field will always appear.

PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]

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

The selection that determines which field (either the **`TX Combiner Power (dBm)`** field or the **`TX Shelf Power (dBm)`** field) will appear on the screen is dependent upon the setting of **PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]**.

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

PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]

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

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

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

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

If the power level is 0.

If **PARAMETER_40 TX Power Adjust [0=no 1=fail 2=always]** is set to 1 or 2.

If **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** is set to 0.

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

If you select the FMPA type in the **`Base Station Radio`** field in the Initialization Screen, and if PARAMETER_40 is set to 1 or 2, the Test Software will display a meter and prompt you to set the power level by adjusting the FMPA+ front panel trimming potentiometer.

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

PARAMETER_41 TX Power, Test Down to Pwr Lev (0-7)

Enter the value to determine the power levels that are checked while power TESTs are running.

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

PARAMETER_42 TX Tests Perform at [0=PA shelf 1=comb/duplexer]

Enter the point at which transmitter TESTs are to be performed at the cell site. Select 0 for the PA shelf; select 1 for the combiner or duplexer.

- If you select 0, the Test Software will prompt you to connect the Test Set's RF input to the PA output on the PA shelf.
- If you select 1, the Test Software will prompt you to connect the Test Set's RF input to the combiner. At that point, you may elect to make the measurement at the duplexer or the combiner.

NOTE: Connecting to the duplexer or the combiner will affect service on the entire cell site.

PARAMETER_43 ZZZZ Test Mode [0=normal 1=demo]

Enter the desired control choice for Test Set operating mode. Select 0 for normal operation; select 1 for operation in demo mode.

- If you select 0, the Test Software will operate in normal mode.
- If you select 1, the Test Software will bypass most communication with the Base Station, allowing the program to be demonstrated without the delay caused by Base Station's 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.

NOTE: If you wish to operate the Test Software in demo mode, change PARAMETER_04 GN Stop Test if Results Fail [0=no 1=yes] to 0 (the default is 1). If PARAMETER_04 is left set to 1, all points will fail in demo mode.

As an operational safety feature, the Test Software will display the following message in large type on the TESTS (IBASIC Controller) screen when you select the **`Run Test`** field or press the **k1** (**`Run Test`**) key after selecting demo mode:

```
THE SOFTWARE IS IN DEMO MODE!
```

PARAMETER_44 GN Synth Ref [0=Int 0CX0 1=4.8 MHz Ext]

Enter the desired control choice to determine the time base to be used in test operations. Select 0 to use the Test Set's internal oven controlled crystal oscillator; select 1 to use the external 4.8-MHz oscillator located in the Base Station. If you elect to use the Base Station oscillator, you must connect the output of that oscillator to the SYNTH REF IN connector on the Test Set's side panel.

NOTE: The 4.8-MHz oscillator selection is not available on the HP E6380A CDMA Base Station Test Set.

If you elect to use the 4.8-MHz oscillator, and the procedure that you select includes TEST_14, the Test Software will temporarily disable the external oscillator and employ instead the Test Set's internal oscillator for running that TEST only.

PARAMETER_45 GN TRU [0=Cellular 1=PCS]

Enter the desired control choice to determine the frequency band for which tests will be performed. Enter 0 to test 850-MHz cellular Base Stations; enter 1 to test 1900-MHz PCS Base Stations. The content of the list of TRU radios available for selection on the Intitialization Screen will be determined by this parameter setting.

NOTE: It is important to keep in mind that PCS-band (1900-MHz) Base Stations are TDMA only. Therefore, the HP E6381A TDMA Base Station Test Set should be used to perform tests on such Base Stations. The HP E6380A CDMA Base Station Test Set will perform some of the Base Stations tests, but it will not perform any of the TDMA digital tests.

PARAMETER_46 RX BER [XXXX.YYYY X=avers Y=slot/aver]

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

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

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

100.0020

Bit Error Rate (BER) Tests:

In bit error rate (BER) tests (TEST_31 and TEST_32), the combination of these two numbers correspond to the total number of bits measured, as shown in the following equation:

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

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

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

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

Bit Error Rate (BER) Screen Tests:

In bit error rate (BER) screen tests (TEST_33 and TEST_34), only the YYYY number is used to arrive at the total number of bits to be measured, as shown in the following equation:

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

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

PARAMETER_47 RX BER RF Level

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

Bit Error Rate (BER) Tests:

In bit error rate (BER) tests (TEST_31 and TEST_32), the number entered is used as the RF level for all measurements.

Bit Error Rate (BER) Screen Tests:

In bit error rate (BER) screen tests (TEST_33 and TEST_34), the number entered is always used as the RF level for the initial measurement, and perhaps it is used for all others. However, you may adjust the RF level during the TEST by pressing the k4 (**`RF Level`**) key and following the on-screen prompts.

PARAMETER_48 RX BER Test Timeslots [1,2,3=slot,4=all]

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

Bit Error Rate (BER) Tests:

In bit error rate (BER) tests (TEST_31 and TEST_32), you may select any timeslot or all timeslots.

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

Bit Error Rate (BER) Screen Tests:

In bit error rate (BER) screen tests (TEST_33 and TEST_34), the operation for selections 1, 2, and 3 are the same as for TEST_31 and TEST_32. However, selection 4 is not applicable.

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

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

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

Pass/Fail Limit Specification Descriptions

Pass/fail limits define the values with which measurement results are compared to determine if the system under test meets specified standards. For information on editing Pass/Fail Limits, see **"Customizing Test Procedures" on page 84**.

All pass/fail limits have lower and upper limits that can be entered or modified. The column labeled **`Check`** on the **`Pass/Fail Limits`** 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 that you 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 pass/fail limits from being lost when a new procedure is selected, save those in a procedure. See **"Saving/Deleting Procedures to/from a Card" on page 91**..

Pass/fail limits may be secured (see **"Securing/Unsecuring Procedures" on page 132**).

The list of pass/fail limits is arranged alphabetically. The first two or three letters in the title of each pass/fail limit indicate its classification. The classifications are:

GN = General

RT = Receiver and Transmitter

RX = Receiver

TX = Transmitter

PASS/FAIL LIMIT_01 RT Audio Deviation (kHz)

Enter the upper and lower pass/fail limits for the transmitter deviation when RF loopback is used to test the RX to TX gain path. See **TEST_12 - RTA Audio Level on page 181**.

PASS/FAIL LIMIT_02 RX RSSI Level @ 0 dBm (dB)

Enter the upper and lower pass/fail limits for the reported level of the received signal strength indicator (RSSI) when 0 dBm is applied to an RX input of the receiver.

See **TEST_08 - RXA RSSI Linearity on page 171**.

PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)

Enter the upper and lower pass/fail limits for the reported level of the received signal strength indicator (RSSI) when –50 dBm is applied to an RX input to the receiver.

See **"TEST_08 - RXA RSSI Linearity" on page 171**.

PASS/FAIL LIMIT_04 RX RSSI Level Err @ –60 dBm (dB)

See **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**. Replace “–50 dBm” with “–60 dBm”.

PASS/FAIL LIMIT_05 RX RSSI Level Err @ –70 dBm (dB)

See **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**. Replace “–50 dBm” with “–70 dBm”.

PASS/FAIL LIMIT_06 RX RSSI Level Err @ –80 dBm (dB)

See **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**. Replace “–50 dBm” with “–80 dBm”.

PASS/FAIL LIMIT_07 RX RSSI Level Err @ –90 dBm (dB)

See **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**. Replace “–50 dBm” with “–90 dBm”.

PASS/FAIL LIMIT_08 RX RSSI Level Err @ –100 dBm (dB)

See **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**. Replace “–50 dBm” with “–100 dBm”.

PASS/FAIL LIMIT_09 RX RSSI Level Err @ –110 dBm (dB)

See **PASS/FAIL LIMIT_03 RX RSSI Level Err @ –50 dBm (dB)**. Replace "–50 dBm" with "–110 dBm".

PASS/FAIL LIMIT_10 RX RSSI/MCGAIN Internal RSSI Offset (dB)

Enter the upper and lower pass/fail limits for the internal RSSI offset value programmed into the radio.

See **"TEST_10 - RXA RSSI/MCGAIN Offset and Gain" on page 176** and **"TEST_11 - RXB RSSI/MCGAIN Offset and Gain" on page 180**.

PASS/FAIL LIMIT_11 RX RSSI/MCGAIN Offset Error (dB)

Enter the upper and lower pass/fail limits for the RSSI offset error in **TEST_10 - RXA RSSI/MCGAIN Offset and Gain** and **TEST_11 - RXB RSSI/MCGAIN Offset and Gain**. RSSI Offset error is determined using the following equation:

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

If the resulting error exceeds the limits entered in these pass/fail limits, and **PARAMETER_10 RX RSSI/MCGAIN Adj [0=no 1=fail 2=always]** is set to 1 or 2, the Test Software will adjust the TRU RSSI MC Gain until the reported RSSI error equals zero.

PASS/FAIL LIMIT_12 RX RSSI/MCGAIN Path Gain (dB)

Enter the upper and lower 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 these pass/fail limits, you will be given the option to adjust the RMC gain. Choosing **yes** will display an adjustment meter.

PASS/FAIL LIMIT_13 RX SINAD for Set & Measure (dB)

Enter the lower pass/fail limit for the SINAD measurement. If the measured SINAD is greater than the number entered, 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 will be determined by **PARAMETER_18 RX SINAD RF Level for Set & Measure (dBm)**.

See **TEST_02 - RXA SINAD Sensitivity**.

PASS/FAIL LIMIT_14 RX SINAD Sensitivity RF Level (dBm)

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

See **TEST_02 - RXA SINAD Sensitivity** .

PASS/FAIL LIMIT_15 TX 1 kHz Tone Generator Audio Frequency (Hz)

Enter the upper and lower pass/fail limits for the frequency error measured in **TEST_20 - TX 1 kHz Tone Generator**. The Test Set directs the Base Station to generate a 1 kHz tone with an 8 kHz deviation. When the Test Set receives the tone, it demodulates it and compares the frequency with the upper and lower settings of these pass/fail limits.

PASS/FAIL LIMIT_16 TX 1 kHz Tone Generator FM Deviation (kHz)

Enter the upper and lower pass/fail limits for the FM deviation measured in **TEST_20 - TX 1 kHz Tone Generator**. The Test Set directs the Base Station to generate a 1 kHz tone with an 8 kHz deviation. When the Test Set receives the tone, it demodulates it and compares the deviation with these pass/fail limits.

PASS/FAIL LIMIT_17 TX Combiner/Duplexer or Backplane Loss

Enter the upper and lower pass/fail limits for the TX combiner's and/or duplexer's loss, which may be computed in **TEST_15 - TX Maximum Power and Power Level**.

The combiner's and duplexer's loss or backplane's loss will be computed by the Test Software if the power reference is read from the **`TX Combiner Power (dBm)`** field on the Initialization Screen (which requires that **PARAMETER_39 TX Pow Ref from TRU Settings [0=no 1=yes]** be set to 0). The results will be displayed and compared with the value entered in these pass/fail limits. This loss is computed using the following equation:

Combiner + Duplexer Loss = TRU Internal Power Level - Measured Power Level

Backplane Loss = TRU Internal Power Level - Measured Power Level

PASS/FAIL LIMIT_18 TX Frequency Error (kHz)

Enter the upper and lower pass/fail limits for the difference between the measured and assigned transmitter frequencies.

PASS/FAIL LIMIT_19 TX Power Error (dB)

Enter the upper and lower pass/fail limits the acceptable error of the PA output power level. The error is derived by subtracting the measured power from the power defined by the **`TX Combiner Power (dBm)`** field or the **`TX Shelf Power (dBm)`** field on the Initialization Screen, and **PARAMETER_36 TRU PA Pwr Step Size(1 to 4, incr 0.25) (dB)**. These pass/fail limits will be used when the power error is checked at each power level.

See **TEST_15 - TX Maximum Power and Power Level**.

PASS/FAIL LIMIT_20 TX Power Error at Power Level 0 (dB)

Enter the upper and lower pass/fail limits for the acceptable error of the PA output power at power level 0. The error is derived by subtracting the measured power from the power defined by the **`TX Combiner Power (dBm)`** field or the **`TX Shelf Power (dBm)`** field on the Initialization Screen. Adjustments are performed at power level 0, so you might wish to set these pass/fail limits tighter than entered in **PASS/FAIL LIMIT_19 TX Power Error (dB)**.

PASS/FAIL LIMIT_21 TX Residual AM Deviation (%)

Enter the upper pass/fail limit for the acceptable rms amplitude modulation of the PA output signal.

See **TEST_17 - TX Residual AM on page 188**.

PASS/FAIL LIMIT_22 TX Residual FM (Hz)

Enter the upper pass/fail limit for the acceptable residual FM of the PA output signal.

PASS/FAIL LIMIT_23 TX SAT Deviation (kHz)

Enter the upper and lower pass/fail limits for the maximum and minimum supervisory audio tone (SAT) tone FM deviation. Transmitter deviation resulting from the SAT tone is nominally 2 kHz.

PASS/FAIL LIMIT_24 TX SAT Frequency Error (Hz)

Enter the upper and lower pass/fail limits for the error in the frequency of the 5970 Hz, 6000 Hz, or 6030 Hz supervisory audio tone (SAT) tones modulated onto the transmitter signal.

PASS/FAIL LIMIT_25 TX Wideband Data Deviation (kHz)

Enter the upper and lower pass/fail limits for the maximum and minimum peak frequency deviation resulting from a wideband data signal.

PASS/FAIL LIMIT_26 TXD TDMA Adjacent Channel Power (dB)

Enter the upper pass/fail limit for the ratio of the transmitter power in the adjacent channels to the power of the desired signal.

See **TEST_22 - TXD TDMA Adjacent Channel Power on page 193**.

PASS/FAIL LIMIT_27 TXD TDMA Alternate 1 Channel Power (dB)

Enter the upper pass/fail limit of the ratio of the transmitter power in the alternate 1 channels to the power of the desired signal. The alternate 1 channels are two channels above and below the assigned channel.

See **TEST_22 - TXD TDMA Adjacent Channel Power on page 193**.

PASS/FAIL LIMIT_28 TXD TDMA Alternate 2 Channel Power (dB)

Enter the upper pass/fail limit of the ratio of the transmitter power in the alternate 2 channels to the power of the desired signal. The alternate 2 channels are three channels above and below the assigned channel.

See **TEST_22 - TXD TDMA Adjacent Channel Power on page 193**.

PASS/FAIL LIMIT_29 TXD TDMA Mod Acc Error Vector Mag Peak (%)

See the description of **"PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)" on page 247**.

This pass/fail limit is the peak error vector magnitude over the sample period.

PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)

Enter the upper pass/fail limit of the difference in the actual transmitted phase and amplitude trajectory from the ideal one.

The transmitted signal can be imagined as a vector that rotates, because of the equivalent phase modulation on the signal, and changes in level, because of the equivalent amplitude modulation on the signal. The word “equivalent” is used because the signal is not actually independently phase- and amplitude-modulated. These modulations result from the 45-degree, shifted, differentially encoded, quadrature-phase-shift-keying modulation. At certain times, called decision points, the phase error and amplitude error from ideal must be within specified limits. The value of the vector that connects an ideal mathematically derived vector to the transmitted vector is determined at the decision points. The values of these error vectors are summed using a square-root-of-the-sum-of-the-squares calculation. The error vector magnitude is the result of this calculation.

Prior to determining the transmitted vector to compare with the ideal vector, the characteristics of frequency error, origin offset, and amplitude droop are mathematically extracted. Frequency error and origin offset are separately specified. Amplitude droop is not relevant in the case of Base Station measurements and is not specified. See **PASS/FAIL LIMIT_32 TXD TDMA Mod Acc Frequency Error (Hz)** and **PASS/FAIL LIMIT_34 TXD TDMA Mod Acc Origin Offset (dBc)**.

PASS/FAIL LIMIT_31 TXD TDMA Mod Acc EVM 10 Averages (%)

See the description of **PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)**. This limit differs from PASS/FAIL LIMIT_30 in that it computes the average error vector magnitude over 10 consecutive readings.

See **TEST_23 - TXD TDMA Modulation Accuracy on page 194**.

PASS/FAIL LIMIT_32 TXD TDMA Mod Acc Frequency Error (Hz)

Enter the upper and lower pass/fail limits for the acceptable frequency error. See the description of **PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)**.

Prior to determining the transmitted vector for comparison to the ideal vector, the characteristics of frequency error, origin offset, and amplitude droop are mathematically extracted.

PASS/FAIL LIMIT_33 TXD TDMA Mod Acc Magnitude Error (%)

Enter the upper pass/fail limit for the error in the magnitude or amplitude. The magnitude error is the difference between the ideal and transmitted signal. See the description of **PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)**.

PASS/FAIL LIMIT_34 TXD TDMA Mod Acc Origin Offset (dBc)

Enter the upper pass/fail limit for the origin offset. Origin offset can be considered to be an unwanted, unmodulated signal at the carrier frequency present in the transmitted signal. See the description of **PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)**.

Units dBc in the limit indicates dB referenced to the carrier.

PASS/FAIL LIMIT_35 TXD TDMA Mod Acc Phase Error (deg)

Enter the upper pass/fail limit for the error in the phase. The phase error is the difference between the ideal and transmitted signal. See the description of **"PASS/FAIL LIMIT_30 TXD TDMA Mod Acc Error Vector Magnitude (%)" on page 247**.

PASS/FAIL LIMIT_36 TXD TDMA Power Error (dB)

Enter the upper and lower the pass/fail limits for the average power of the transmitter while operating in the digital mode. These pass/fail limits are used in TEST_21 to measure transmitter power in the digital mode.

PASS/FAIL LIMIT_37 RX Bit Error Rate (BER)

Enter the upper limit for the percentage of allowable error in the bit error rate (BER). This pass/fail limit is used in TEST_31 and TEST_32. It is not required that you enter a lower limit because of the nature of the measurment.

Glossary

`Abort` A USER key. Pressing this key exits the testing process.

AMPS (Advanced Mobile Phone System) The cellular system in use on the North American continent and on other continents.

AVL (Average Voice Level) A standard audio voltage that is used to set the level of the signal applied to the modulator in the base station. It is expressed in dBm into a 600-ohm load.

BER (Bit Error Rate) The rate of errors induced by the base station. Expressed as a percentage.

BPF (Band-Pass Filter) A filter that increasingly rejects frequency components of signals as those components diverge above and below 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.

BTS (Base Transceiver Station) A set of transmitter, receiver, and control equipment at a cell site.

CDMA (Code Division Multiple Access) A technique for spread-spectrum multiple-access digital communication that creates channels through the use of unique code sequences.

`Choices:` A context-driven drop-down list on the Test Set screen that includes several possible functions for selection.

cursor A movable brightened region of the Test Set screen that indicates the field or function currently selected.

`Del Step` A USER key. Pressing this key deletes a step in the procedure.

`DPA` Dual-channel Power Amplifier.

Epson card A PC card that meets the Epson Corporation standards. There are two types of Epson cards: OTP and SRAM. (The Test Set does not accommodate Epson type cards.)

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 of interest on the Test Set screen, often with an inverse video display in which entries may be made.

function A particular field, feature, or operation of the test set.

GN (Abbreviation for General) 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 Test Software feature that provides specific information about the current screen or function.

HELP A Test Set feature that provides information on Test Set functions. It is accessed by pressing the Help key.

highlight A brightened region of the test set screen.

HPF (High-Pass Filter) A filter that has a single transmission band extending from some cutoff frequency (not zero) and extending to an infinite frequency.

HP-IB (Hewlett-Packard Interface Bus) The Hewlett-Packard implementation of the interface bus system described in Specification IEEE-488.2.

IBASIC (Instrument BASIC) A computer language (code or software) used in the Test Set by the built-in controller.

Initialization Screen The screen that is accessed by pressing the k1 (**`Run Test`**) key. It is used to customize the Test Software and execute (run) all automated testing.

initialize The process of formatting a storage medium before storage may occur.

key Any of the push buttons on the front panel. Also, a USER key, which is one of the k1 through k5 group. These keys perform associated numbered functions listed in the action field at the right-hand side of the screen. USER keys are user programmable.

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

library A collection of the names of all of the parameters, specifications, and tests in the Test Software. The Test Software and the Test Set 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 PC card with its associated procedure files.

location A device to which to store and from which to retrieve information (for instance, card, RAM, ROM, or a PC.

LPF (Low-Pass Filter) A filter that has a single transmission band extending from zero to some cutoff frequency, not zero.

measurement A series of calculations performed by the Test Set on data from a base station under test.

Menu A Test Set front panel key. Pressing this key displays the SOFTWARE MENU screen.

menu A list of functions on the Test Set screen among which the user may select using the cursor.

message A block of text characters in the upper portion of the Test Set screen that contains information of interest to the user. This area is reserved for messages and prompts. Messages give an indication of the status of the Test Set, for example, **System initialization**. Prompts direct the user to perform some function or action.

MPA Modulating Power Amplifier.

MCPA Multi-channel Power Amplifier.

OTP card (One Time Programmable card) A type of PC card on which data may be stored once only; similar to integrated-circuit ROM.

parameter A Test Software function that is user modifiable and that is used to specify certain values and control information to the Test Software. These include calibration data, base station characteristics, or test

customization. Parameters provide flexibility in the manner in which the Test Software is used. Default values for all parameters are included in the Test Software.

pass/fail limit A Test Software function that is user modifiable and that is used to specify the measurement criteria for verifying the performance of the base station. Specifications can include high limits, low limits, and high/low limits. The associated measurement value must meet or fall within the pass/fail values to pass the test. Default values are included in the Test Software and have been derived from standard methods of measurement or from standard base station test requirements.

Pause/Continue A Test Set front panel key that is used to pause (temporarily stop) or continue (restart) the program running in the Test Set. Pressing the key the first time pauses the program, pressing it a second time restarts the program.

Pause/Continue (Reset) A Test Set front panel shift function key that is used to reset the program running in the Test Set. Pressing the **Shift** key, then this key resets the program.

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.

PC Card A PCMCIA or Epson card that contains the procedures for testing the base station. (The Test Set accommodates PCMCIA type cards only.)

PCMCIA card A PC card that meets the specification of the Personal Computer Memory Card International Association. There are two types of PCMCIA cards: OTP and SRAM. (The Test Set accommodates PCMCIA type cards only.)

Preset A Test Set front panel key. Pressing this key sets the test set to its initial power-up state.

procedure A collection of test operations that are performed on a base station under test. Also, a group of channels, parameters, pass/fail limits, and testing order, saved in a file, that customizes the Test Software to a specific application.

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

RAM (Random-Access Memory) A type of integrated circuit that is capable of data storage, with the data read- or write-accessible on an address-selectable, or random-access, basis. RAM is used in the Test Set to store program code and data. The Test Set RAM is backed up by a battery so that data and program code are retained when the power is turned off.

ROM (Read-Only Memory) A type of integrated circuit that is capable of data storage, into which data may be loaded one time only, with the data read-accessible on an address-selectable, or random-access, basis. ROM is used primarily for control applications in which data must be read multiple times.

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

Run Test A USER key. Pressing this key directs the Test Set to load the Test Software, including the selected procedure, and begin testing.

SAT (Supervisory Audio Tone) A 5970 Hz, 6000 Hz, or 6030 Hz tone that is transmitted by a base station on a forward analog voice channel and transponded by a mobile station on the reverse analog voice channel. It is used to confirm that the mobile station has connected to the desired base station on the voice channel.

screen The video display of the Test Set. Also, a particular display related to a specific function, as in Initialization Screen.

select To choose a particular field or function. This is done by rotating the cursor control knob to move the highlighted cursor to the chosen field or function, then pressing the knob. In some instances, 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 (Channel Information) screen.

SCLPA Single-channel Linear Power Amplifier.

SINAD (Signal plus Noise And Distortion) A representation of 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 receiver sensitivity.

softkey (familiar name) The set of five keys to the right of the Test Set display that can be assigned to certain special actions or fields. The keys are also called USER keys.

SOFTWARE MENU The Test Set screen that is accessed by pressing the **Menu** key or the k5 (**Main Menu**) key. It is used to customize and execute (run) automated testing.

specification See pass/fail limits.

SRAM (Static Random-Access Memory) A sub-type of RAM integrated circuit that is optimized for relatively high-speed general memory applications.

SRAM card (Static Random Access Memory card) A type of PC card that is used for data storage. An SRAM card may be used with the Test Set to save programs and test results.

Step A Test Software function that orders the sequence of tests. For instance, Step 1 might be Test_5, and Step 2 might be Test_26.

TEST A collection of measurements (or a series of other tests) that verify a particular specification value or operation of the base station under test. A sequence of tests is contained in a test procedure.

TRU (Transmit Receive Unit) A Northern Telecom transceiver.

USER keys A group of programmable keys located immediately to the right of the Test Set display that allow the user to select more rapidly certain functions without rotating and pressing the knob. The key assignments are displayed in fields in the right-hand area of the screen. The number to the left of the field corresponds to the number of the USER key (k1 through k5).

value The scaler quantity or number entered in a section of a menu field or in a specification or parameter field. Units of measure (dB, inches, volts, watts, and so forth) are contained in the menu item, parameter, or pass/fail limit.

VSWR (Voltage Standing Wave Ratio) The absolute value of the antenna impedance, normalized to that of the RF transmission line (50 ohms). Note that, because the impedance matching properties of the antenna are important primarily for power matching, the phase information is of less importance. Phase change with frequency, which is related to the group delay and to the frequency dispersion, may also be of importance.

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