HP 11807B Option 023 Lucent CDMA Base Station Test Software

User's Guide

Software Revison: B.02.00 and above

HP Part Number 11807-90156

Revision C

Printed in U.S.A

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1 Product Description

Review this chapter for general information on the HP 11807B Option 023 Lucent CDMA Base Station Test Software. Included is a list of required equipment to perform the tests, plus a look at the basic Software flow.

Overview

Description of the Lucent Cellular CDMA Base Station Test Software

The Software is an Instrument BASIC (IBASIC) application used to set up the Test Set for transmitter measurements on Lucent Series II CDMA base station equipment. The Software runs on the Test Set's internal IBASIC controller to allow you to perform the following tests and procedures:

- TX Power Meter
- Pilot Only Test
- Code Domain Tests
- Automated BBA Test
- Spectrum Analyzer
- Code Domain Analyzer
- CDMA Analyzer
- PN Offset Search
- Calibrate TX Test Port
- Insertion Loss Test
- Return Loss Test
- BTS Laptop Utility

Using a modem in the Test System, the Software can control the base station equipment by sending commands to the Mobile Switching Center (MSC). This provides automated testing to reduce time spent at the site and to greatly improve the repeatability of measurements.

As tests are run, the measured results are compared to user specified limits. These test results can be printed or stored to a memory card for archival purposes.

Who should use the Lucent CDMA Base Station Test Software?

If you are installing, commissioning, or maintaining Lucent Technologies' Series II CDMA cell site equipment, this Software will assist you in performing key tests of transmitter performance.

Included with the Software

Included with the HP 11807B option 023 Software:

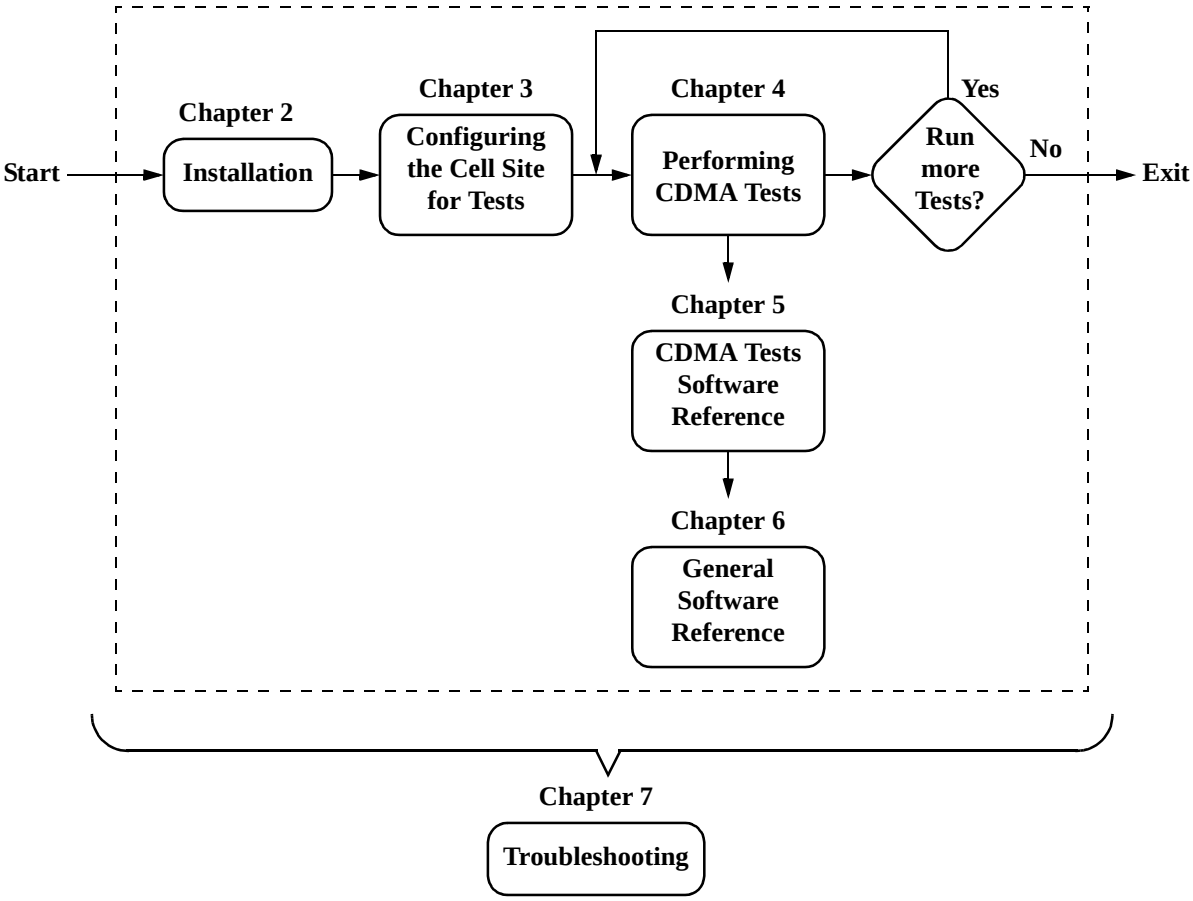
- ❏ Memory card (OTP) containing the program files (part number 11807-10046)
- ❏ Memory card (OTP) containing the program files (part number 11807-10046)
- ❏ Blank RAM card
- ❏ Lucent CDMA Base Station Test Software manual - this manual (part number 11807-90156)
- ❏ Software License Agreement
- ❏ 3.5 inch diskette containing the BTS Laptop Utilities program (part number E6961-10001)

Software Operation Overview

Figure 1-1 illustrates the basic steps for Software operation. After running the software, a test can be repeated or you can select another test.

Chapter 4 , “Performing CDMA Tests,” gives step-by-step instructions for each of the tests. If you have questions, further details can be found in Chapter5 , “CDMA Tests Software Reference.” If you encounter errors, Chapter 7, “Troubleshooting,” can assist you.

Figure 1-1 Steps for the Use of the CDMA Test Software



Test System Hardware

Required Equipment

Test Equipment

The Software is written specifically to work with:

- HP 8921A Option 600 (includes the HP 8921A Cell Site Test Set, HP 83205A CDMA Cellular Adapter).
- HP 8921A Option603.
- HP 8921A plus either the HP 83203B or HP 83205A CDMA Cellular Adapter.

NOTE

To take full advantage of this Software, your HP 8921A Cell Site Test Set should have firmware revision A.12.04 or higher. The Software will execute on earlier revisions, but may behave differently than shown in this book. To check your Test Set's revision number, exit any software program and press SHIFT, CONFIG (DUPLEX). The installed revision will be displayed in the upper right corner of the CRT. Contact your nearest Hewlett-Packard sales office for firmware upgrade information.

Modem

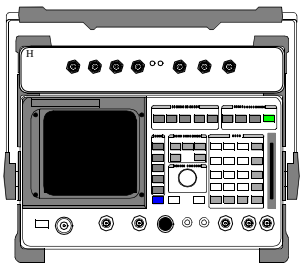
The best way to communicate with the MSC to control the cell site during testing is to use a laptop PC (Personal Computer) with an internal modem. This allows you to dial up and login to the MSC, and enter the maintenance craft shell as you normally would for other cell site operations.

Cables and Adapters

Several cables and adapters are required. See "Connector Kit" on page 93 for information on an optional cable kit that supplies the necessary cables and adapters to connect the Test Set to the base station and computer.

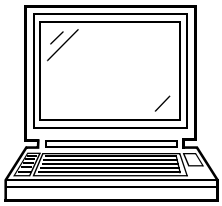
Figure 1-2 Required Equipment

Test Equipment required:

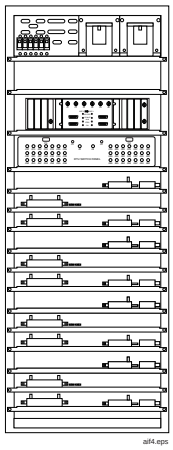


- HP 8921A Opt. 600, 603 or an HP 8921A with an HP 83203B or 83205A Cellular Adapter.

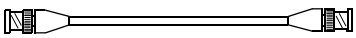
You must supply:



- Laptop PC with modem to communicate with the switch.

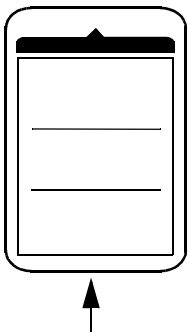


- Lucent CDMA Base Station.



- Cables to connect the base station to the Test System.

Supplied with the HP 11807B Option 023 Software:



HP 11807B Option 023 Lucent CDMA Base Station Test Software

- CDMA Base Station Test Software on OTP card
- RAM Card with battery.
- This Manual

Optional Equipment

Cable Kit

See "Connector Kit" on page 93 for information on a cable kit that supplies required cables and adapters for connection of the Test System to the base station and computer.

Printer

A printer can be used to provide a record of test results. A summary of the test performed, the measured results, and a pass/fail analysis is included for tests that provide printed results.

The Test System supports printing via the PARALLEL, and SERIAL ports. The following printers are supported:

- ❏ HP DeskJet printers
- ❏ HP LaserJet printers
- ❏ HP ThinkJet printers
- ❏ HP QuietJet printers
- ❏ Epson FX-80 and LQ-850 printers

You may also collect the results using a PC and BTS Laptop Utility on the serial port.

Personal Computer (PC)

The Test Set and Software supports using a PC to control the base station via the MSC. The PC is connected to the Test Set via the SERIAL 9 port. Most PC's with an available serial port are compatible with the Test Set.

If you install the BTS Laptop Utilities program on your PC, you can use your laptop and internal modem to relay commands to the MSC from the Test Set, collect test data, log commands sent between the Test Set and the MSC, and capture screen images.

GPS Time and Frequency Reference Receiver

The Lucent CDMA Base Station Test Software supports the HP 58503A GPS time and frequency reference receiver for supplying the timebase signal normally taken from the base station equipment. See Figure 5-3 on page 92.

When connecting to the base station's SCT modules as the timing reference, the Software uses the signals out of the modules as though they are correctly timed to GPS time to provide the correct system time. If a problem exists in the base station's GPS reference or SCT modules, the base station's PN offset will likely be incorrect.

Using the HP 58503A, you provide a GPS-referenced timing signal that is independent of the base station. This helps isolate problems associated with the base station's own GPS reference equipment and/or SCT module(s). An example of this is an "island cell", where the base station passes performance tests but does not properly interact with adjacent cells during handoffs.

Getting Help, Software Upgrades, and Training

For instrument servicing, see the *HP 8921A Test Set Assembly Level Repair Guide*.

For application assistance, call the HP Application Hotline (1-800-922-8920, USA and Canada only).

For information about software upgrades and hands-on HP training, contact your local HP sales engineer.

2 Installation

Follow the steps in this chapter to load and run the Software, to connect the test equipment, and to make initial settings to configure your Test Set. *You must complete the steps in this chapter before attempting measurements with the Software.*

Overview

The steps in this chapter are:

1. “Load and Run the Lucent CDMA Base Station Test Software” on page 19
2. “Connect the Test Set to the Site Equipment” on page 23
3. "Communications with the MSC" on page 28

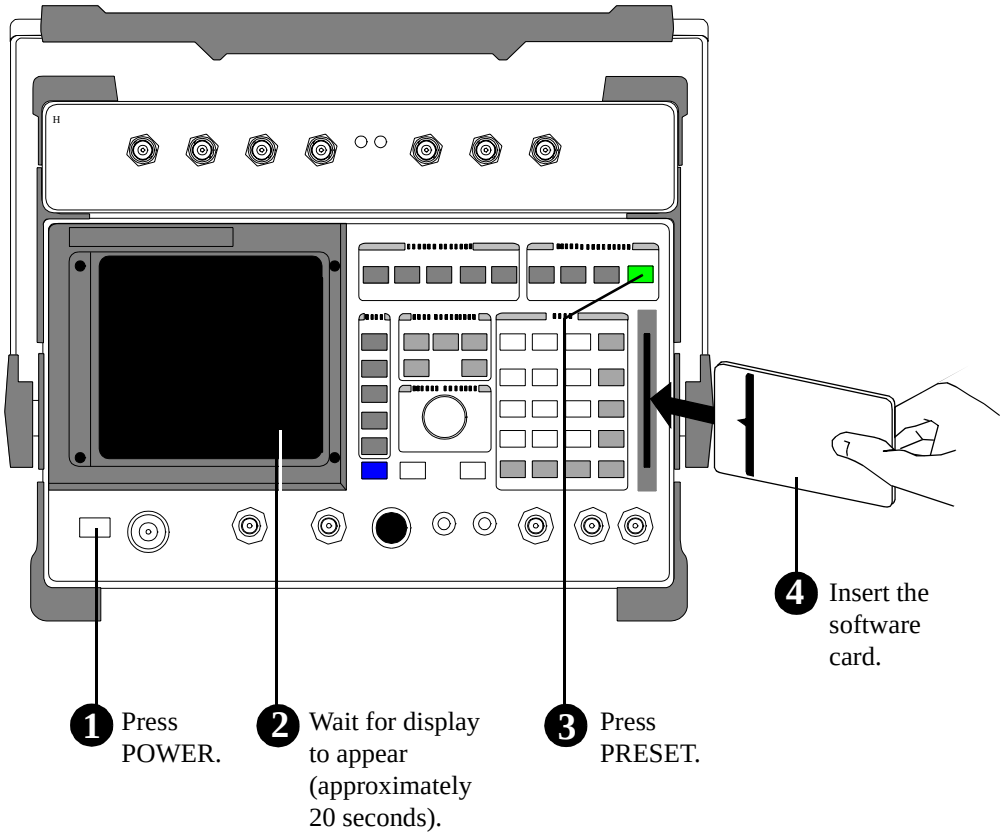
NOTE

The last step, communications with the MS, is not a strict requirement. However, the test examples in “Performing CDMA Tests” on page 43 use a modem to control the cell site via the MSC. The Software also supports testing without modem control. If you are not using a modem with your Test System, skip the last step and see “Testing without MSC Control” on page 104 for a summary of differences when running without the modem.

Load and Run the Lucent CDMA Base Station Test Software

Locate the PC card labeled Lucent CDMA Base Station Test SW and follow the steps outlined in Figure 2-1 and Figure 2-2.

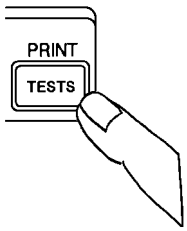
Figure 2-1



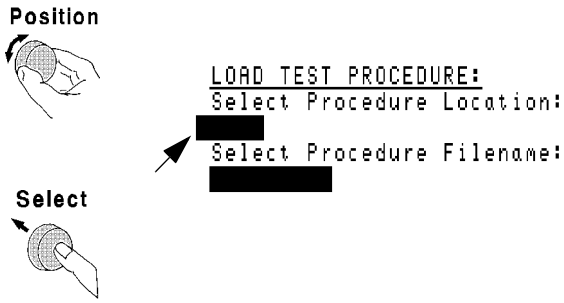
Continued on the following page

Figure 2-2 Loading the Software (continued)

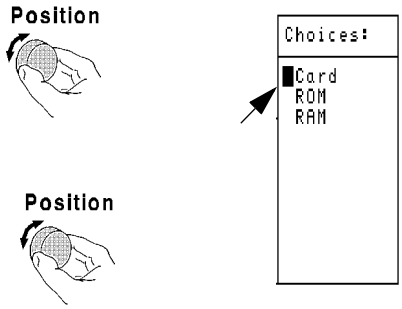
5 Press the **Tests Menu** key to display the **Tests (Main)** menu screen.



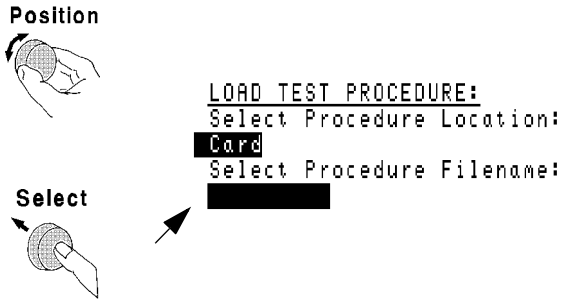
6 Position the cursor at **Select Procedure Location:** and select it.



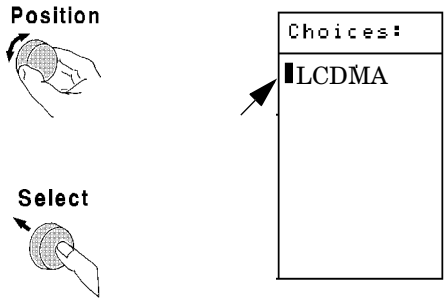
7 Position the cursor at **Card** and select it.



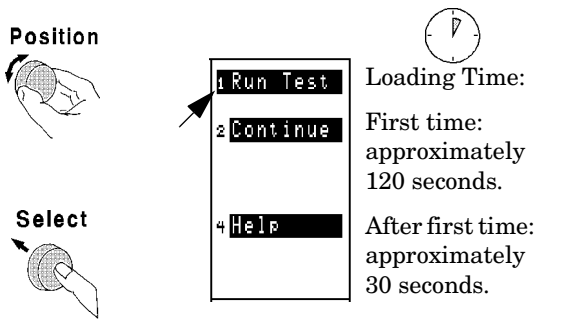
8 Position the cursor at **Select Procedure Filename:** and select it.



9 Position the cursor at **Choices:** and select the Procedure name: LCDMA.



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



Loading Time:

First time: approximately 120 seconds.

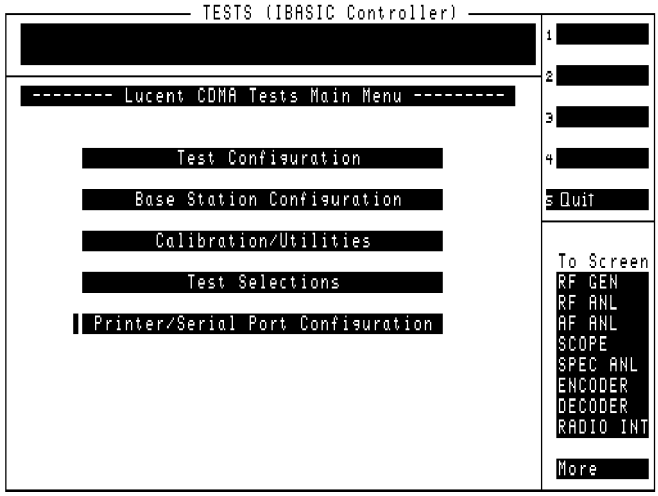
After first time: approximately 30 seconds.

Navigation of the Lucent CDMA Base Station Test Software

After the software has loaded, you will see the Software's Main Menu on the display of the Test Set (see Figure 2-3).

Configuration operations, test utilities, and tests are grouped into sub menus. Turn and press the knob to access the desired sub menu.

Figure 2-3 Lucent CDMA Base Station Test Software Main Menu

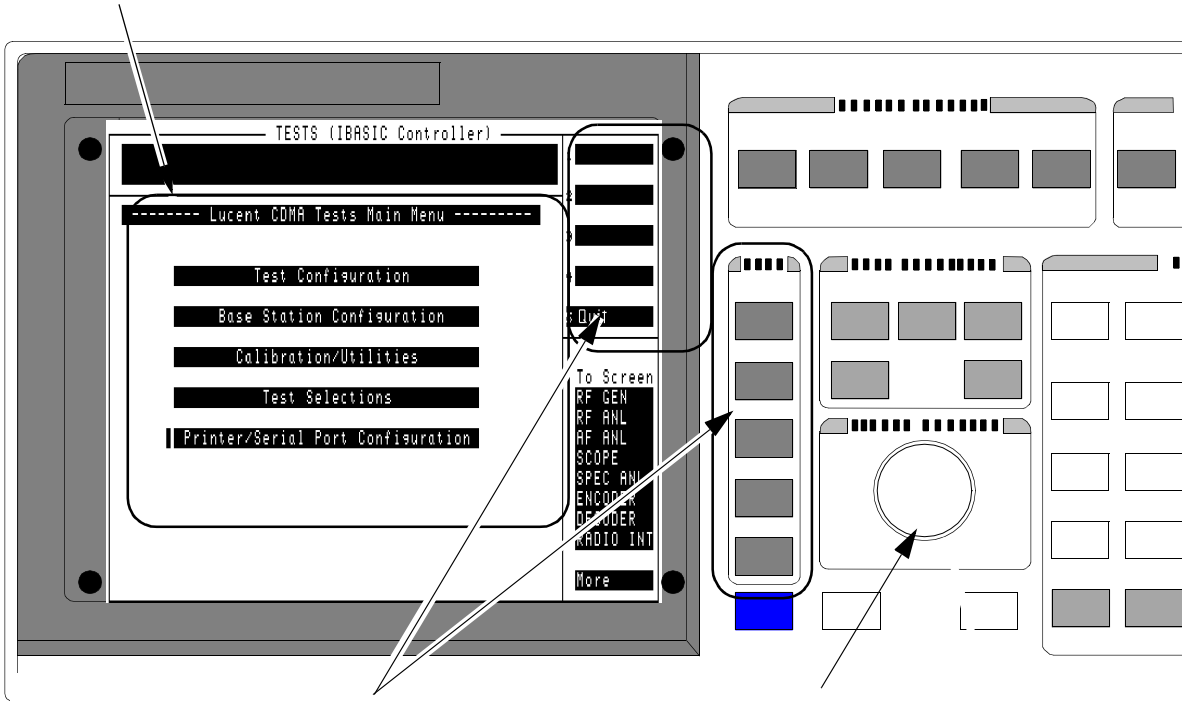


Main Menu Functions

- **`Test Configuration`** is where you define test information used by all tests; such as identifying the timing reference signal source, cable losses, and TX test port coupling factor.
- **`Base Station Configuration`** is where you enter the specific base station information the Software needs to control your base station when communicating with the MSC during tests. These include the channel number and PN offset of the BCR you are testing.
- **`Calibration/Utilities`** accesses procedures used to measure test cable insertion loss, coupled port loss, PN Offset values and return loss.
- **`Test Selections`** accesses CDMA tests.
- **`Printer/Serial Port Configuration`** accesses routines used to enable printing of test results, enable data collection operations, and define the serial port communication settings.

Figure 2-4 Lucent CDMA BS Test Software Main Menu features.

Main Selections and Cursor Control
Menu selections open lower-level menus. To select a menu item, rotate the knob until the cursor is in front of the line and press the knob.



USER Keys and their Fields
The USER Keys (k1 - k5) correspond to fields 1-5 at the top right corner of the test screen. They are used for navigation through menus and for making selections. In many lower-level menus, a “Return” key is provided to take you up one menu level.

Knob
The knob controls the cursor position on the display and is sometimes used to make numeric entries.

Connect the Test Set to the Site Equipment

Connect the clock signals (J2 CLK and J3 2PPS) and transmitter output to the Test Set. See "Test Set Connections to the Base Station" on page 89.

NOTE To enable the clock signals on the base station, be sure to switch on the "TST CLK" switch on the SCT module.

If you are using a separate GPS reference instead of the cell site's clocks, see Figure 5-3 on page 92.

Which Test Set Port to Use - ANT IN or RF IN/OUT?

CAUTION The Test Set's ANT IN port is only used for very low signal levels ≤60 mW (17.78 dBm). Therefore, to prevent damage to the Test Set, *never connect this port directly to the TX Antenna port of the base station*. This port is typically connected to the base station's TX Test port.

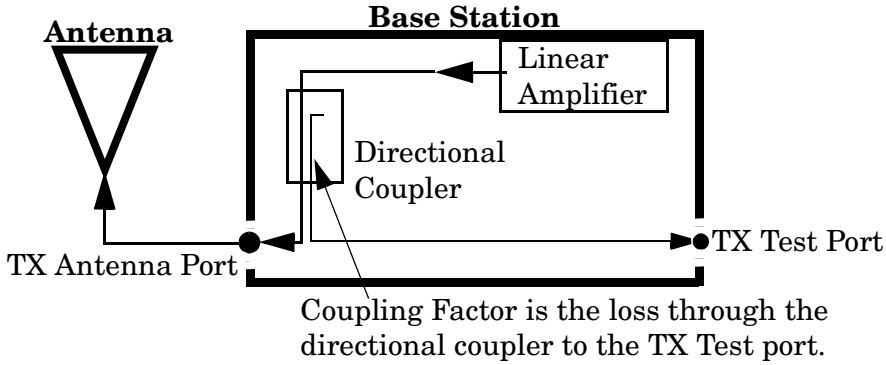
The Test Set's RF IN/OUT port is for continuous wave signals of ≤60 W or CDMA signals of ≤15 W. This is the only port on the Test Set that you should connect directly to the base station's TX Antenna port.

Which Base Station Port to Use - TX Test or TX Antenna?

In Service Testing Using the TX Test Port

The TX Test port gets its signal through a directional coupler connection to the TX Antenna port (see Figure 2-7 on page 27). This allows you to make measurements on an active base station without disconnecting the transmit antenna and interrupting service. A "Coupling Factor" (loss) through the directional coupler is entered into the Software to compensate power measurements. Coupling factors are typically 40 to 50 dB, but can vary depending on the base station design.

Figure 2-5 Simplified Diagram of the Transmitter Output Path



If you do not know the exact coupling factor, the software contains a utility to measure the coupling factor. See "TX Test Port Calibration" on page 74.

NOTE If you do not know the Specified Output Power for your transmitter at the *TX Antenna* port, the Software must measure the power to calculate the coupling factor. This requires you to take the base station out of service to connect the Test Set directly to the TX Antenna port during the calibration routine.

One disadvantage to using the TX Test port to make measurements is the possibility that its coupler is malfunctioning and therefore will cause erroneous measurements. If TX power measurements fail by a large amount, but you suspect the actual *transmitted* power is correct, you should take the base station out of service and make measurements directly at the TX Antenna port to verify the failed reading. If the Software is correctly configured, TX power measurements using the TX Test port and TX Antenna port should not vary significantly.

Out of Service Testing Using the TX Antenna Port

Disconnecting a TX Antenna feed line and connecting the Test Set to the TX Antenna port requires you to first take the associated base station out of service (disable call processing and turn off all transmissions to that TX Antenna port).

The base station can be taken out of service (and turned back on to make measurements) two ways:

1. Dial into the MSC using your laptop with internal modem and BTS Laptop Utility running on your PC, to control the base station through its maintenance software.
2. Call the MSC and have switch personnel control the base station for you.

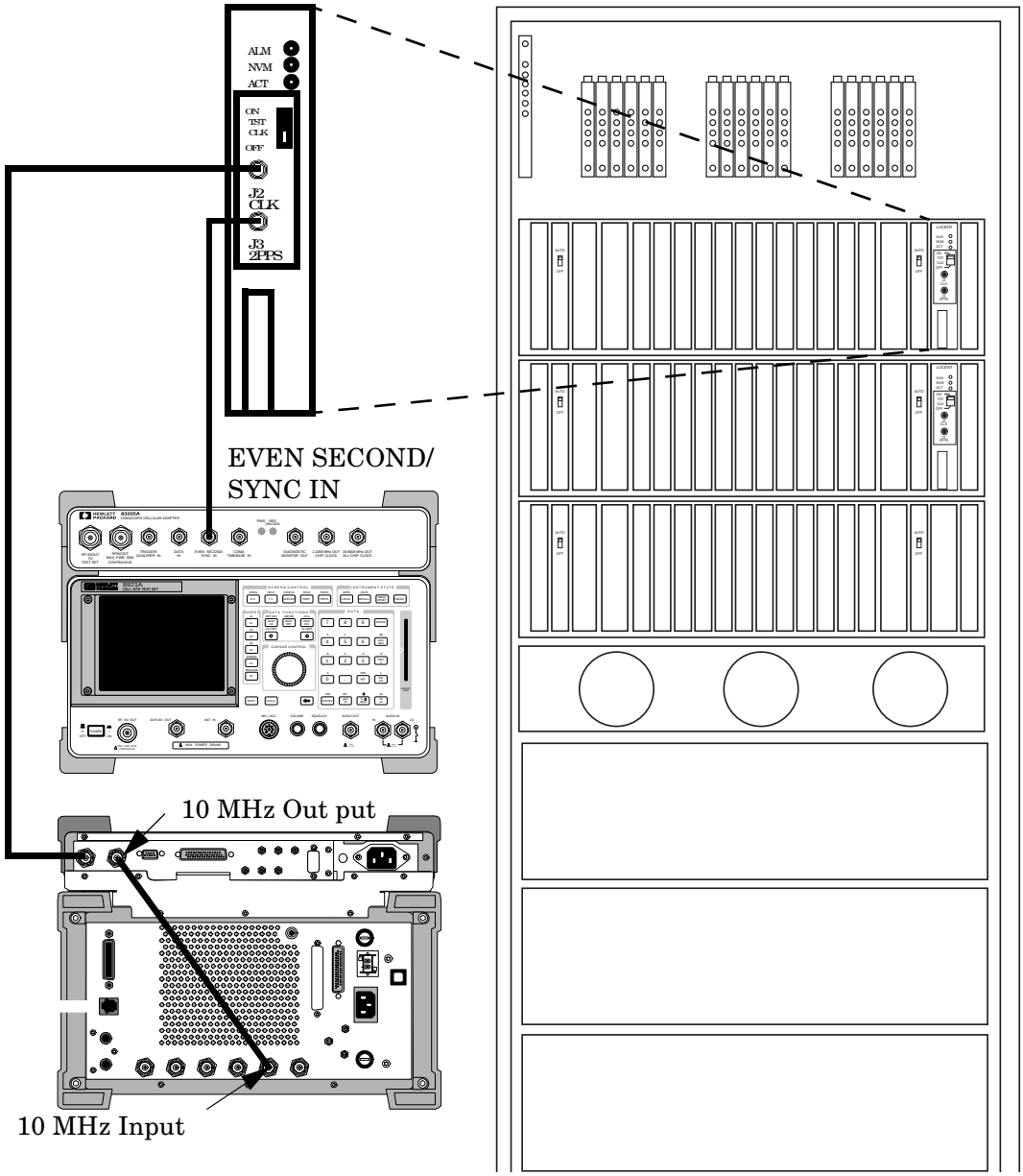
One benefit of testing directly at the TX Antenna port is the confidence that you are measuring the true output power of the base station at the point where the antenna feed line connects to the base station, verifying the operation of the full transmission path inside the base station. It also provides an opportunity to perform transmission line and antenna testing while the antenna is disconnected from the base station.

Connect the Test System to the Site Equipment

Connect the clock signal (19.6608 MHz) and even-second clock as shown in Figure 2-6 , for alternative ways of connecting these clock signals, see "Connections" on page 89.

NOTE To enable the clock signals on the base station, be sure to place the “TST CLK” switch on the SCT module to the ON position.

Figure 2-6 Lucent Series II - CDMA Clock and Timing Connections



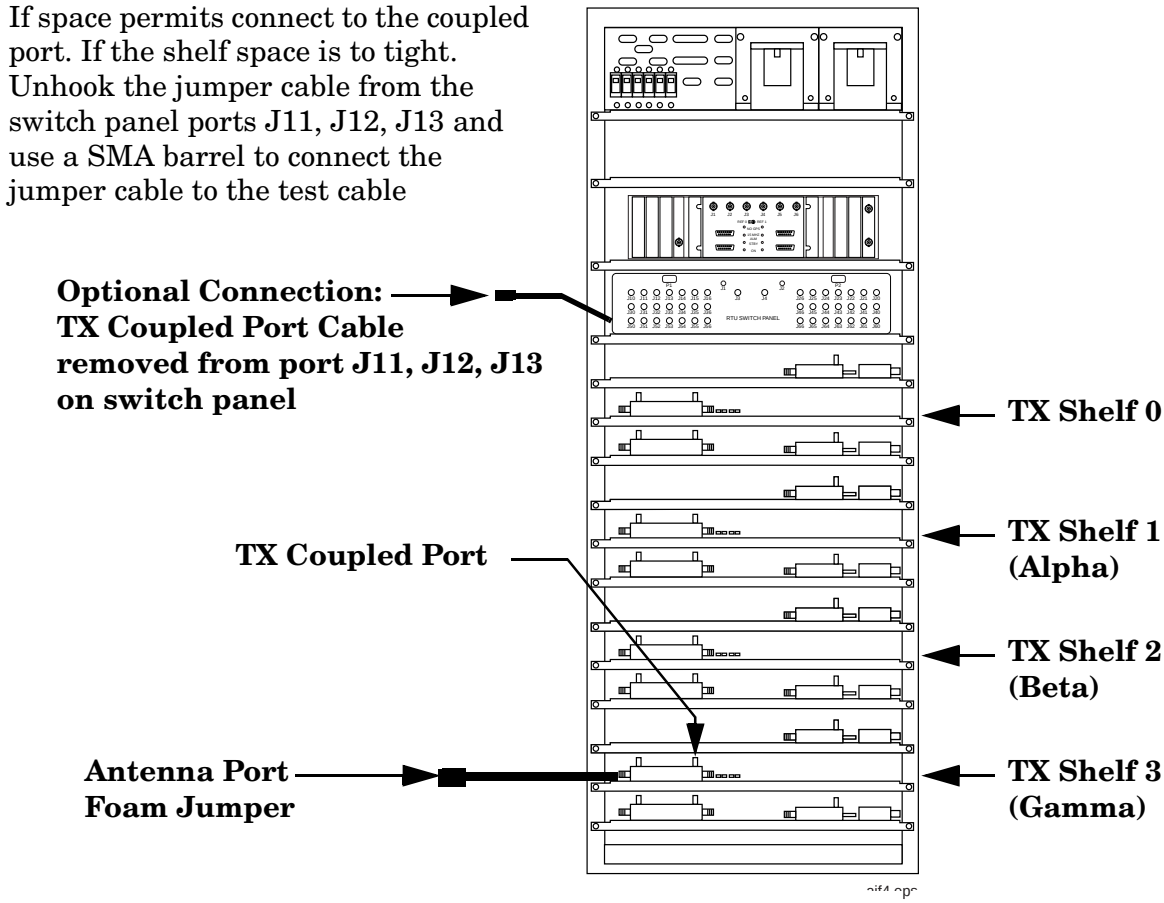
The Test Software can utilizes two different RF connection points.

- For in-service testing, connect the Test Set's antenna port to the TX coupled port associated with the BBA under test. If the available space at the transmit shelf does not permit direct connection of the test cable to the coupler port, the jumper cable from the coupler to the switch panel can be used. Disconnect the jumper from the switch port (either J11, J12, or J13) for BBA 0, 1 and 2. Connect the test cable to the jumper cable with a SMA(f) to SMA(f) barrel connector. Remember that the signal will level will be reduced by the amount of insertion loss associated with the jumper cable.

NOTE It is advisable to only disconnect one jumper cable at a time from the switch panel when testing. Reconnect the jumper to the correct switch panel port before disconnecting the jumper associated with the next BBA you wish to test.

- For out-of-service testing, connect the Test Set's RF IN/OUT port to the foam jumper attached to the output coupler. The cable can be unhooked at the polyphasor and connected to the test cable using a N(f) to N(f) barrel.

Figure 2-7 RF Connection Points



Communications with the MSC

"BTS Laptop Utility" on page 28 - is the recommended method of communicating with the MSC. BTS Laptop Utility, is a PC based program designed to be used with the Test Set and a laptop computer for communications with the MSC and for logging test data and communications with MSC.

BTS Laptop Utility

BTS Laptop Utilities is shipped with the HP 11807B opt 023 Lucent CDMA software on two 3.5 inch floppy disks. This program sets up the internal modem and serial communications port of your laptop PC for automated testing with the Test Set. The software also provides several other helpful functions.

Since you probably already use your laptop's internal modem to connect to the MSC, using this program is the best way to establish communications between the Test Set and the MSC.

The BTS Laptop Utilities provides the following functions:

- A Switch Terminal window to dial into the switch (MSC) and monitor replies sent back from the switch.

  The Switch Terminal window may also be used to make a telnet connection to the MSC. This is done by first dialing into a remote access server (dial-in connection to the company network usually using the windows dial-up adaptor). Once this dial-up connection has been made, the Switch Terminal window can act like a telnet session to set up communications with the MSC.

- A Test Results window where automated test results are displayed and can be saved for later use.

- A Screen Capture window to capture screen images and save them as a bit mapped image (BMP). This is very helpful when using the Test Set's spectrum analyzer or other screen you want to capture. (IBASIC operation must be paused first to print any of the TESTS screens used for automated testing.)

Need More Information?

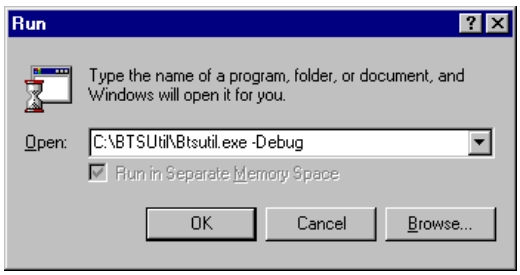
For additional information on using the BTS Laptop Utilities after installation, refer to the online Help topics included with that program.

System Requirements for BTS Laptop Utilities

If your laptop does not meet the following minimum system requirements, you could encounter erratic operation and longer test times.

- 133 MHz Pentium™[1] Processor
- 16 MBytes or RAM
- Windows 95™[2] or Windows NT 4.0 (Intel based)
- Available RS-232 serial port
- Internal modem

Installing the BTS Laptop Utilities Program



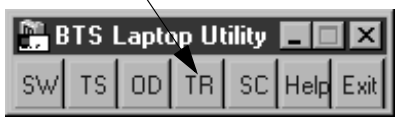
BTS Laptop Utilities comes compressed on an install disk for easy setup on your laptop. Simply insert the floppy into your drive and select `Start` then `Run` then type A:\Setup. The install shield will lead you through the installation process.

After installing the BTS Laptop Utilities, you need to configure the laptop's serial port to communicate with the Test Set. If you are using the BTS Laptop Utilities to communicate and control the base station, you also need to configure the laptop's modem to match the modem's port setting. The following communications parameters should be determined before configuring the serial ports.

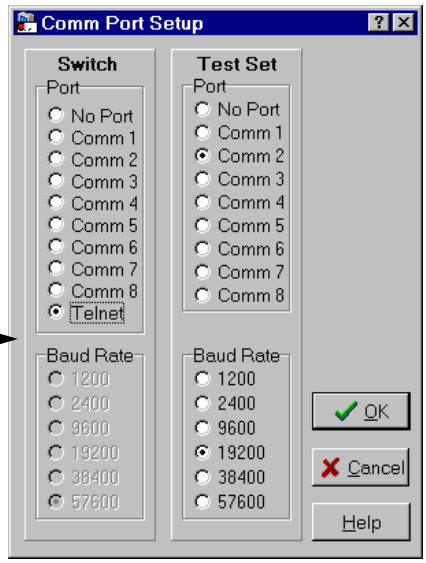
1. Pentium is a U.S. registered trademark of Intel Corporation.
2. Windows 95 and Windows NT are U.S. registered trademarks of Microsoft Corp.

Figure 2-8 Specifying the Serial Communication Port Settings

After installing the running the BTS Laptop Utility, select the **TR** button from the menu to display the Test Results window.



Select **`Preferences`**, **`Comm Port Setup...`** to bring up this window to specify the com ports and baud rates used to communicate with the internal modem and the Test Set (via the serial ports on the PC and Test Set).



- Switch Port - This port is used to communicate with the laptop's Modem. The port number can be found in your laptop's Device Manager in the System Properties window. Simply right click the My Computer icon then select properties. Look under the properties for the modem.

  If the modem's port is already in use, a message will be posted telling you a device already has control of that port. The most common culprits are programs such as Laplink or other communications programs running in the computer's background. You will need to close the other program and reselect the required Com port.

- Switch Baud Rate - This setting defines the speed at which the laptop communicates with the PC card or internal modem. This is not the speed at which the modem communicates with the switch or MSC. This value can be set to 57600. Most modems negotiate at the start of the session with the modem on the other end of the line for the best data transfer rate.

- Test Set Port - This is the port your laptop uses to communicate with the Test Set. This port setting can also be found in your laptop's Device Manager in the System Properties window. Just look under `Ports` to determine the choices available.

- Test Set Baud Rate - This is the speed that the laptop communicates with the Test Set. This value should match the baud rate found on the Test Set's I/O CONFIGURE screen. This value will not automatically adjust during the session. The recommended baud rate for the Test Set is 9600 but speeds of 19200 are available.

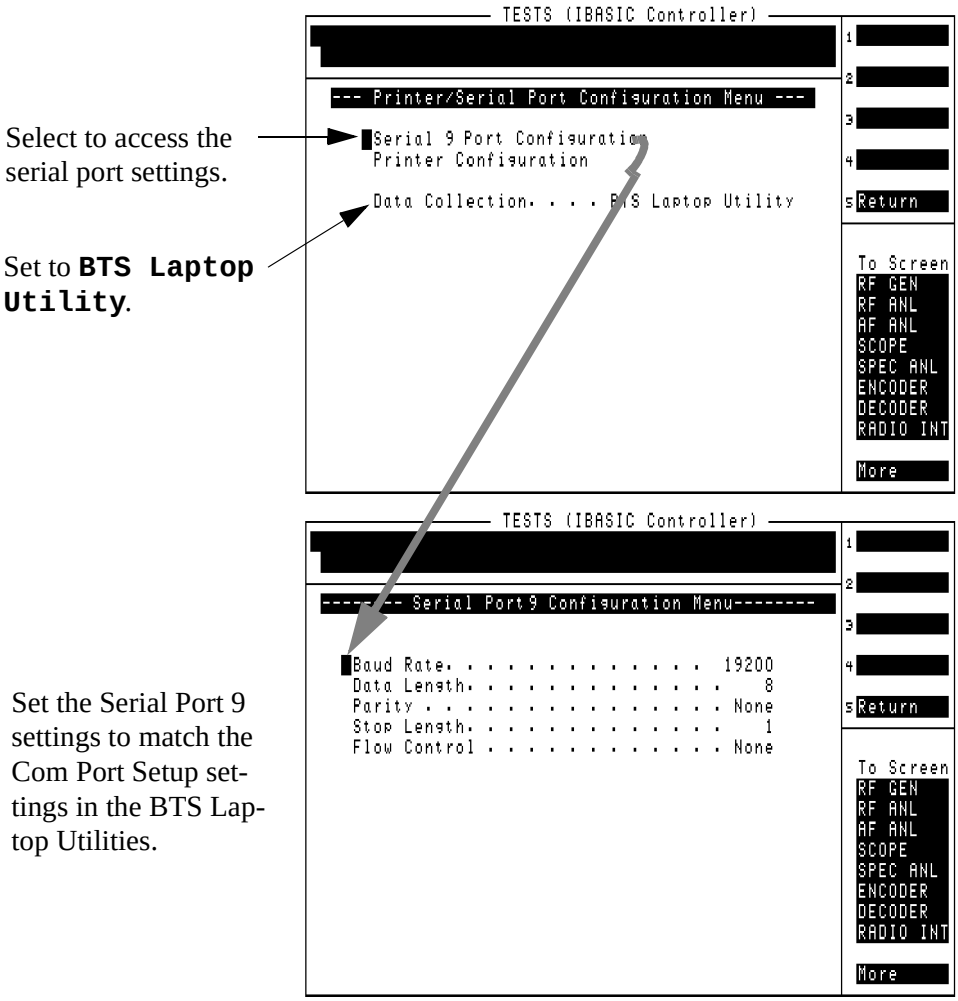
Configuring the Test Set Software to Work with the BTS Laptop Utilities Software

After installing BTS Laptop Utilities on your laptop, you need to configure the HP 11807B option 023 Software to send data to the laptop. This is accomplished by telling the Software to use the BTS Laptop Utilities and by setting the SERIAL 9 port communication parameters.

- To select BTS Laptop Utilities operation.

  1. Load and run the Software (see "Load and Run the Lucent CDMA Base Station Test Software" on page 19). The Software's Main Menu is displayed.
  2. Select **`Printer/Serial Port Configuration`** on the Lucent CDMA Tests Main Menu.
  3. Set the **`Data Collection`** field to **`BTS Laptop Utility`**.

Figure 2-9 Serial Port Settings and BTS Laptop Selection



4. Set the Serial 9 Port Configuration menu settings to work with the BTS Laptop Utilities (see Figure 2-8 on page 30 and Figure 2-9 on page 31).

   — Set the **`Baud Rate`** field to match the Baud Rate setting on the Comm Port Setup window (9600 is recommended)

   — Set the **`Data Length`** to **`8`**

   — Set the **`Parity`** to **`None`**

   — Set the **`Stop Length`** to **`1`**

   — Baud rate 9600

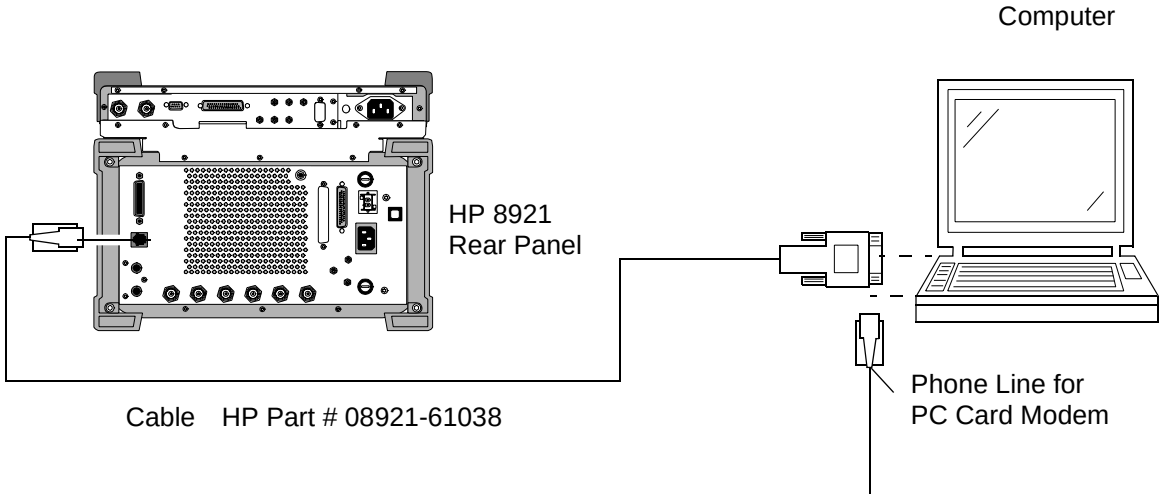
   — **`Flow Control`** to **`None`**

With BTS Laptop Utility running on your laptop and the proper connections between the Test Set and Laptop; you should now be able to use the laptop to log onto the switch. With the 11807B opt 023 Software running, you should be able to perform automated base station tests and record test results. You should also be able to capture Test Set screens.

Test Set to Laptop Connections

The illustration below shows the Test Set to laptop connections. The laptop's modem must also be connected to a phone line capable of connecting to the MSC. If no phone line is available at the base station, a cellular phone with properly configured cellular capable modem will work.

Figure 2-10 Test Set to Laptop Connections



Testing Your Connections and Configuration Settings

To test the settings you have selected, you can connect a cable (RJ11 to DB9) from the Test Set to the Com port of your laptop and try a screen capture. With the cable connections complete and BTS Laptop Utility running on your laptop simply press the Test Set's **Shift** then **Print** key (if the software is running in the Test Set, press **CANCEL** key to pause the program before printing).

To test the modem connections you can open the Switch Terminal window and type AT followed by a carriage return. The modem should reply OK.

If You Had Problems

If you were unable to load and run the software, make the required entries, or you encountered error messages, refer to "Troubleshooting" on page 139 for help.

3 Configuring the Software for Tests

Follow the steps in this chapter to connect to the MSC and configure the Software for testing. *You must complete the steps in this chapter before attempting automated CDMA measurements with the Software.*

If you are not using automated control of the cell site, you still need to provide some information about the base station before testing (see “Base Station Configuration Procedure” on page 38).

Overview

For automated control of the cell site, you should have connected and configured the modem to work with the Test Set, as outlined in chapter 2. The modem is used to communicate with the MSC to set up the cell site for testing. In this chapter, you will use the modem to connect to the MSC and configure the base station for testing.

If you are using the BTS Laptop Utility program with a PC and an internal modem, that program should be installed and the PC's serial communication ports configured ("Installing the BTS Laptop Utilities Program" on page 29).

NOTE

This method of site control is optional, but is highly desirable when possible. If you have other means of controlling the site equipment, enter the Specified Output Power, as directed in the "Base Station Configuration Procedure" on page 38, skip the rest of this chapter and start making tests (see "Performing CDMA Tests" on page 43). See also "Testing without MSC Control" on page 104.

Define Which Cell Site and BBA to Test

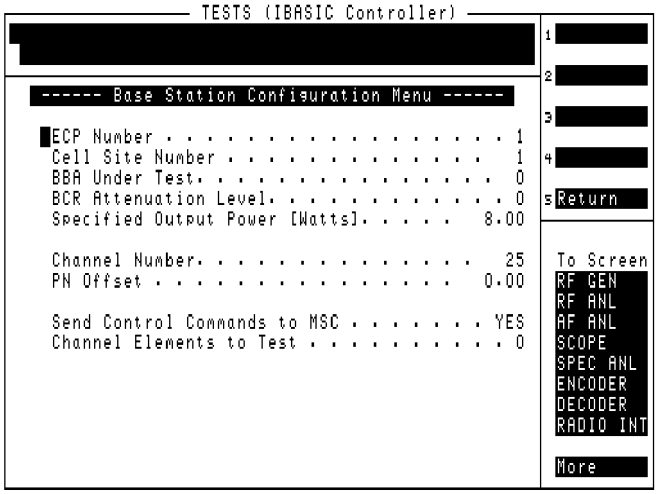
Before the Software can control the base station, it must be able to tell the MSC which cell site and which BBA to test. The Software also needs to know how much power you expect to measure. This information is supplied on the Base Station Configuration Menu.

Base Station Configuration Procedure

Step 1. Load and run the Software (see page 19). The Software's Lucent CDMA Tests Main Menu is displayed (see Figure 2-3 on page 21).

Step 2. Select **`Base Station Configuration`**. The Base Station Configuration Menu is displayed (Figure 3-1).

Figure 3-1 Specifying Base Station Configuration Information



Step 3. Enter the **`ECP Number`** for the ECP that controls the cell site you are testing.

Step 4. Enter the **`Cell Site Number`** for the cell site you are testing.

Step 5. Enter the number of the BBA you are testing in the **`BBA Under Test`** field. This tells the MSC which BBA to control.

Step 6. Enter the **`BCR Attenuation Level`**. This is the value used to control base station power by the MSC, and is used when measuring transmitted power. This value varies according to the base station type (model) and geographic location. See "TX Power Meter" on page 51 for more information.

Step 7. Enter the **Specified Output Power [Watts]**. This is the expected output power at the TX Antenna port (foam jumper) or at the TX Test port after subtracting the coupling factor. This value must be set for both manual and automated testing.

This setting is for a pilot channel only signal, and is affected by the number of channel elements that are active, the BCR attenuation setting and digital gain unit (DGU) settings for the pilot, sync, paging, and traffic channels in the translation table. Use the value specified by Lucent for testing power.

Step 8. Enter the **Channel Number** for the CDMA channel your base station is transmitting on.

Step 9. Enter the **PN Offset** of your cell site. If you are unsure of the offset, run the PN Offset Search utility to find and automatically enter the PN offset. See "PN Offset Search" on page 76.

Step 10. For automated control of the cell site:

1. Set the **Send Control Commands to MSC** field to **YES**.
2. Enter the number of **Channel Elements to Test** [0 to 55].
3. Select **Return** (**k5**) to return to the Software's Main Menu.

If you are going to use manual control of the cell site, set the **Send Control Commands to MSC** field to **No**, and select **Return** (**k5**) to return to the Software's Main Menu.

Connect to the MSC Using a Laptop PC

MSC Dial-Up Procedure Using a PC and Internal Modem

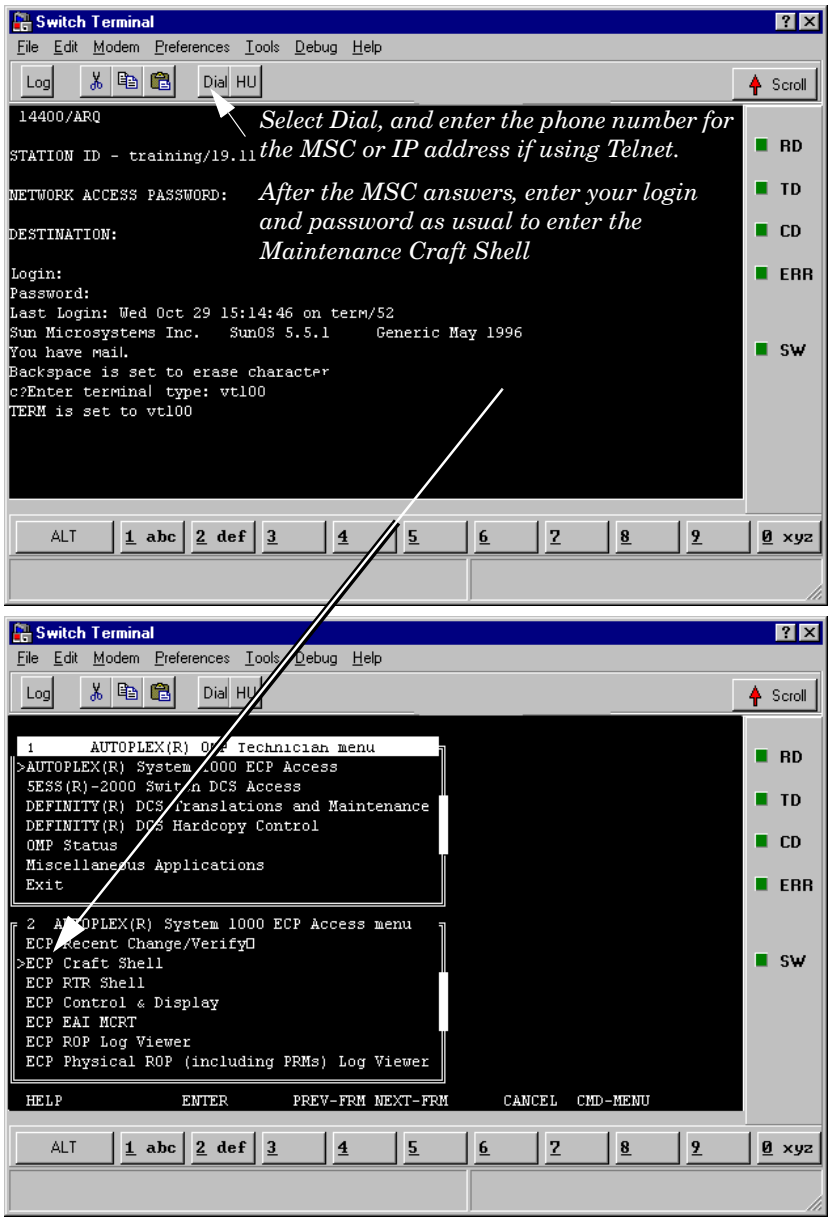
You can connect to the MSC using a PC with an internal modem and the BTS Laptop Utilities connected to the Test Set. Connections are shown in Figure 2-10 on page 32.

Step 1. Make sure your PC is connected to the Test Set (SERIAL 9 port) and the PC's internal modem is connected to a phone line.

Step 2. Install and configure the BTS Laptop Utility program on your PC. Refer to "BTS Laptop Utility" on page 28. Be sure to access the Preferences menu, Comm Port Setup, and define the Switch and Test Set communications settings. This specifies the ports and data rates the PC will use to communicate with the MSC and the Test Set.

Step 3. Access the BTS Laptop Utilities Switch Terminal window and enter the same commands you would use in your regular communications program to dial up and login to the ECP and enter the maintenance craft shell. A command prompt should be displayed, signaling that the MSC is waiting for the next command.

Figure 3-2 Dialing and Logging Into the MSC Using the Switch Terminal Window in the BTS Laptop Utility



Step 4. Verify that the HP 11807B option 023 Software is running in the Test Set. You can now communicate with the MSC. You should now be able to start automated testing.

If You Had Problems

If you were unable to load and run the software, make the required entries, or encountered error messages, refer to "Troubleshooting" on page 139 for help.

4 Performing CDMA Tests

This chapter shows detailed steps used in running each of the Software's tests and utilities.

NOTE Testing may be interrupted if cell site diagnostics are initiated by the MSC while tests are being run. To prevent this, use your PC, to send a command to inhibit diagnostics from the switch before testing.

Overview

These test procedures are intended to take you from setting up a test to getting test results. To simplify the procedures, all procedures are written to use a modem to communicate with the MSC (where applicable) and the Software will be set to send control commands.

Making Measurements

Before making CDMA measurements, verify that you have performed the following steps in order:

Getting Ready to Test

Step 1. Make sure you have performed all steps in the previous two chapters, including:

- "Installation" on page 17.
- "Configuring the Software for Tests" on page 35.

  The Software will allow you to control the cell site equipment manually, but these steps are not covered specifically in these procedures. See "Testing without MSC Control" on page 104 for instructions on manual control of the site equipment.

Step 2. You have specified the required test parameters on the Test Configuration Menu. See "Specifying General Test Configuration Parameters" on page 46

Step 3. You have calibrated the test setup to compensate for losses and other variables. See "Calibrating the Test Setup" on page 48

Step 4. You have entered the test specifications to use during automated tests. These values are compared to the measured values to alert you to a failing test point. See "How to Change Pass/Fail Limits" on page 115

Start Testing

You are now ready to select and run CDMA tests. After successfully running the tests, it is recommended that you save all of the configuration information as a procedure file for later retrieval. This eliminates the need to re-enter the information if you run a different program, change parameters when testing another cell site, or install new operating system firmware in your Test Set. See "How to Save a Test Procedure" on page 118

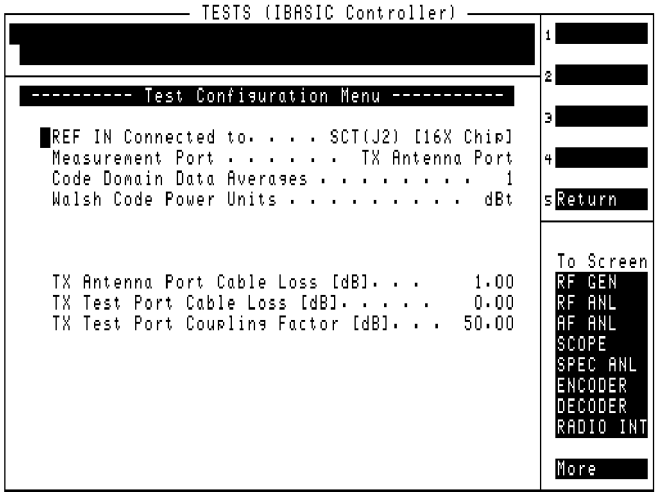
Specifying General Test Configuration Parameters

The Software uses several settings when running almost every test and utility. These parameters determine such things as the connection diagram used for each test and how much to offset measurement values because of test cable losses. *These values must be entered before you can make CDMA measurements.*

These parameters are entered on the Test Configuration Menu. This menu is accessed by selecting **`Test Configuration`** from the Software's Main Menu.

Once configured, these values are preserved in memory, even after turning off the Test Set, unless you load another program or update the Test Set's operating system (firmware).

Figure 4-1 Entering Values on the Test Configuration Menu



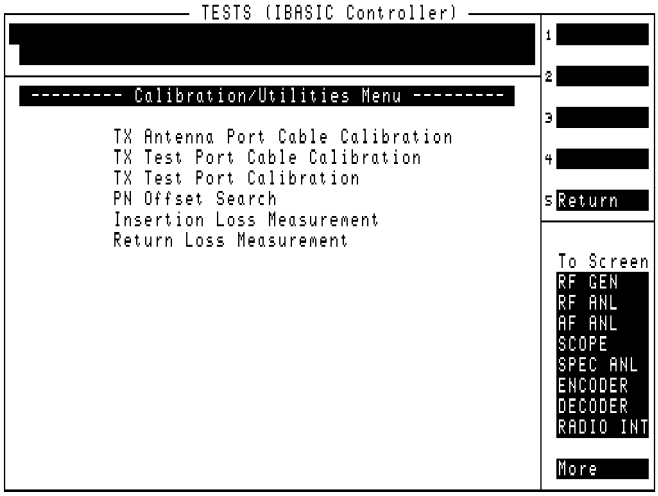
Test Configuration Menu Settings

- **`REF IN Connected to`** specifies the source of the signal connected to the REF IN connector. This is typically the 19.6608 MHz clock, and comes either from one of the cell site's SCT modules or from a GPS receiver.
- **`Measurement Port`** selects the base station port to make the transmitter measurements on; the TX Test port (which comes from a directional coupler in the transmitter's output) or the TX Antenna port (which supplies the transmitter power directly to the antenna).
- **`Code Domain Data Averages`** specifies how many data samples to use when averaging measurements during the code domain tests. Larger values reduce the effects of small changes in level during the test to produce more consistent results, but also increase test times.

- **`Walsh Code Power Units`** specifies the units to use when displaying the power in each Walsh Code when running the code domain tests. The unit “dBt” refers to the power of a Walsh code relative to the total measured pilot channel power. Watts and dBm are measurements of the absolute power for a Walsh code.
- **`TX Antenna Port Cable Loss [dB]`** specifies the loss through the cable you connect from the Test Set’s RF IN/OUT port to the base station’s TX Antenna port. This value can be measured and automatically entered into this field using the TX Antenna Port Cable Calibration routine. See “TX Antenna Port Cable Calibration” on page 70.
- **`TX Test Port Cable Loss [dB]`** specifies the loss through the cable you connect from the Test Set’s ANT IN port to the base station’s TX Test port. This value can be measured and automatically entered into this field using the TX Test Port Cable Calibration routine. See “TX Test Port Cable Calibration” on page 72.
- **`TX Test Port Coupling Factor [dB]`** specifies the loss through the directional coupler used to provide the transmitter signal to the TX Test port. The Software uses this value to calculate the transmitter’s true power output without the need to disconnect the transmit antenna from the TX Antenna port. This value can be measured and automatically entered into this field using the TX Test Port Calibration routine. See “TX Test Port Calibration” on page 74.

Calibrating the Test Setup

Figure 4-2 The Calibration/Utilities Menu



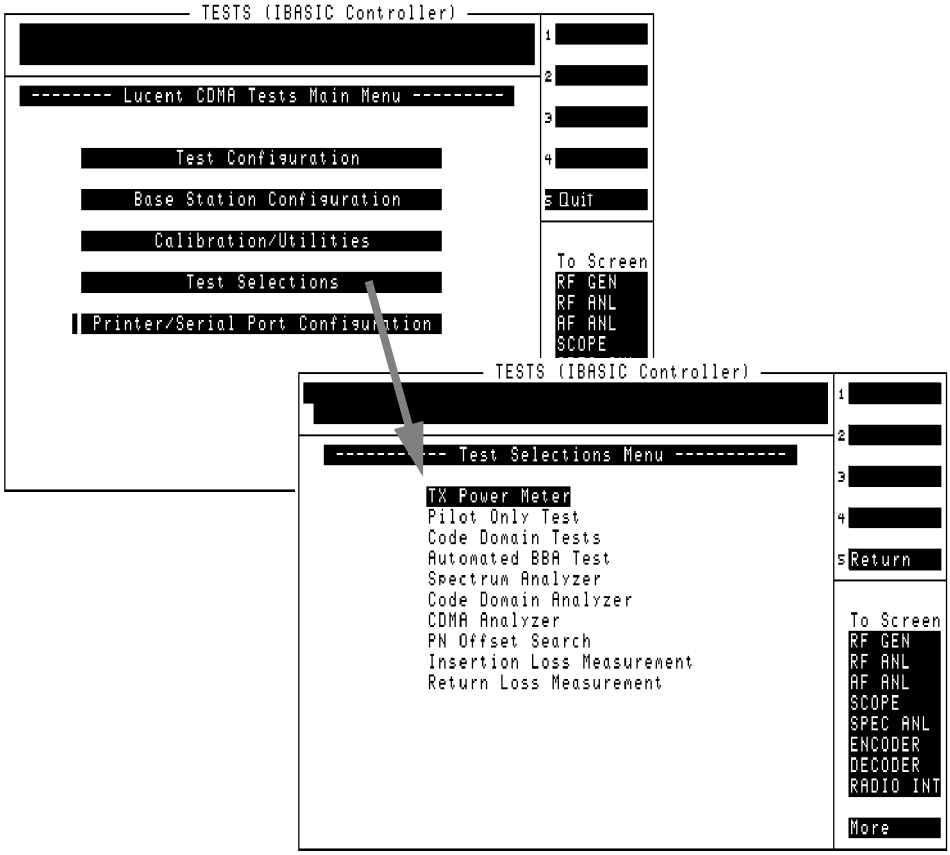
Before making CDMA measurements, you must first run a few simple calibration and utility routines to improve measurement accuracy. These routines are accessed by loading and running the Software (see page 19) and selecting **`Calibration/Utilities`** from the Software's Main Menu. After these values are measured, they are automatically entered into the Software for future testing, without having to rerun the routines every time you test. However, if you run a different program in the Test Set after making these measurements, the values must be re-measured (or re-entered) the next time you use the Software.

Calibration and Utility Procedures

- "TX Antenna Port Cable Calibration" on page 70 and "TX Test Port Cable Calibration" on page 72. Run these utilities to determine cable losses at the frequency and power level you will be testing at.
- "TX Test Port Calibration" on page 74. Run this utility to determine the exact coupling factor (loss) of the TX Test port.
- "PN Offset Search" on page 76. Use this utility to find the PN offset of the base station you are testing.
- "Insertion Loss Measurement" on page 78. Use this routine to measure losses through cables, attenuators, power splitters, or other RF devices.
- "Return Loss Measurement" on page 81. Use this routine to measure the return loss of a transmission line and/or an antenna.

Selecting Tests

Tests are selected by loading and running the software (explained on page 19) and choosing **`Test Selections`** on the Main Menu.



Once you have decided on the test you want to run, use the list below to locate the start page for the steps for that test. The PN Offset Search, Insertion Loss Test, and Return Loss Test utilities are also available on this screen.

- "TX Power Meter" on page 51.
- "Pilot Only Test" on page 54.
- "Code Domain Tests" on page 56.
- "Automated BBA Test" on page 59.
- "Spectrum Analyzer" on page 62.
- "Code Domain Analyzer" on page 64.
- "CDMA Analyzer" on page 67.
- "PN Offset Search" on page 76.
- "Insertion Loss Measurement" on page 78.
- "Return Loss Measurement" on page 81.

For More Information

For more details on the tests in this chapter:

- "Parameters List and Descriptions" on page 97
- "Specifications (Pass/Fail Limits) List and Descriptions" on page 102

If You had problems or received error messages when running a test:

See "Troubleshooting" on page 139.

TX Power Meter

The TX Power Meter test provides an analog display of power measurements. This mode is useful when making adjustments to power levels on a CDMA transmitter.

This test can be performed in-service using the TX Test port, or performed out-of-service using the TX Antenna port. See "Which Base Station Port to Use - TX Test or TX Antenna?" on page 23

Features of the power meter display include:

- Tick marks on the meter to indicate when a power level setting is within the desired limits.
- Audible tones to indicate whether the power reading falls within specified limits.
- A USER key to access the spectrum analyzer.

  Be sure to use the correct Test Set input port for the power level you are measuring. See "Which Test Set Port to Use - ANT IN or RF IN/OUT?" on page 23

For Automated Base Station Control

If you have configured the Software to automatically control the base station, the Software will send a command to the MSC to set the BCR attenuation to the level specified on the Base Station Configuration Menu.

However, the Software cannot override a minimum BCR attenuation level that has been set in the translation tables of the MSC's CEQFACE or CEQCOM2 form. If the measured power is out of specifications, make sure that the **`BCR Attenuation`** setting on the Software's Base Station Configuration Menu is not set to a lower value than the minimum BCR attenuation level listed in the translation tables of the CEQFACE form.

For Manual Base Station Control

If you have configured the Software to require manual control of the base station, you need to make sure that the **BCR Attenuation** setting on the Base Station Configuration Menu matches the BCR attenuation setting on the MSC's CEQFACE control form. If these values are different, the TX Power Meter measurement may be incorrect.

NOTE

Transmitter power is partly controlled by the MSC using the BCR attenuation setting. The value for this setting, and the corresponding TX power of the base station, varies between models of base station and individual base station location.

It is very important that you correctly set the **BCR Attenuation Level** and **Specified Output Power** on the Software's Base Station Configuration Menu. See "Base Station Configuration Procedure" on page 38

Specifications and Parameters Used

The following specifications and parameters are used when running this test. Refer to Chapter 5 , "CDMA Tests Software Reference," on page 85 for descriptions of the specifications and parameters.

Specifications (Pass/Fail Limits):

- 6. Output Power Adjustment Error. This specification determines where the low and high tick marks appear on the measurement's graphic scale.
- 7. Output Power Error. These limits will be used when a power reading is made. If the power measured is more or less than the value set in this specification, a fail indication (**F**) will result

Parameters:

- TX Output Power - found in the Base Station Configuration menu.

Select and Run the Test

Use these steps to select and run the TX Power Meter test:

Step 1. From the Main Menu, scroll to **`Test Selections`** and press the knob.

Step 2. Scroll to **`TX Power Meter`** and press the knob.

Step 3. Follow the displayed instructions and diagram to make the measurement.

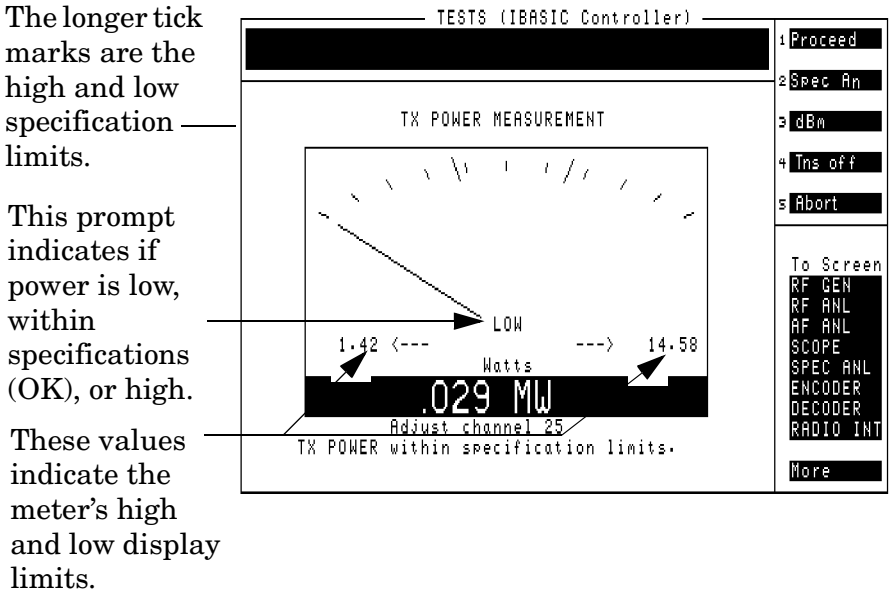
NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off by the MSC (or by switch personnel if not using a modem). The green ACT LEDs on the ACU and BCR modules indicate the transmitter is active, and therefore should be off before disconnecting cables.

Review the Results

1. The Test Set will display the power meter screen (see Figure 4-3).

   The power meter display defaults to units of Watts. To view the power level in dBm, select **`dBm`** (**`k3`**). A beeping tone accompanies the measurement to assist in adjusting your transmitter's power without looking at the display. Adjust the tone's volume by selecting **`Tns off, Tns quiet, Tns loud`** (**`k4`**).

Figure 4-3 Power Meter Display



Pilot Only Test

The Pilot Only Test performs a suite of CDMA tests on a carrier with only the pilot channel active (no active traffic or paging channels). Therefore, this test can only be performed with the base station out-of-service.

The tests performed are:

- Rho (modulation quality)
- Pilot Time offset
- Frequency error
- Carrier feedthrough

Specifications and Parameters Used

The following specifications and parameters are used when running this test. Refer to "Parameters List and Descriptions" on page 97 and "Specifications (Pass/Fail Limits) List and Descriptions" on page 102 for descriptions of these parameters and specifications.

Specifications (Pass/Fail Limits):

- 1. Carrier Feedthrough
- 5. Frequency Error
- 8. Rho
- 9. Time Offset

Parameters:

- None

Select and Run the Test

Use these steps to select and run the Pilot Only Test:

Step 1. From the Main Menu, scroll to **`Test Selections`** and press the knob.

Step 2. Scroll to **`Pilot Only Test`** and press the knob.

Step 1. Follow the displayed instructions and diagram to make the measurement.

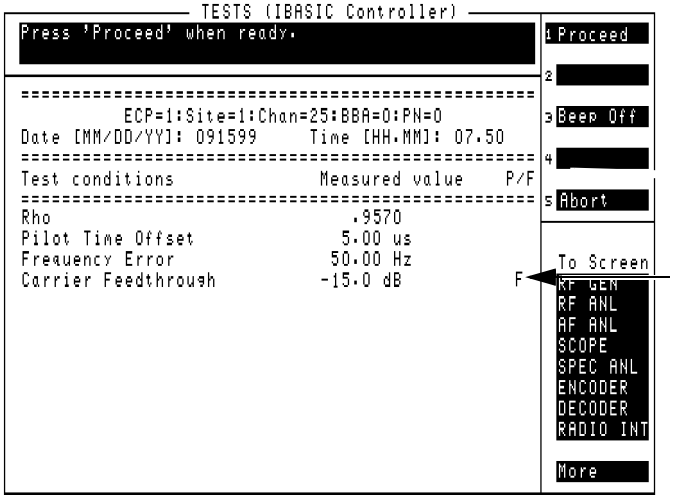
NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off by the MSC (or by switch personnel if not using a modem). The green ACT LEDs on the ACU and BCR modules indicate the transmitter is active, and therefore should be off before disconnecting cables.

Review the Results

The Software begins running pilot channel tests on the selected BBA. During the test, results are displayed with a failure indication if a measurement falls outside your specified limits (see Figure 4-4).

To see the pass/fail limits for each data point as it is measured, use the data collection function. See "Data Collection" on page 123

Figure 4-4 Results from the Pilot Only Test Sequence



The "F" (Fail) tells you that the measured value is outside of the specified limits. To change limits, see "How to Change Spec Pass/Fail Limits" on page 116.

When the testing is complete, the Software pauses to allow you to review the on-screen test results. Select `Proceed` (`k1`) to return to the Test Selections menu.

Code Domain Tests

The Code Domain Tests performs a suite of CDMA transmitter tests on the selected BBA. Unlike the Pilot Only test, in this test one or more traffic channels (channel elements) are turned on.

This test can be performed in-service by setting the **Send Commands to MSC** field on the Base Station Configuration Menu to **NO**. Measurements are then made on the existing active channel elements.

When the commands are sent to the MSC during out-of-service testing, you must enter the number of channel elements (CEs) to test on the Base Station Configuration Menu. For information on enabling automated control, see "Base Station Configuration Procedure" on page 38.

NOTE Before out-of-service testing you must inhibit call processing by sending a manual command using the Switch Terminal in BTS Laptop Utility. After completing this test remember to enable call processing.

The following measurements are performed:

- Time offset
- Frequency error
- Carrier feedthrough
- Code domain tests on traffic channels (if CEs are configured)

  TX Walsh code power

  Estimated rho

  Walsh code timing

  Walsh code phase

Specifications and Parameters Used

The following specifications and parameters are used when running this test. Refer to the "CDMA Tests Software Reference" on page 85 for descriptions of these specifications and parameters.

Specifications (Pass/Fail Limits):

- 1. Carrier Feedthrough
- 2. Code Domain Floor

NOTE The Code Domain Floor specification only needs to be set if GN Print Inactive Walsh Codes is set to 1 on the parameters screen.

- 3. Code Domain Phase
- 4. Code Domain Timing
- 5. Frequency Error
- 9. Time Offset

Parameters:

- 4. GN Code Domain Power Threshold
- 5. GN Print Inactive Walsh Codes [0=no 1=yes]

Select and Run the Test

Use these steps to select and run the Code Domain Tests:

Step 1. From the Main Menu, position the cursor next to **`Test Selections`** and press the knob.

Step 2. Scroll down to **`Code Domain Tests`** and press the knob.

Step 3. Follow the displayed instructions and diagram to make the measurement.

NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off by the MSC (or by switch personnel if not using a modem). The green ACT LEDs on the ACU and BCR modules indicate the transmitter is active, and therefore should be off before disconnecting cables.

Review the Results

1. The Software begins running code domain tests on the selected BBA. After tests are performed, test results will begin showing on the display. See Figure 4-5. Failures are indicated in the **P/F** column if a measurement falls outside your specified limits.

   If you need to stop testing before the sequence is complete, select **Abort** (**k5**). Depending on the state of the system, it can take up to 60 seconds for the test to stop.

Figure 4-5 Final Results from the Code Domain Tests

ECP=1:Site=1:Chan=25:BBA=0:PN=0

Date [MM/DD/YY]: 062998 Time [HH.MM]: 08.11

Test conditions	Measured value	Lower limit	Upper limit	P/F
Pilot Time Offset	2.35 us	-10.00	10.00	
Frequency Error	-.70 Hz	-44.00	44.00	
Carrier Feedthrough	-31.26 dB		-25.00	
Active Walsh code set:				
TX Walsh Code # 0 Power	-.05 dBt			
Estimated Rho	.9880			
Inactive Walsh code set:				
Walsh Code # 1 Power	-36.41 dB		-28.00	
Walsh Code # 2 Power	-36.86 dB		-28.00	
Walsh Code # 3 Power	-36.75 dB		-28.00	
Walsh Code # 4 Power	-36.71 dB		-28.00	
Walsh Code # 5 Power	-37.17 dB		-28.00	
Walsh Code # 6 Power	-37.86 dB		-28.00	

Automated BBA Test

The Automated BBA Test performs a suite of CDMA transmitter tests on the selected BBA. *This test requires that the Test Set send control commands to the MSC.*

NOTE Before out-of-service testing you must inhibit call processing by sending a manual command using the Switch Terminal in BTS Laptop Utility. After completing this test remember to enable call processing.

The test sequence includes the following tests:

- Pilot Channel Tests

  Rho

  Time Offset

  Frequency Error

  Carrier Feedthrough

- Code Domain Tests on traffic channels (if CEs are configured)

  TX Walsh Code Power

  Walsh Code Timing

  Walsh Code Phase

  Estimated Rho

- Code Domain Tests on pilot and paging channels (active mode)

Specifications and Parameters Used

The following specifications and parameters are used when running this test. Refer to the "CDMA Tests Software Reference" on page 85 for descriptions of these specifications and parameters.

Specifications (Pass/Fail Limits):

- 1. Carrier Feedthrough
- 2. Code Domain Floor
- 3. Code Domain Phase
- 4. Code Domain Timing
- 5. Frequency Error
- 8. Rho
- 9. Time Offset

Parameters:

- 4. GN Code Domain Power Threshold
- 5. GN Print Inactive Walsh Codes [0=no 1=yes]
- 18. TX Antenna Port Cable Loss
- 20. TX Test Port Cable Loss
- 21. TX Test Port Coupling Factor

Select and Run the Test

Use these steps to select and run the Automated BBA Test:

Step 1. From the Main Menu, scroll to **`Test Selections`** and press the knob.

Step 2. Scroll to **`Automated BBA Test`** and press the knob.

Step 3. Follow the displayed instructions and diagram as prompted to make the measurement.

NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off by the MSC (or by switch personnel if not using a modem). The green ACT LEDs on the ACU and BCR modules should be off.

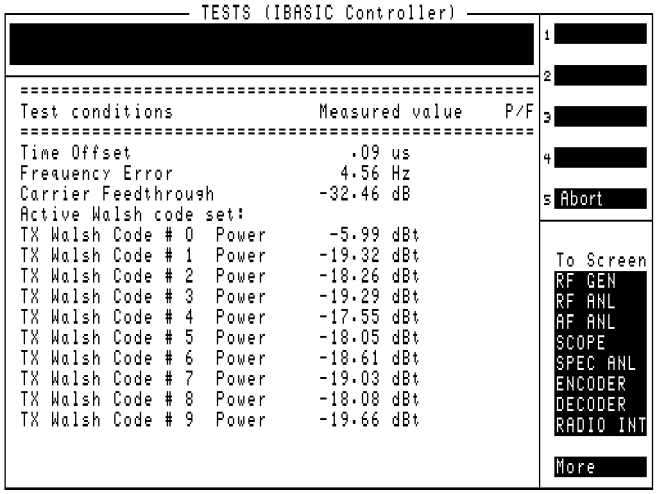
Review the Results

1. The Software begins running tests on the active BBA. See Figure 4-6. As tests are performed, test results begin showing on the display with a failure indication if a measurement falls outside your specified limits.

   If you need to stop testing before the sequence is complete, select **Abort** (**k5**). Depending on the state of the system, it can take up to 60 seconds for the test to stop.

   Because the site configuration may not have been reset before testing was aborted, you will be given a choice to send a “multistop” command to reset the BBAs.

Figure 4-6 Partial Code Domain Tests Sequence Results



Spectrum Analyzer

The spectrum analyzer mode configures the Test Set to display spectrum sweeps. This mode is useful when you would like to verify the presence of a CDMA signal or look for sources of interference.

This test can be performed in-service or out-of-service. When you have set the Send Control Commands to MSC to No, you will need to make sure the base station is not transmitting RF before connecting to the antenna port. When commands are being sent to the MSC, and the Measurement port is set to TX Antenna port the software will take the base station out of service before prompting you to unhook RF connections. See "Which Base Station Port to Use - TX Test or TX Antenna?" on page 23

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

- None used for this test

Parameters:

- 18. TX Antenna Port Cable Loss
- 20. TX Test Port Cable Loss
- 21. TX Test Port Coupling Factor

Select and Run the Test

Use these steps to select and run the spectrum analyzer mode:

Step 1. From the Main Menu, scroll to **`Test Selections`** and press the knob.

Step 2. Scroll to **`Spectrum Analyzer`** and press the knob.

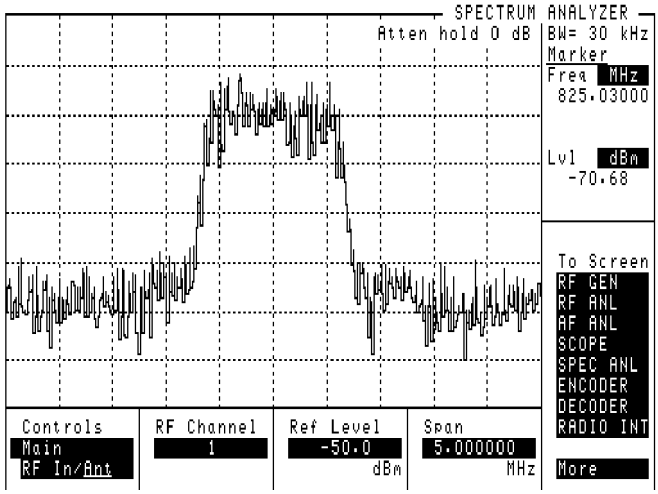
Step 3. Follow the displayed instructions and diagram to make the measurement.

NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off by the MSC (or by switch personnel if not using a modem). The green ACT LEDs on the ACU and BCR modules indicate the transmitter is active, and therefore should be off before disconnecting cables.

Review the Results

1. The Test Set sets up and displays the spectrum analyzer. See Figure 4-7.

Figure 4-7 The Spectrum Analyzer Display



2. You can read the marker frequency and level in the upper-right of the display. If you would like to change the marker position, use the **`Controls`** field to select **`Marker`**, then use the **`Position`** field.
3. When you are finished using the spectrum analyzer, press the **Shift k1 ENTER** key and follow the instructions on the Test Set's display. The Software will return to the Test Selections menu.

Code Domain Analyzer

The Code Domain Analyzer Test is used to set up the Test Set to make manual measurements on a CDMA transmitter. This test is useful if you would like to switch between Code Domain Power, Code Domain Timing, and Code Domain Phase measurement screens. It is also useful for looking at changes in Code Domain readings over time. Otherwise, you would probably want to use the automated tests: "Code Domain Tests" on page 56 and "Automated BBA Test" on page 59.

This test can be made with the base station either in-service or out-of-service. If you have set Send Control Commands to the MSC to NO, you must disable call processing and turn off any transmitters prior to connecting the Test Set to the TX Antenna port. If you have set Send Control Commands to the MSC to Yes, the automated software will configure the base station for testing and prompt you to make connections to the proper port.

Available measurements in the Code Domain Analyzer screen are:

- Code Domain Power
- Code Domain Timing
- Code Domain Phase

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

- None used for this test

Parameters:

- 18. TX Antenna Port Cable Loss
- 20. TX Test Port Cable Loss
- 21. TX Test Port Coupling Factor

Select and Run the Test

Use these steps to select and run the code domain analyzer mode:

Step 1. From the Main Menu, scroll to **`Test Selections`** and press the knob.

Step 2. Scroll to **`Code Domain Analyzer`** and press the knob.

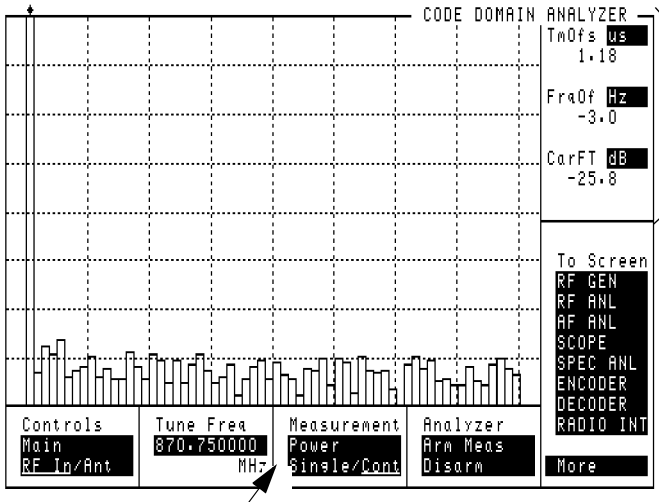
Step 3. Follow the displayed instructions and diagram to make the measurement.

NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off by the MSC (or by switch personnel if not using a modem). The green ACT LEDs on the ACU and BCR modules indicate the transmitter is active, and therefore should be off before disconnecting cables.

Review the Results

1. The Test Set displays the Code Dom Analyzer (see Figure 4-8). You can now make changes to the setup fields and view the code domain response for your transmitter's signal. Use the **`Measurement`** field to choose between measurements of power, phase, and timing.

Figure 4-8 Making Code Domain Analyzer Measurements

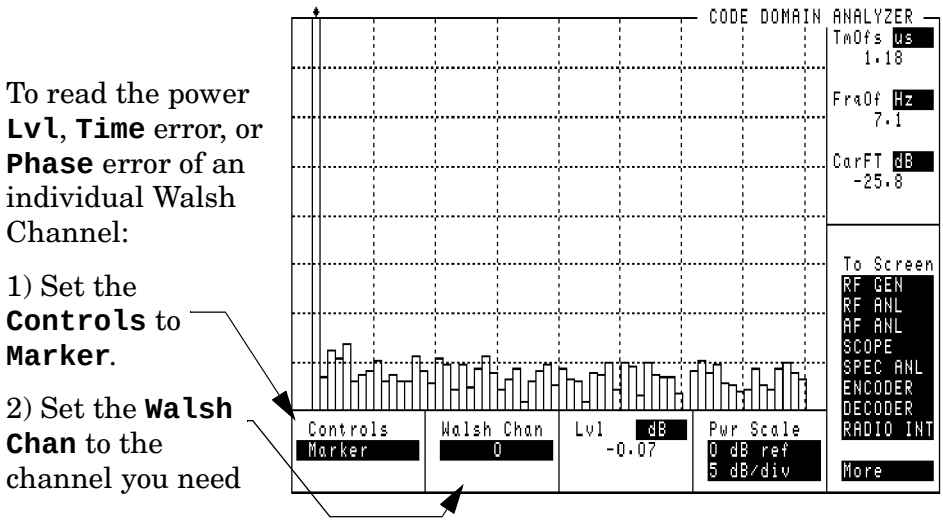


The Time Offset, Frequency Offset, and Carrier Feedthrough are displayed here.

Select the **`Measurement`** field to change the measurement type to **`Fast Pwr`**, **`Phase`**, or **`Timing`**. For fast power measurements, you must access **`FP Setup`** in the **`Controls`** menu and manually set the **`Time Offset`**.

2. Changing the **Controls** field from **Main** to **Marker** lets you move the marker to any **Walsh Chan** (0-63), with the resulting **Lvl** (level), **Time**, or **Phse** (phase) indicated for the current marker position (depending on the **Measurement** field setting shown in Figure 4-8). See Figure 4-9.

Figure 4-9 Reading Individual Walsh Channel Measurements



3. When you are finished using the code domain analyzer screen, press the **Shift k1 ENTER** key, and follow the directions on the screen. The Software returns to the Test Selections menu.

CDMA Analyzer

The CDMA Analyzer sets up the Test Set to manually make several measurements.

This test can be made with the base station either in-service or out-of-service. If you have set Send Control Commands to the MSC to NO, you must disable call processing and turn off any transmitters prior to connecting the Test Set to the TX Antenna port. You must then manually set the base station to transmit in pilot only mode. If you have set Send Control Commands to the MSC to Yes, the automated software will configure the base station for testing and prompt you to make connections to the proper port.

The following measurements can be performed:

- Channel Power
- Rho (modulation quality). The following measurements are also displayed when Rho is selected:
  - — Time offset
  - — Frequency error
  - — Carrier feedthrough
- EVM
  - — The following measurements are also displayed when EVM is selected:
    - — Phase error
    - — Magnitude error
- Average Power

NOTE The Rho and EVM measurements should be made with all traffic, paging, and sync channels off; only the pilot channel should be transmitting.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

- None used for this test

Parameters:

- 18. TX Antenna Port Cable Loss
- 20. TX Test Port Cable Loss
- 21. TX Test Port Coupling Factor

Select and Run the Test

Use these steps to select and run the CDMA Analyzer:

Step 1. From the Main Menu, scroll to **`Test Selections`** and press the knob.

Step 2. Scroll to **`CDMA Analyzer`** and press the knob.

Step 3. Follow the displayed instructions and diagram to select and make the measurement.

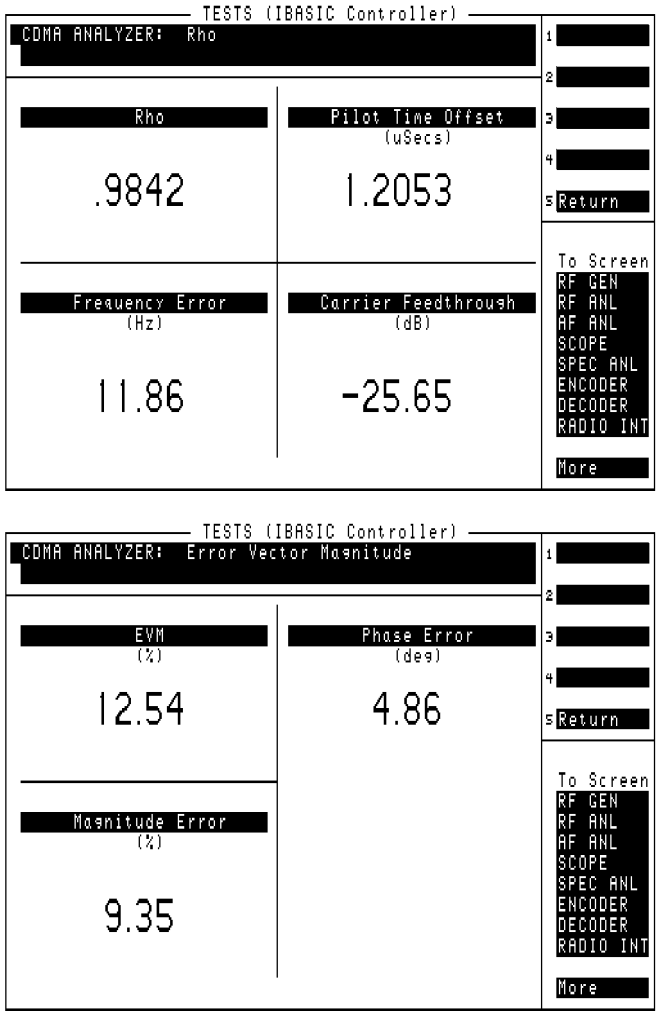
NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off by the MSC (or by switch personnel if not using a modem). The green ACT LEDs on the ACU and BCR modules indicate the transmitter is active, and therefore should be off before disconnecting cables.

Step 4. Select the desired measurement from the displayed list. The Test Set configures itself and makes the measurement. It may take several seconds before the measurement results are displayed.

Review the Results

Channel power and average power are displayed as individual measurements. Additional measurements are displayed if Rho or EVM is selected. See Figure 4-10.

Figure 4-10 CDMA Analyzer Rho and EVM Test Results



1. When you are finished using the CDMA analyzer, select **Return (k5)** to return to the CDMA Analyzer Choices menu. Select **Return (k5)** again and follow the displayed instructions to return to the Test Selections menu.

TX Antenna Port Cable Calibration

This utility measures the signal loss through the cable used to connect the Test Set to the base station's TX Antenna port. This loss must be known when making power measurements. Once this value is measured, you should label the cable indicating the loss through it for future use.

This routine requires the use of two external 6 dB attenuators (pads) and a short calibration cable. These parts are not standard equipment with the Test Set, but are included in the optional connector kit (see "Connector Kit" on page 93).

This test sends no control commands to the MSC.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

None used for this test.

Parameters:

- 18. TX Antenna Port Cable Loss

Select and Run the Utility

Use these steps to select and run the TX Antenna Port Cable Calibration procedure:

Step 1. From the Main Menu, scroll the cursor to **`Calibration/Utilities`** and press the knob.

Step 2. Scroll to **`TX Antenna Port Cable Calibration`** and press the knob.

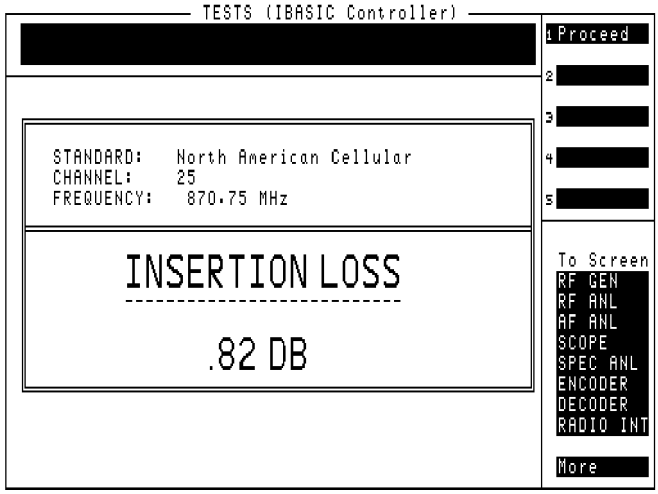
Step 3. Follow the displayed instructions to connect the 6 dB pads and calibration cable. Select **`Proceed`** (**`k1`**) to continue.

Step 4. Follow the displayed instructions to connect the test cable in series with the calibration cable and pads. Select **`Proceed`** (**`k1`**) to continue making the measurement.

Review the Results

1. The measured insertion loss and test frequency are displayed. Select **Proceed** (**k1**) to continue.

Figure 4-11 TX Antenna Port Cable Loss display.



2. You are asked if you want to store the insertion loss as the TX Antenna Port Cable Loss. Use the knob to select **Yes** or **No**.

- If you select **Yes**, the Software automatically enters the value in the Test Configuration Menu. Unless you believe that the indicated loss is incorrect, you should select **Yes**.
- If you select **No**, you are asked if you want to **Remeasure** the loss or **Return** to the Calibration/Utilities Menu.

TX Test Port Cable Calibration

This utility measures the signal loss through the cable used to connect the Test Set to the base station's TX Test port. This is the base station port that samples the BCR's transmitter output through a directional coupler. This loss must be known when making power measurements. Once this value is measured, you should label the cable indicating the loss through it for future use.

This routine requires the use of two external 6 dB attenuators (pads) and a short calibration cable. These parts are not standard equipment with the Test Set, but are included in the optional connector kit (see "Connector Kit" on page 93).

This test sends no control commands to the MSC.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

None used for this test.

Parameters:

- 20. TX Test Port Cable Loss

Select and Run the Utility

Use these steps to select and run the TX Test Port Cable Calibration routine:

Step 1. From the Main Menu, scroll to **`Calibration/Utilities`** and press the knob.

Step 2. Scroll to **`TX Test Port Cable Calibration`** and press the knob.

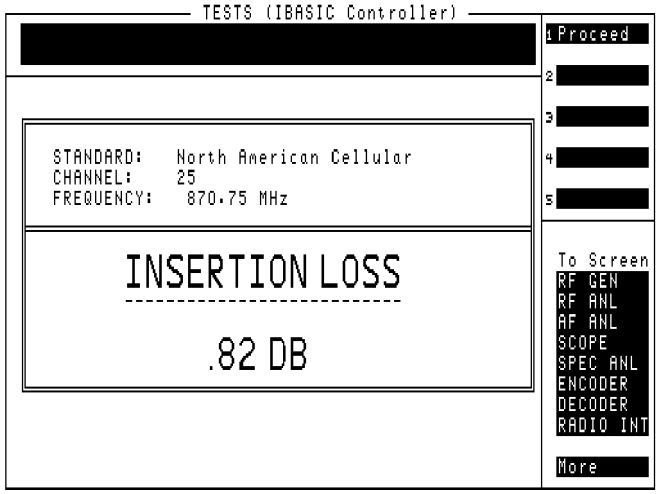
Step 3. Follow the displayed instructions to connect the 6 dB pads and calibration cable. Select **`Proceed`** (**`k1`**) to continue.

Step 4. Follow the displayed instructions to connect the test cable in series with the calibration cable and pads. Select **`Proceed`** (**`k1`**) to continue making the measurement.

Review the Results

1. The measured insertion loss and test frequency are displayed. Select **Proceed** (**k1**) to continue.

Figure 4-12 TX Test Port Cable Loss Display



2. You are asked if you want to store the insertion loss as the TX Test Port Cable Loss. Use the knob to select **Yes** or **No**.
   - If you select **Yes**, the Software automatically enters the value in the Test Configuration Menu. Unless you believe that the indicated loss is incorrect, you should select **Yes**.
   - If you select **No**, you are asked if you want to **Remeasure** the loss or **Return** to the Calibration/Utilities Menu.

TX Test Port Calibration

The Calibrate TX Test Port utility measures the loss associated with testing from the TX Test port. This gives the Test Set a coupling factor to use with measurements from the TX Test port.

At the start of the test, you are prompted to choose either full or specified calibration.

- Full calibration first measures the level at the TX Antenna port, then measures the level at the TX Test port. The difference in these levels is used to determine the loss through the TX Test port.

  If automated control of the base station is enabled, the Software sends commands to the MSC during the test. See "Base Station Configuration Procedure" on page 38 If manual base station control is used, you must disable call processing and turn off any transmitters prior to connecting the Test Set to the TX Antenna port.

NOTE

During full calibration, you are prompted to connect the Test Set's RF IN/OUT port to the base station's TX Antenna port using the TX Antenna Port cable. After proceeding, you are then prompted to connect the Test Set's ANT IN port to the base station's TX Test port using the TX Test Port cable.

For accurate TX Test port calibration, you must use the correct cables when prompted.

- Specified calibration uses the Specified Output Power level from the Base Station Configuration menu to determine the coupling factor. If the correct output level is specified, the level at the TX Test port is measured and the difference in these levels is used to determine the loss through the TX Test port.

  Unless you are certain that the Specified Output Power level is correct (± 0.5 dB), you should use the full calibration for the most accurate results.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

- None used for this test

Parameters:

- 18. TX Antenna Port Cable Loss
- 20. TX Test Port Cable Loss
- 21. TX Test Port Coupling Factor

Select and Run the Test

Use these steps to select and run the TX Test Port Calibration utility:

NOTE This procedure may include steps that prompt you to disconnect cables from the Test Set's antenna port and RF IN/OUT port. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off (check the green ACT LEDs on the ACU and BCR modules; *they should be off*) by the MSC (or by switch personnel if not using a modem).

Step 1. From the Main Menu, scroll to **`Calibration/Utilities`** and press the knob.

Step 2. Scroll to **`TX Test Port Calibration`** and press the knob.

Step 3. Select full or specified calibration (see the description of full and specified calibration on page 74).

Step 4. Follow the directions on the screen.

Step 5. Connect the Test Set to the base station as indicated and select **`Proceed`** (**`k1`**) to continue after each setup.

- Full calibration requires two separate measurement setups. Be sure to use the correct test cables for each setup.
- Specified calibration uses one measurement setup. Be sure to use the TX Test Port cable when making the measurement.

Review the Results

1. The TX Test Port coupling factor is calculated and displayed. You should write this value next to the TX Test port for future reference.

   Select **`Proceed`** (**`k1`**) to return to the Calibration/Utilities Menu. Then select **`Return`** (**`k5`**) to return to the Main Menu.

   If you select **`Test Configuration`** (from the Main Menu) you see that the **`TX Test Port Coupling Factor [dB]`** field now contains the value determined by the test.

PN Offset Search

The PN Offset Search is a utility that can be used when you are testing a BBA and do not know the PN offset value. The utility has the Test Set tune to the CDMA channel and search to find the valid PN offset. The resulting PN offset value is then entered into the **PN Offset** field of the Main Menu.

This utility can be performed with the base station in or out of service. No commands are sent to the MSC during this test.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

- 3. BBA PN Offset

Parameters:

- None used for this test

Select and Run the Test

Use these steps to select and run the PN Offset Search:

Step 1. You will need to make timing and RF connections to the Test Set. See "Connect the Test Set to the Site Equipment" on page 23.

Step 2. From the Main Menu, scroll to **Calibration/Utilities** and press the knob.

Step 3. Scroll to **PN Offset Search** and press the knob.

Step 4. Select **Proceed** (**k1**) to start the search.

Review the Results

NOTE The displayed setup diagram may prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off (check the green ACT LEDs on the ACU and BCR modules; *they should be off*) by the MSC (or by switch personnel if not using a modem).

1. The setup diagram prompts you to make connections between the Test Set and the base station. Press **Proceed** (**k1**) when the connections have been made.
2. The Test Set begins searching for the BBAs PN offset. This is an iterative process and it may take several minutes before returning the PN offset. Once the value has been found, it will be displayed on the screen.

   The PN offset returned by the search also enters the value into the **PN Offset** field on the Test Configuration Menu.
3. Once the PN offset value is displayed, select **Proceed** (**k1**) and follow the displayed instructions to return to the Calibration/Utilities Menu.

Insertion Loss Measurement

The Insertion Loss Measurement is used to measure the loss associated with RF cables, filters, and other passive devices in the measurement path. This test uses the Test Set's internal source and measures the relative loss through the cable or device.

To optimize measurement accuracy, the measurement setup diagram indicates the use of two external 6 dB attenuators (pads) and a short calibration cable. The pads are optional, but should be used if available. These parts are not standard equipment with the Test Set, but are included in the optional connector kit (see "Connector Kit" on page 93).

This test sends no control commands to the MSC.

Select and Run the Test

Use these steps to select and run the Insertion Loss Measurement:

Step 1. From the Main Menu, scroll to **`Calibration/Utilities`** and press the knob.

Step 2. Scroll to **`Insertion Loss Test`** and press the knob.

Step 3. If prompted to do so, remove the RF connections from the Test Set and select **`k1`** (**`Proceed`**) to perform a channel power calibration. If channel power was recently calibrated, you may not be prompted to recalibrate before starting the Insertion Loss test.

Step 4. Select the **`Loss Measurement Type`**:

- **`Swept`** measures the loss over the frequency range you specify in the **`Start Frequency`** and **`Stop Frequency`** settings.
  - ❑ The **`Maximum Expected Loss`** for the device you are testing is used to adjust the scale on the results plot. Use a value slightly greater than expected for the best display resolution.
  - ❑ The **`Duplex Out Level`** into the device being tested may be adjusted if necessary.
- **`Discrete`** measures the loss at the frequency you specify by entering the **`Channel Number`** you are testing.

Step 5. Select **`k1`** (Run) to start the measurement.

Step 6. Connect the short calibration cable as directed, and then select **`k1`** (**`Proceed`**).

Step 7. The Test Set turns on the source and makes a reference measurement. You are then prompted to add in the cable or device to be tested. Leave the calibration cable and pads connected to the ANT IN port and insert the cable or device you want to measure as shown in the diagram. Select **Proceed** (**k1**) to make the insertion loss measurement.

Review the Results

1. When making a discrete measurement, the insertion loss is displayed as a single numeric value (in units of dB).

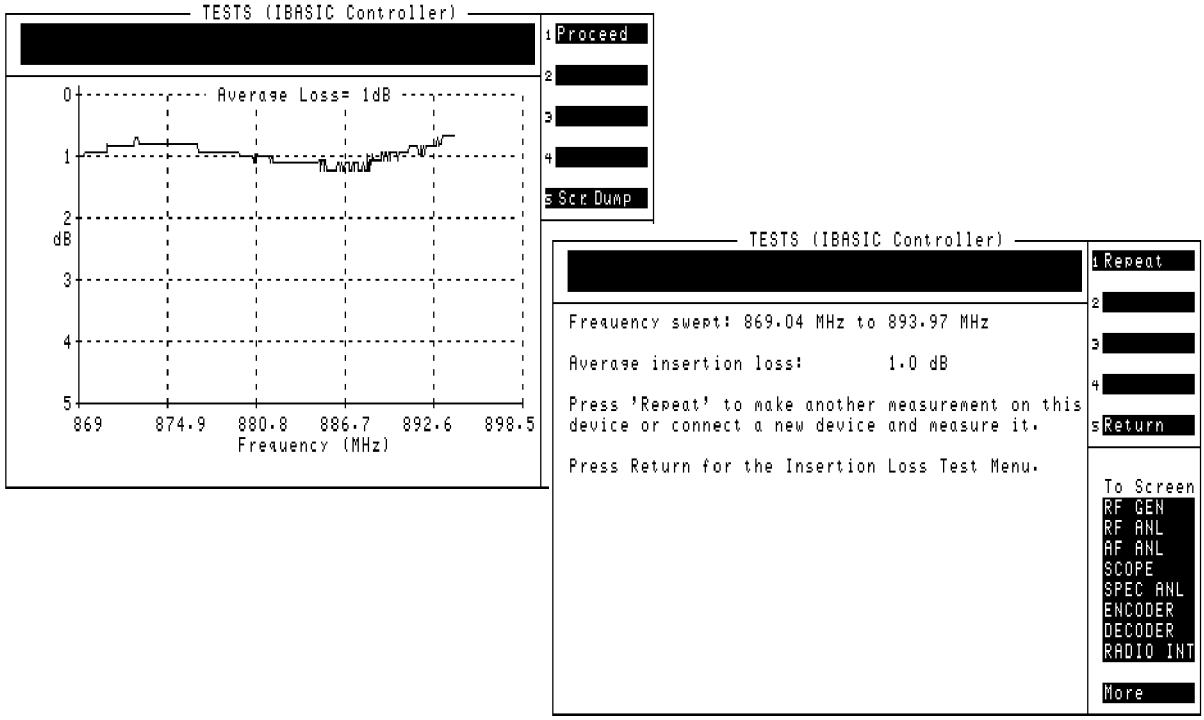
   When making a swept measurement, the loss is displayed on the screen (in units of dB) and as a plot of loss versus frequency. (See Figure 4-13.)

   - Selecting **Scr Dump** (**k5**) causes the Test Set to pause automated operation. Press the **Print** key to send the plot to a printer connected to the Test Set. After the plot has printed, select **Continue** (**k2**).

     Printer selection and settings are accessed by selecting **Configure Printer** from the list of tests at the Software's Main Menu.

   - Selecting **Proceed** (**k1**) displays the frequency range settings and average insertion loss for the test. From this point you can select **Repeat** (**k1**) to test another cable or device, select **Return** (**k5**) once to go to the Insertion Loss Test setup menu, or select **Return** (**k5**) twice to return to the Calibration/Utilities Menu.

Figure 4-13 Insertion Loss Test Results



Return Loss Measurement

The Return Loss Measurement is used to measure the return loss of a cable, antenna, or other device in the swept mode. A SWR bridge and a 6 dB pad are connected to the Test Set. The Software uses the pad to improve the mismatch between the SWR bridge and the ANT IN port on the test set. A reference level is measured with an open or short on the bridge and then the return loss is measured with the cable or antenna-under-test. Measured values for minimum and maximum return loss are printed at the top of the screen.

This measurement requires the use of two external 6 dB attenuators (pads), two type-N cables, and an SWR bridge. These parts are not standard equipment with the Test Set, but are included in the optional HP E6554A 8935 RF Tools Hardware Accessory Kit. See "Hardware Accessory Kit" on page 94

This test sends no control commands to the MSC.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

- None used for this test

Parameters:

- None used for this test

Select and Run the Test

Use these steps to select and run the Return Loss Measurement:

Step 1. From the Main Menu, scroll to **`Calibration/Utilities`** and press the knob.

Step 2. Scroll to **`Return Loss Test`** and press the knob.

Step 3. If prompted to do so, remove the RF connections from the Test Set and select **`k1`** (**`Proceed`**) to perform a channel power calibration. If channel power was recently calibrated, you may not be prompted to recalibrate before starting the Return Loss test.

Step 4. Select the loss **Measurement Type**:

- **Swept** measures the loss over the frequency range you specify in the **Start Frequency** and **Stop Frequency** settings.
  - — The **Maximum Expected Loss** for the device you are testing is used to adjust the scale on the results plot. Use a value slightly greater than expected for the best display resolution.
  - — The **Duplex Out Level** into the device being tested may be adjusted if necessary.
- **Discrete** measures the loss at the frequency you specify by entering the **Channel Number** you are testing.

Step 5. Select **Run** (**k1**) to start the test.

NOTE This procedure may include steps that prompt you to disconnect cables from the site's antenna ports and make connections to the Test Set. Before removing or re-installing the antenna cables, make sure that the transmitter has been turned off (check the green ACT LEDs on the ACU and BCR modules; *they should be off*) by the MSC (or by switch personnel if not using a modem).

Step 6. At the start of the test sequence, you see a connection diagram. You are prompted to make a connection between the DUPLEX OUT port, ANT IN port of the Test Set, and the SWR bridge indicated on the on-screen diagram. Select **Proceed** (**k1**) when the connections have been made.

Step 7. The Test Set will turn on the source and make a reference measurement. You will then see a prompt to add in the DUT (Device-Under-Test). Connect the DUT you want to measure, as shown in the diagram, and select **Proceed** (**k1**).

Review the Results

- When making a discrete measurement, the return loss and VSWR are displayed as single numeric values.

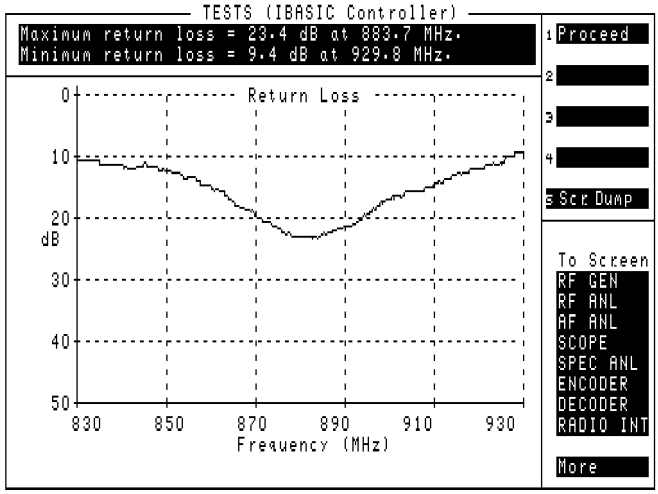
  When making a swept measurement, the loss is displayed on the screen (in units of dB) and as a plot of loss versus frequency. (See Figure 4-14.)

  — Selecting **Scr Dump** (**k5**) causes the Test Set to pause automated operation to print a copy of the plot. Press the **Print** key to send the plot to a printer connected to the Test Set. After the plot has printed, press **Continue** (**k2**).

  Printer selection and settings are accessed by selecting **Configure Printer** from the list of tests at the Software main menu.

  — Selecting **Proceed** (**k1**) displays the minimum and maximum return loss and VSWR measured during the test. From this point you can select **Repeat** (**k1**) to test another device, select **Return** (**k5**) once to go to the Return Loss Test setup menu, or select **Return** (**k5**) twice to return to the Calibration/Utilities Menu.

Figure 4-14 Return Loss Test Results



5 CDMA Tests Software Reference

This chapter describes detailed operation of the Software that was not covered in Chapter 4 , “Performing CDMA Tests,” on page 43. The information in this chapter is organized by key topics, listed alphabetically. Use this chapter as a supplement when you have questions about using the CDMA tests.

Overview

Reference Information Topics

Refer to the following topic areas for detailed instructions on Software use:

Acronyms List

The following acronyms appear throughout this book. Use this as a reference when you have questions about the meaning of a particular acronym.

ACU – Analog Conversion Unit

AIF – Antenna Interface Frame

AWGN – Added White Gaussian Noise

BBA – BIU/BCR/ACU Combination

BCR – Baseband Combiner and Radio

BIU – Bus Interface Unit

CAT – Catalog

CCC – CDMA Cluster Controller

CCU – CDMA Channel Unit

CDMA – Code Division Multiple Access

CE – Channel Element

CP – Call Processing

CS – Cell Site

CR – Carriage Return

CRT – Cathode Ray Tube

CRTU – CDMA Radio Test Unit

dB – deciBel

dBm – deciBels with Respect to a milliwatt

dBt – deciBels with Respect to Total Channel Power

DTMF – Dual Tone Multi Frequency

DUT – Device Under Test

Eb/No – Ratio of Energy-Per-Bit to Noise Spectral Density

ECP – Executive Cellular Processor

ERP – Effective Radiated Power

EVM – Error Vector Magnitude

GPS – Global Positioning System

LED – Light Emitting Diode

MHz – Megahertz

MSC – Mobile Switching Center (also, MTSO)

OMP – Operations Management Platform

OOS – Out-Of-Service

OP – Output Process

OTP – One Time Programmable

PC – Personal Computer

PCS – Personal Communications Services

PN – Pseudonoise

RAM – Random Access Memory

RF – Radio Frequency

RX – Receiver

SCT – Synchronized Clock and Tone

TX – Transmitter

VSWR – Voltage Standing Wave Ratio

UCL – UnConditionaL

Connections

Refer to the following sections for details on making connections:

Test Set Connections to the Base Station

Figure 5-1 on page 90 and Figure 5-2 on page 91 show connections between the Series II base station and the Test Set. All the setups utilize the SCT module's clocks for the Test Set reference.

Figure 5-1 Lucent Series II - CDMA Out-of-Service Measurements

Connect to the antenna port or the foam jumper attached to the antenna port using a type-N barrel.

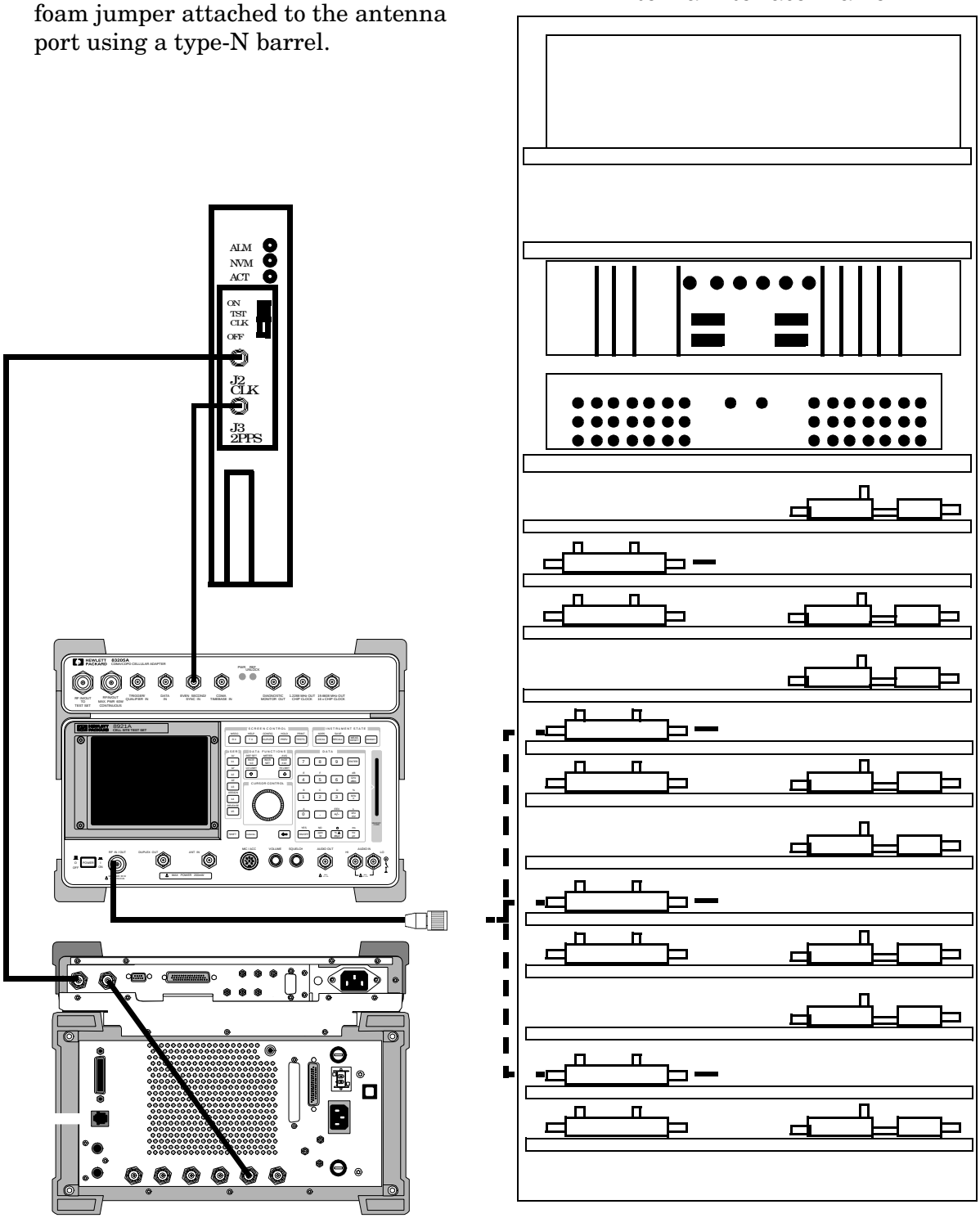


Figure 5-2 Lucent Series II - CDMA In-Service Measurements

If space permits connect to the coupled port. If the shelf space is to tight. Unhook the jumper cable from the switch panel ports J11, J12, J13 and use a SMA barrel to connect the jumper cable to the test cable

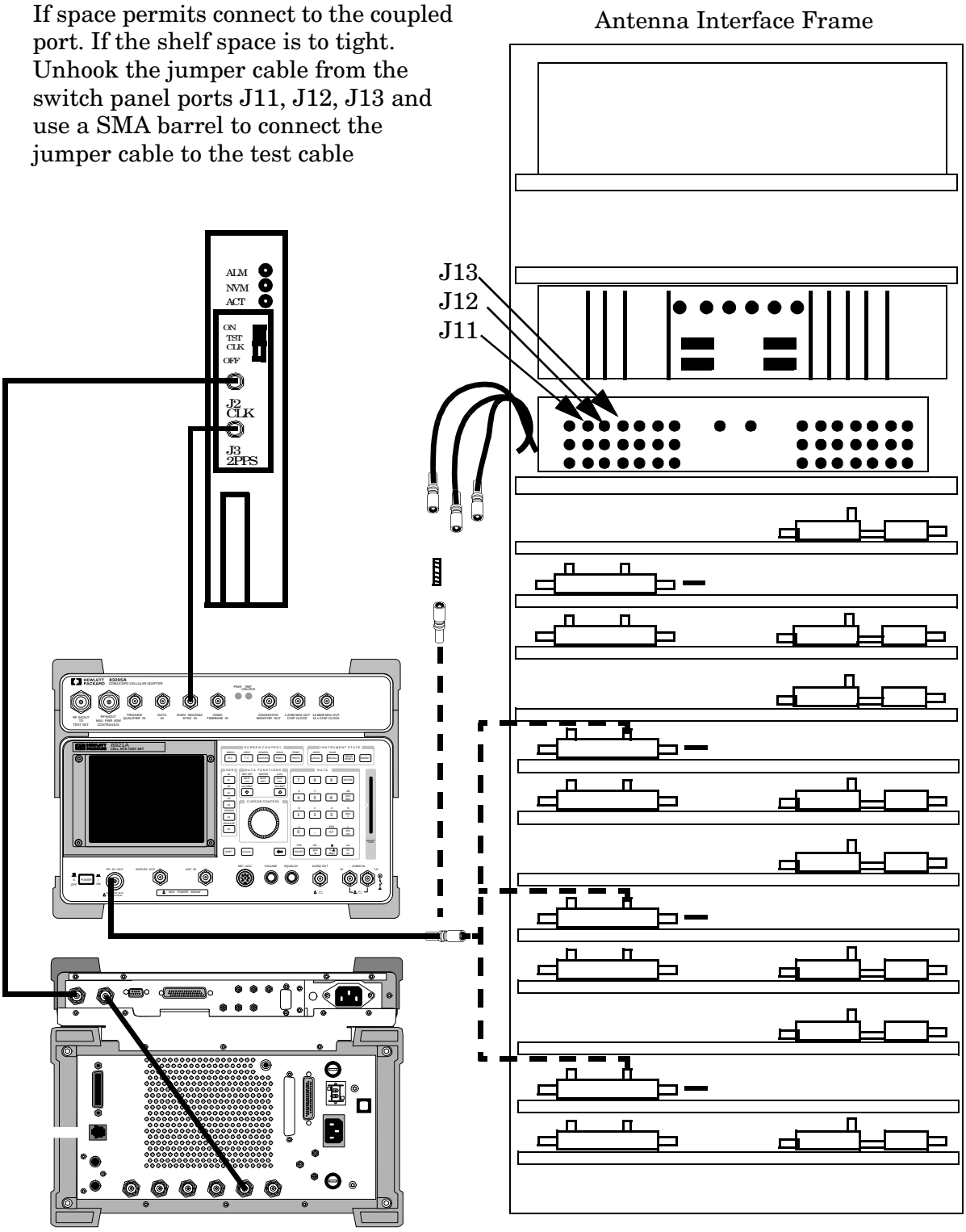
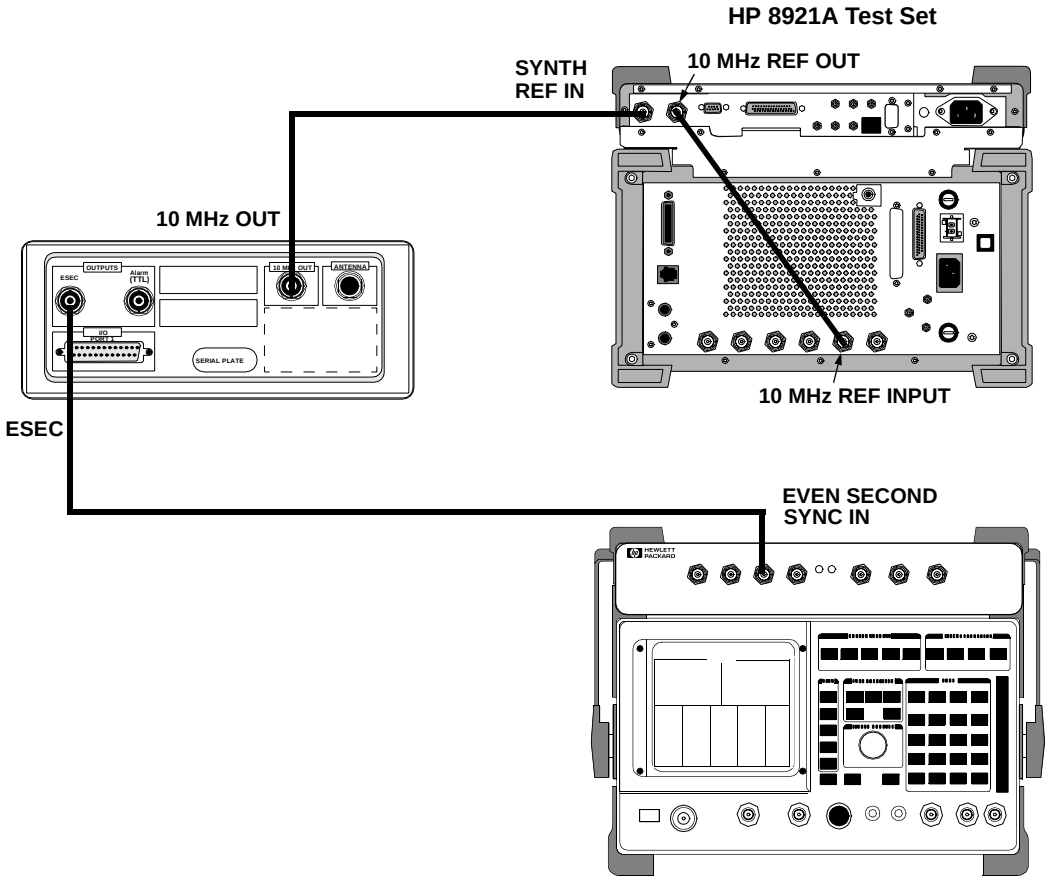


Figure 5-3 shows the connections to the Test Set when using an HP 58503A GPS time and frequency reference receiver to establish a time base. This configuration utilizes a GPS signal for the Test Set timebase instead of connecting to the cell site's SCT modules. See "GPS Time and Frequency Reference Receiver" on page 14 for information on why you would use the HP 58503A.

When using the HP 58503A, be sure to set the **`REF IN Connected to`** field on the Test Configuration Menu to **`GPS [10 MHz]`** (see "Test Configuration Menu Settings" on page 46).

Figure 5-3 Connections to base station equipment using an HP 58503A GPS time and frequency reference receiver.



Printer Connections

Screen images, test data, and communications between the MSC and Test Set can all be printed to a hard copy (paper). You can print using the SERAIL 9, PARALLEL 15, or the HP-IB port. When using SERIAL 9, you cannot have your laptop PC connected at the same time.

- Screen images of any screen can be printed. Certain tests, such as the Insertion Loss Test and Return Loss Test provide a **`Scr Dump`** (**`k5`**) feature to allow you to send the test's result plot to a connected printer.
- Using the data collection function, you can print test results as tests are run. See "Data Collection" on page 123.

Connector Kit

A cable kit for use with the Software can be used to supply the required parts to connect the Test System to the base station equipment and modem. The HP 83202A Option 043 Cable Accessory Kit supplies serial cables, RF cables and adapters needed to connect the Test System for testing. Refer to Table 5-1 for a list of parts included with the HP 83202A Option 043 Cable Accessory Kit.

Table 5-1 HP 83202A Option 043 Cable Kit Contents

Part	Part Number	Quantity	Use
Adapter, SMA(m) to BNC(f)	1250-1200	2	Connects to base station TX Test Port.
Adapter, DB25(f) to DB9(m)	1252-5568	1	Serial cable (modem) adapter.
Cable assembly, N(m) to N(m), 10 ft.	08921-61010	1	Connects the base station TX Antenna Ports to the Test System RF IN/OUT port.
Cable assembly, BNC(m) to BNC(m), 10 ft.	08921-61011	2	Connects the base station TX Test Port to the Test System RF IN/OUT port
Cable assembly, RJ11(m) to RJ11(m), 25 ft.	08921-61015	2	Serial (modem) cable.
Adapter, RJ11(f) to DB25(m)	08921-61018	1	Serial (modem) adapter.
Cable assembly, RJ11(m) to dual RJ11(f)	08921-61031	1	Splits the serial path to allow connection to modem and PC.
Cable assembly, RJ11(m) to DB9(f), 7 ft.	08921-61038	1	Connects the Test System serial path to a PC or printer.

Hardware Accessory Kit

The HP E6554A 8935 RF Tools Hardware Accessory Kit contains the equipment necessary to run the "Return Loss Measurement" on page 81 and to run the RF Tools ROM programs that reside in the Test Set. Refer to the HP 8935 CDMA Cellular/PCS Base Station Test Set Reference Guide for more information about the RF Tools program.

Table 5-2 HP E6554A 8935 RF Tools Hardware Accessory Kit

Part	Part Number	Quantity	Use
Cable Assy N(M) to N(M) 2 ft.	8120-8687	2	Used to connect the Test Set to the VSWR bridge.
VSWR bridge	0955-0829	1	Used to measure return loss
50Ω N(M) termination	1250-2656	1	Used to terminate transmission lines.
Short N(M)	1250-2655	1	Used to terminate the DUT port of the VSWR bridge during return loss tests.
Resistive power splitter, 2-way	0955-0827	1	Divide one signal into two signals.
Adapter BNC(M) to N(F)	1250-0077	2	Connect BNC cables to type N connections.
Attenuator 6 dB N(M) to N(F)	0955-0826	2	Used during cable loss, insertion loss, and return loss tests.
Transit case	E6554-61004	1	Organizes and safely transports kit contents.
Verification Guide	E6554-9001	1	Used as a checklist for accessory kit contents.

Demo (Demonstration) Mode

A good way to get started with the Software is to run it in the demo mode. The demo mode allows you to step through the menus and simulate testing without the need for a modem, a connection to the switch, or even a base station to test.

In the demo mode, the system will not send commands to the MSC, but it will perform very much the same as if actually testing a base station. When measurements are displayed, it provides sample numbers in order to show what the printout format will look like.

NOTE Once the demo mode is enabled, *it will stay on until you turn it off*. Even if you power off the Test Set and run the Software later, the demo mode setting is stored in non-volatile RAM and will still be set.

Entering the Demo Mode

The switch used to turn the demo mode on and off is a parameter in the test parameters menu. To turn on the demo mode:

Step 1. If the Software is running, press **Cancel** to stop program operation.

Step 2. Press the **k5 Main Menu** key to display the TESTS (Main Menu) screen.

Step 3. Scroll to **`Parm Test Parameters`** and press the knob.

Step 4. When the **`TESTS (Test Parameters)`** menu is displayed, press the knob again to allow scrolling.

Step 5. Scroll to **`ZZZZ Test Demo Mode`** (usually the last parameter in the list) and press the knob again (this stops the scrolling function).

Step 6. Turn the knob to place the cursor in front of the field's value (**`0.000000`**) below the parameter name.

Step 7. Using the DATA ENTRY keys, press **1** then **Enter**.

Step 8. That is all it takes to set up demo mode. The demo mode begins the next time the Software is run. If you want to re-run the Software now, press the **k5 Main Menu** key and then select (**k1**) **`Run Test`**. You will return to the Software's Lucent Tests Main Menu in the demo mode.

Exiting the Demo Mode

To turn off the demo mode, enter a value of 0 for the demo mode setting:

Step 1. If the Software is running, press **Cancel** to stop program operation.

Step 2. Press the **k5 Main Menu** key to display the TESTS (Main Menu) screen.

Step 3. Scroll to **Parm Test Parameters** and press the knob.

Step 4. Once in the **TESTS (Test Parameters)** menu, press the knob again to (allow scrolling).

Step 5. Scroll to **ZZZZ Test Demo Mode** and press the knob again (to stop the scrolling function.

Step 6. Turn the knob to place the cursor in front of the field's value (**1.000000**) below the parameter name.

Step 7. Using the DATA ENTRY keys, press **0** (zero) then **Enter**.

Step 8. The demo mode is now off and will not be in effect the next time the Software is run. If you want to re-run the Software now, press the **k5 Main Menu** key and then select **k1 Run Test**. You will return to the Software's Lucent Tests Main Menu in the test mode.

Parameters List and Descriptions

The Software uses your entries in the Test Parameters screen to customize testing.

A special parameter allows you to run the Software in a demo mode, which is useful for familiarization with the operation of the Test Set without connecting to any external equipment. See "Demo (Demonstration) Mode" on page 95.

Most parameters can be entered two ways:

- By loading and running the software and entering all of the information in the Test Configuration, Base Station Configuration, and Printer/Serial Port Configuration menus, the software automatically changes the test parameter settings to match your configuration settings.

  Parameters that can not be set while the Software is running include:

  — 1. Adjust Power [0=no 1=on fail 2=always]

  — 4. GN Code Domain Power Threshold

  — 5. GN Print Inactive Walsh Codes [0=no 1=yes]

  — 6. GN Stop Test if results fail [0=no 1=yes]

  — 22. ZZZZ Test Demo Mode [0=normal 1=demo]

- By loading the Software and selecting **`Parm Test Parameters`** on the TESTS (Main Menu) screen, you can change the settings or any or all parameters from the factory defaults.

This section lists the parameters and describes their use. For instructions on changing the parameters and saving your changes on a memory card, see "How to Change the Test Parameters and Conditions" on page 113 and "How to Save/Delete Procedures" on page 118.

Parameter Names and Use

1. **`Adjust Power [0=no 1=on fail 2=always]`**

   The entry in this parameter field determines how power measurements are made. The settings have the following effects:

   - If set to **`0`**, power measurements are displayed whether they meet the specified pass/fail limits or not, but the power meter is not displayed.
   - If set to **`1`**, the adjustment power meter will be displayed if the measured power is outside the specified pass/fail limits. You can then adjust power to within the limits and continue with testing.
   - If set to **`2`**,the adjustment power meter will be displayed any time power measurements are made, whether the values are within the specified pass/fail limits or not.

   See "Output Power Adjustment Error" on page 103 and "Output Power Error" on page 103.

2. **`BBA Channel Number`**

   This parameter identifies the channel number for the BBA you are testing.

3. **`BBA PN Offset`**

   This parameter identifies the PN offset for the BBA you are testing. If you don't know this value, run the PN offset search to find it (see "PN Offset Search" on page 76).

4. **`GN Code Domain Power Threshold`**

   This parameter is used to set a level for code domain power measurements. The level of each Walsh channel is compared to this threshold level; if it exceeds the threshold value, the channel is considered **active**. If it falls below the threshold, the Walsh channel is considered **inactive**.

NOTE The useful range for entries into the **`Code Domain Power Threshold`** parameter is 0 to –30 dB. If you enter a value outside of this range, the Software will use the nearest value within the range.

On **active** Walsh channels (when running code domain test sequences), the Software will measure and report:

- Code Domain Power
- Code Domain Timing
- Code Domain Phase

5. **GN Print Inactive Walsh Codes [0=no 1=yes]**

   This parameter is used with the **Code Domain Power Threshold** parameter. Walsh channels with levels below the **Code Domain Power Threshold** parameter entry are considered **inactive**. If this parameter is set to **0=no**, the inactive Walsh values are not measured or reported. If the parameter is set to **1=yes**, the Software will measure and report the code domain power for each of the inactive Walsh channels.

6. **GN Stop Test if results fail [0=no 1=yes]**

   An **F** appears in the P/F column of the test results to indicate a failure of that data point.

   - Setting this value to **0** causes the Software to continue running if a measured value is not within specifications.
   - Setting this value to **1** causes the Software to stop testing if a measured value is not within specifications.

7. **MSC BBA Number [50 Max]**

   Enter the number for the BBA you are testing.

8. **MSC BCR Attenuation [30 dB Max]**

   Enter the BCR attenuation setting for the BBA you are testing.

9. **MSC Cell Site Number [222 Max]**

   Enter the cell site number where you are testing.

10. **MSC Command Speed Type [0=fast 1=slow]**

    This parameter, under normal operation is set to 0=fast for communicating with the MSC. If the connection speed is at a low baud rate, or excessive errors are occurring during communication with the switch, set the parameter to 1=slow to add a short waiting period between commands.

11. **MSC ECP Number**

    Enter the number of the ECP that controls the cell site you are testing.

12. **SP9 Baud Rate [valid test set range]**

    Enter the baud rate to use for communications between the laptop PC and the Test Set's SERIAL 9 port. Valid rates (bps) are: 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, and 57600. This setting must match the setting used by your laptop's communication software.

13. **SP9 Data Length [7 or 8]**

Select either 7 or 8 bits for your serial communication data link between the laptop PC and the Test Set's SERIAL 9 port. This number can be entered using the DATA ENTRY keys. This setting must match the setting used by your laptop's communication software.

14. **SP9 Flow Control [1=None 2=Xon 3=Hw]**

Enter the type of data flow control for your serial communication data link between the laptop PC and the Test Set's SERIAL 9 port. This setting must match the setting used by your laptop's communication software.

- **1** provides no flow control.
- **2** uses Xon/Xoff flow control.
- **3** uses hardware flow control. This setting must be used for baud rates of 38400 and above.

15. **SP9 Parity [0=0 1=1 2=none 3=even 4=odd]**

Set to match your laptop's communication program settings for communication between the laptop PC and the Test Set's SERIAL 9 port. Enter the number value to indicate your desired setting as indicated below:

Table 5-3 Parity Settings for Laptop to Test Set Communication

MSC Parity Parameter Entry	Parity Setting
0	zero parity
1	ones parity
2	parity equals "none"
3	even parity
4	odd parity

16. **SP9 Stop Length [1 or 2]**

Enter **1** or **2** to match your laptop's communication program settings for the number of stop bits to use for communications between the laptop PC and the Test Set's SERIAL 9 port.

17. **Test Set REF IN [1=CS 2=GPS]**

    Define the source for the timebase reference signal to use when testing:

    - **1** is used when using the cell site's clock signals from the SCT modules.
    - **2** is used when you are using an HP 58503A GPS time and frequency reference receiver.

18. **TX Antenna Port Cable Loss**

    This parameter is used to account for the cable loss when testing from the TX Antenna port. If you do not know this value, you can have the Software measure it for you, (See "TX Antenna Port Cable Calibration" on page 70.)

19. **TX Output Power**

    Enter the power level (in Watts) that the BCR should be transmitting (at the TX Antenna port) when BCR Attenuation is set to **0** (zero).

20. TX Test Port Cable Loss

    This parameter is used to account for the cable loss when testing from the TX Test port. If you do not know this value, you can have the Software measure it for you, (See "TX Test Port Cable Calibration" on page 72.)

21. **TX Test Port Coupling Factor**

    Enter the amount of isolation between the BCR's transmitter output and the TX Test port. If you do not know this value, you can have the Software measure it for you. (See "TX Test Port Calibration" on page 74.)

22. **ZZZZ Test Demo Mode [0=normal 1=demo]**

    Use this parameter to put the Software into the demo mode. The demo mode will let you run the tests without really testing or connecting to a base station. This allows you to become familiar with Software operation. For details, see "Demo (Demonstration) Mode" on page 95.

Specifications (Pass/Fail Limits) List and Descriptions

The Software uses the entries in the TESTS (Pass/Fail Limits) screen to determine if a measurement meets your test requirements. If not, a "fail" indication is generated on the printout (and in some cases you are able to make adjustments and re-test).

This section lists the specification limit names and explains how they are used. For instructions on changing the pass/fail limits and saving your changes to a memory card, see "How to Change Pass/Fail Limits" on page 115 and "How to Save/Delete Procedures" on page 118.

1. **`Carrier Feedthrough`**

   These are the pass/fail limits for the test that measures the performance of the I/Q modulator of the CDMA transmitter.

   Units are dBc.

2. **`Code Domain Floor`**

   These pass/fail limits are used when performing code domain tests, and are used if the **`Print Inactive Walsh Codes`** parameter is set to **`1=yes`**. The **inactive** Walsh channel levels are measured and compared to this value (typically, they should fail some upper limit).

   Units are dB.

   See "GN Print Inactive Walsh Codes [0=no 1=yes]" on page 99.

3. **`Code Domain Phase`**

   These pass fail limits are used when performing code domain tests. The Test Set measures the phase of a Walsh channel compared to the pilot (Walsh 0) and compares the result to these limits.

   Units are mrad (milliradians).

4. **`Code Domain Timing`**

   These pass/fail limits are used when performing code domain tests. The Test Set measures the time offset of a Walsh channel compared to the pilot (Walsh 0) and compares the result to these limits.

   Units are ns (nanoseconds).

5. **Frequency Error**

   The Test Set measures the transmitter's center frequency and compares it to the ideal frequency, based on your entry for channel number. The difference between the two is the frequency error. The calculated frequency error is then compared to these pass/fail limits to determine if the test passes or fails.

   Units are Hz (hertz).

6. **Output Power Adjustment Error**

   These limits determine how the power meter is displayed. When the power meter display is shown, it has major tick marks that indicate the adjustment range for power settings. If you enter ±1 dB as the limits, the meter will be drawn with the ideal setting in the center and major tick marks 1 dB up and 1 dB down from center.

   Units are dB.

7. **Output Power Error**

   The previous limit setting (**Output Power Adjustment Error**) controls the adjustment diagram in power meter use. These (Output Power Error) values determine whether or not the power measurement made in automated testing meets specifications. If you set **Output Power Error** limits of ±2 dB, these limits will be used when a power reading is made. If the power measured is more than 2 dB from the desired setting, a fail indication (**F**) will result.

NOTE In general, it is best to have the **Output Power Adjustment Error** limits set narrower (smaller) than the **Output Power Error** limits.

   Units are dB.

8. **Rho**

   These limits are used when measuring rho, a measure of the modulation quality of a CDMA transmitter. Typically, only the lower limit is checked.

   This measurement has no units.

9. **Time Offset**

   These pass/fail limits are used when measuring the transmitter's time-alignment to system time.

   Units are μs (microseconds).

Testing without MSC Control

Chapter 4 , “Performing CDMA Tests,” on page 43, lists the steps for fully automated testing, using the Software to control the base station. The steps of that chapter use a modem to control the cell site via the MSC.

If you *are using a Test Set setup with no modem and connection to the MSC*, the following considerations apply:

- Be sure to set the **Send Control Commands to MSC** field on the Base Station Configuration Menu to **NO**. The Test Set will no longer send control commands to the MSC using the modem.
- The connection diagrams at the start of each test sequence will include prompts to apply or remove power for the BBA being tested. You must control the transmitter signal (on and off) manually at the site.

NOTE In addition to turning the transmitter signal on and off, you will also need to ensure that the proper configuration of the BBA is done for each test. For example, when running the Pilot Only Test, you will need to make sure that the pilot channel is the only active channel for that BBA (no paging or traffic channels should be active). For Code Domain tests, you will want to enable traffic, paging, and sync channels in most cases.

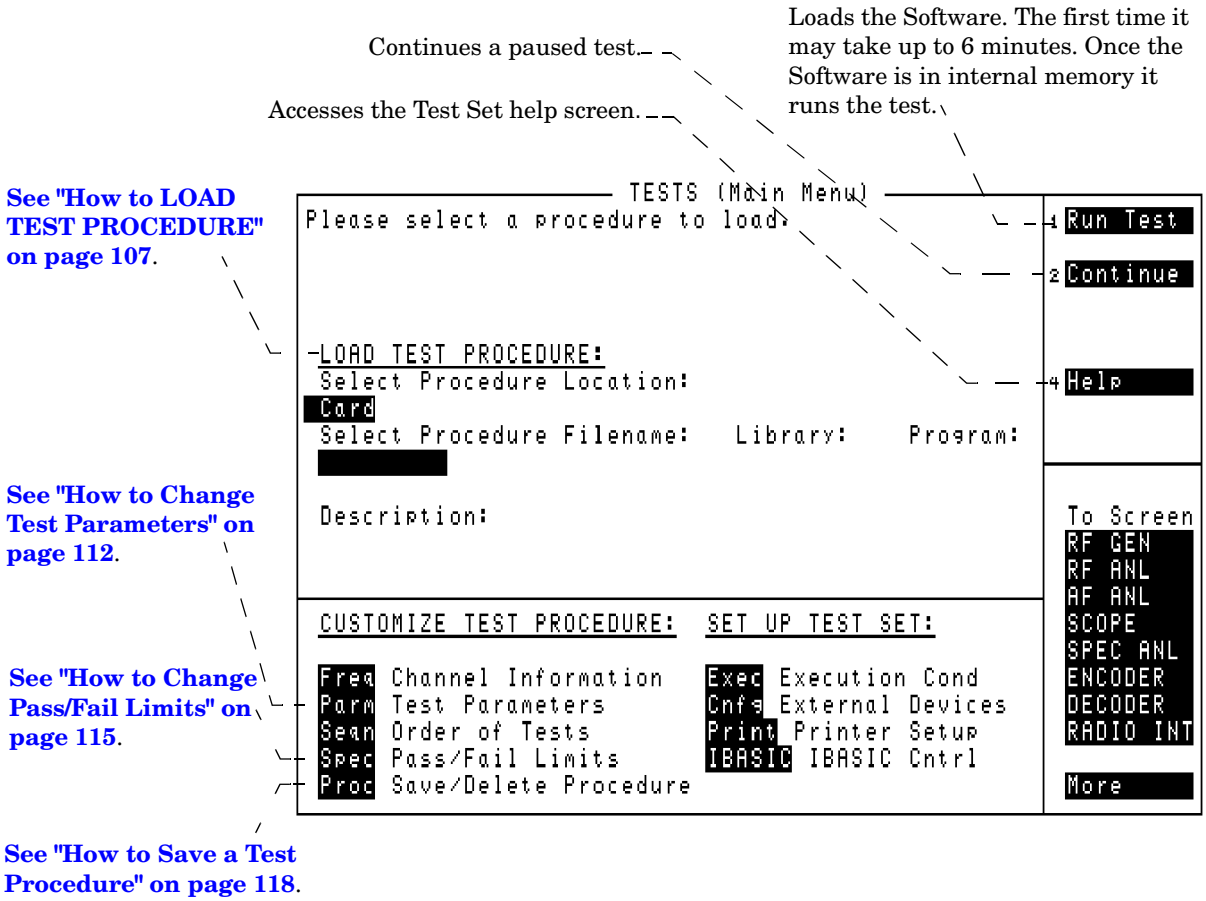
- You will probably need an assistant at the MSC to control the site and remove the radios from service.

6 General Software Reference

This chapter contains general Software operating instructions for use with the Test Set. These include how to load the Software, customize the test procedure, and set up the Test Set for use with automated tests.

TESTS (Main Menu) Screen Overview

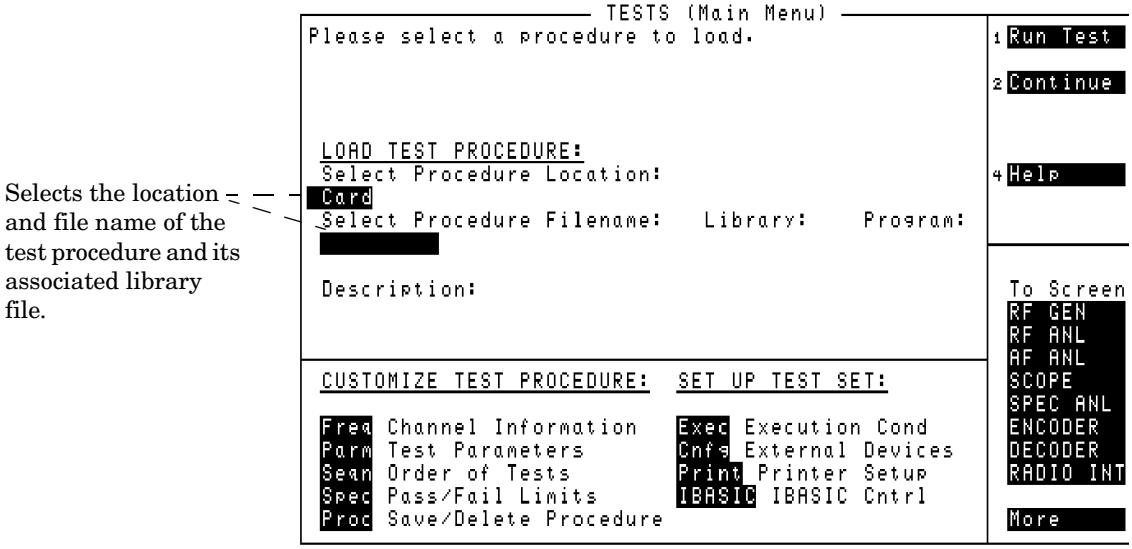
Figure 6-1 Test Subsystem



Pressing the front panel **TESTS** key will display the TESTS (Main Menu) screen. This screen allows the user to configure and run custom Software, access help, proceed with a paused procedure, or access additional test screens.

How to LOAD TEST PROCEDURE

Figure 6-2 **LOAD TEST PROCEDURE**



NOTE

How to Troubleshoot the Installation

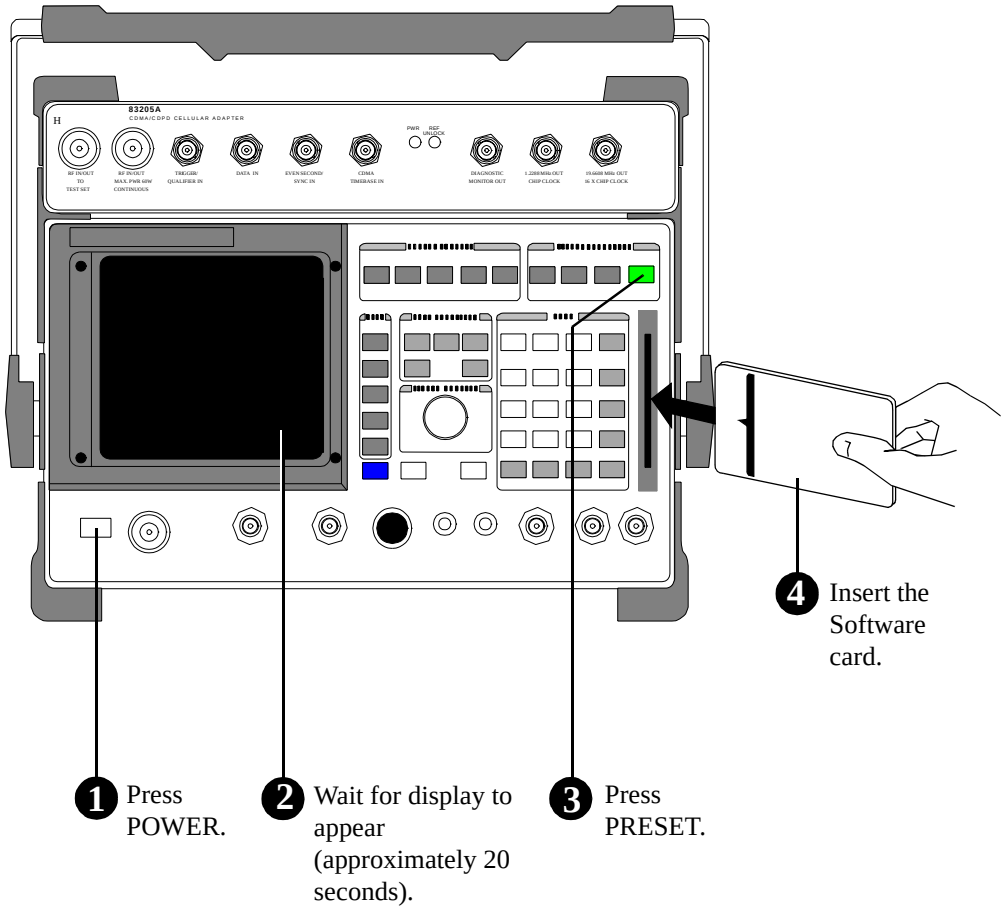
See "Troubleshooting the Software Installation" on page 110 for some hints to help debug any problems you may have during the installation of the Software.

Before you begin testing, you must load the Software into the Test Set's memory. To load the Software, select the location where the procedure currently resides (in this case, it will be a memory card) and a procedure file name to download into the Test Set's memory. Your card comes pre-programmed with at least one procedure.

The first time you select a procedure the actual Software program does not get loaded into the Test Set's memory until you select **k1** (**Run Test**) on the Test Set. It will take approximately 6 minutes for the Software program to be loaded. The program will remain in memory after a power-down/power-up cycle, unless it is manually deleted or a new program is loaded.

Loading the Software Card

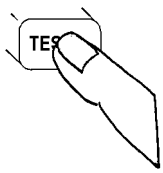
Figure 6-3 Loading the Software Card



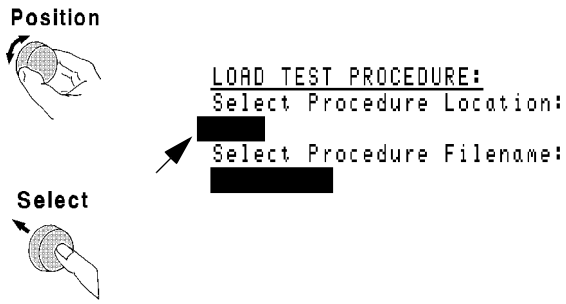
Continued on the following page

Figure 6-4 Selecting a Procedure

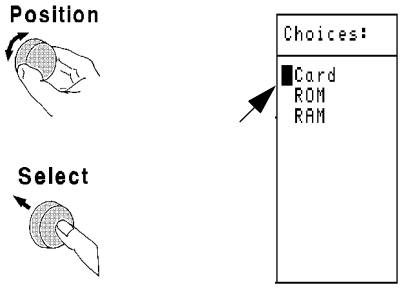
5 Press the **TESTS** key to display the **TESTS (Main Menu)** screen.



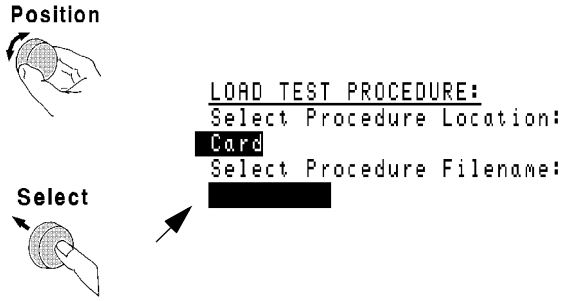
6 Position the cursor at **Select Procedure Location:** and select it.



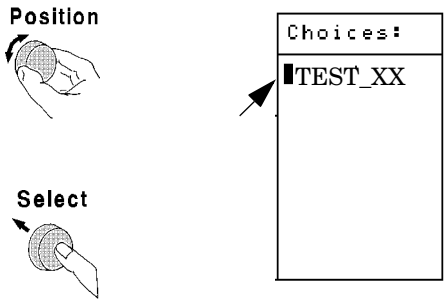
7 Position the cursor at **Card** and select it.



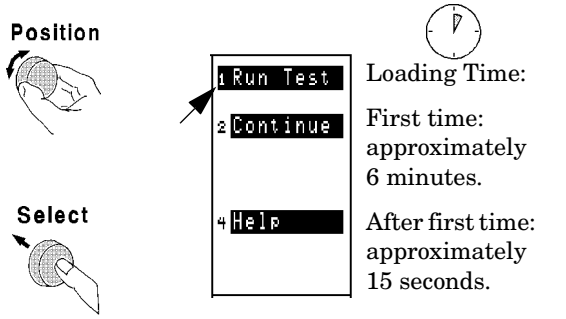
8 Position the cursor at **Select Procedure Filename:** and select it.



9 Position the cursor at **Choices:** and select the Procedure name: LUCENT.



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



Loading Time:

First time: approximately 6 minutes.

After first time: approximately 15 seconds.

Troubleshooting the Software Installation

If your Software did not install properly, check the following:

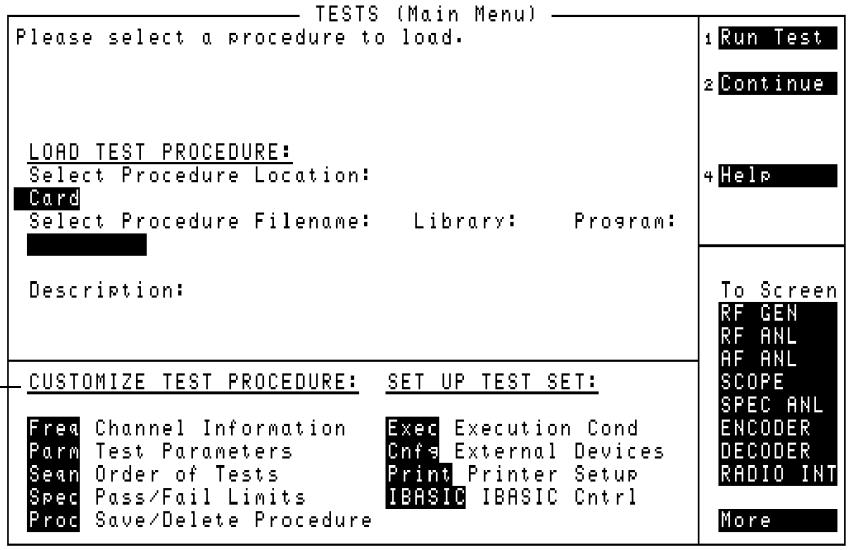
- Is the power on?
- Is the memory card inserted in the right direction?
- Is the memory card firmly seated in the slot? It should slide in loosely, then must be firmly pushed in to make proper contact.
- Did you get to the TESTS (Main Menu) screen? Pressing **PRESET** should take you to the TX TEST screen, and pressing the **TESTS** key should take you to the TESTS (Main Menu) screen.

NOTE If the Test Set displays an error that states “One or more self-tests failed”, you have a hardware problem. In this case, refer to the Test Set’s *Assembly Level Repair Guide*. If a problem persists, call the HP Factory Hotline from anywhere in the USA or Canada (1-800-922-8920), 8:30 am - 5:00 pm Pacific time).

- Do you see TESTS (IBASIC Controller) at the top of the display after selecting **Run Test** (**k1**)? If not, make sure you have specified the correct **Procedure Location** and **Procedure Filename**.

How to CUSTOMIZE TEST PROCEDUES

Figure 6-5 **CUSTOMIZE TEST PROCEDURES**



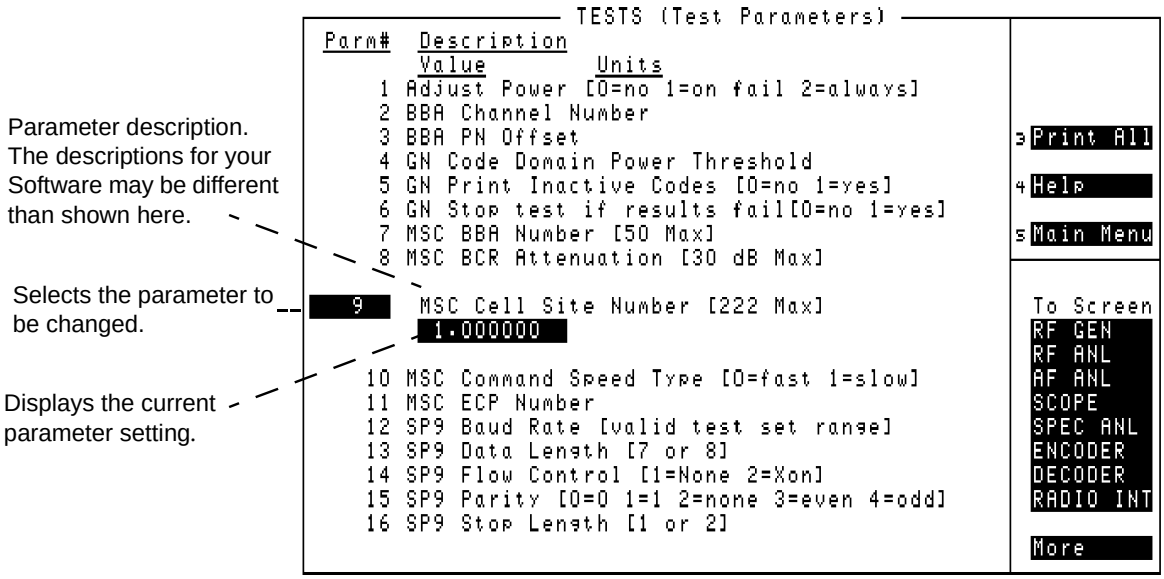
The fields listed under CUSTOMIZE TEST PROCEDURE are used to customize the software for various testing needs.

NOTE Your Software package may not allow customization of testing procedures. If you try to enter a customization screen which is not supported with your package the message “Access to secure test information denied” is displayed.

Software packages have been designed so that changes may be easily made from the Test Set’s front panel. For example, tests may be inserted or deleted, and later after running the tests you can change the pass/fail limits or decide to test different channels. You may store your customized test procedure on a memory card so that you may skip these steps in the future, see "How to Save/Delete Procedures" on page 118.

How to Change Test Parameters

Figure 6-6 TESTS (Test Parameters) screen



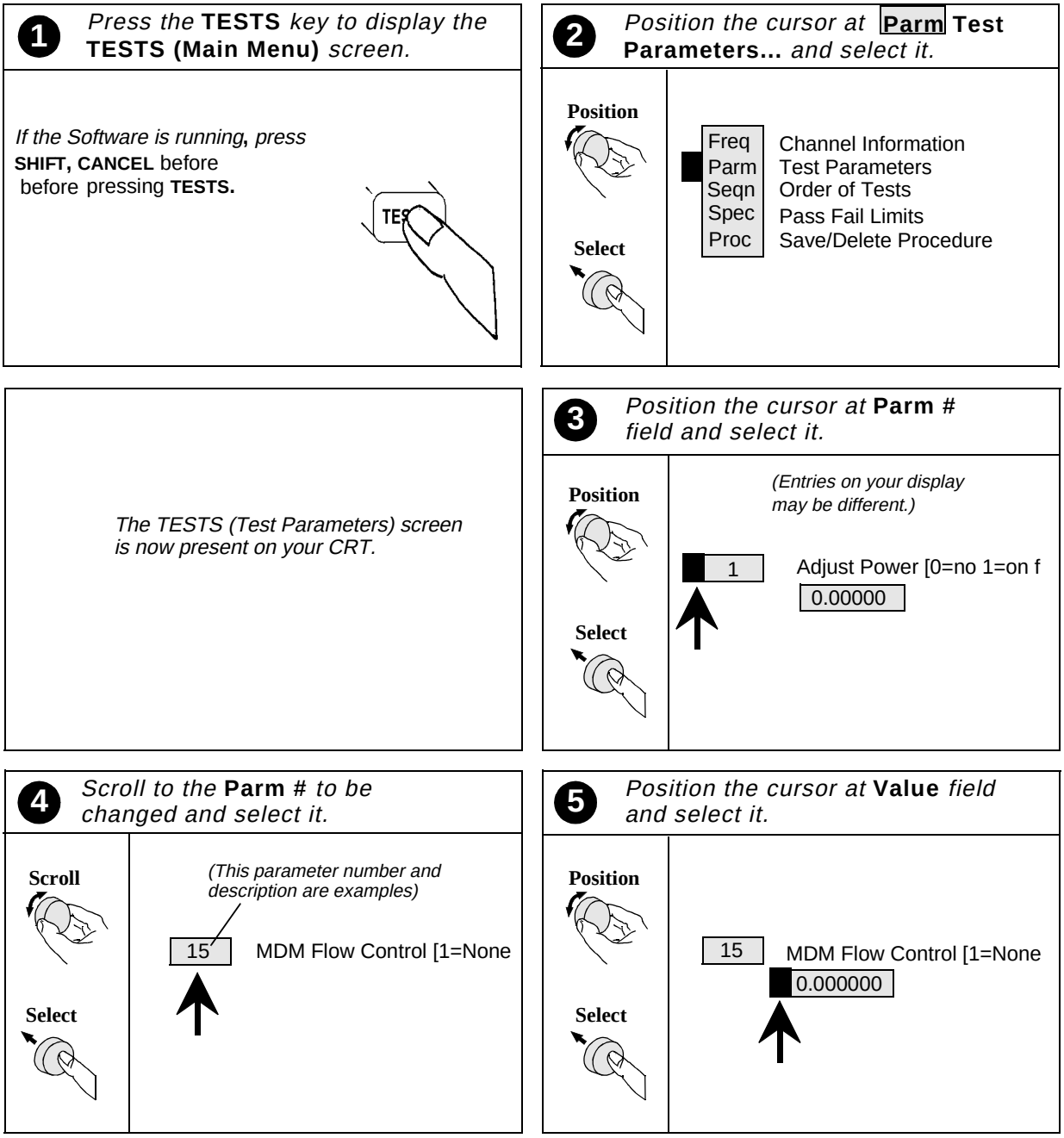
NOTE The TESTS (Test Parameters) screen may not be used in your particular Software package or some fields may not be present depending on the Software application. The message “Access to secure test information denied” is displayed if the screen is not supported in your current Software package.

The Software uses parameters to optimize the test environment and conditions for your testing situation. The default test parameters are determined by examining your testing needs and specifications from the equipment manufacturer. The Software comes with default settings for all test parameters.

The following procedure describes how you can change test parameters through the TESTS (Test Parameters) screen to optimize your testing conditions. For information on saving customized test parameters, see "How to Save/Delete Procedures" on page 118.

How to Change the Test Parameters and Conditions

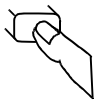
Figure 6-7 Procedure for Changing Parameters



Continue on next page

6 *Use* the **DATA** *keys to enter a new value, then select it.*

Select

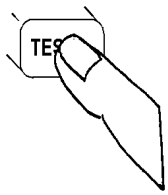


Select

15 MDM Flow Control [1=None

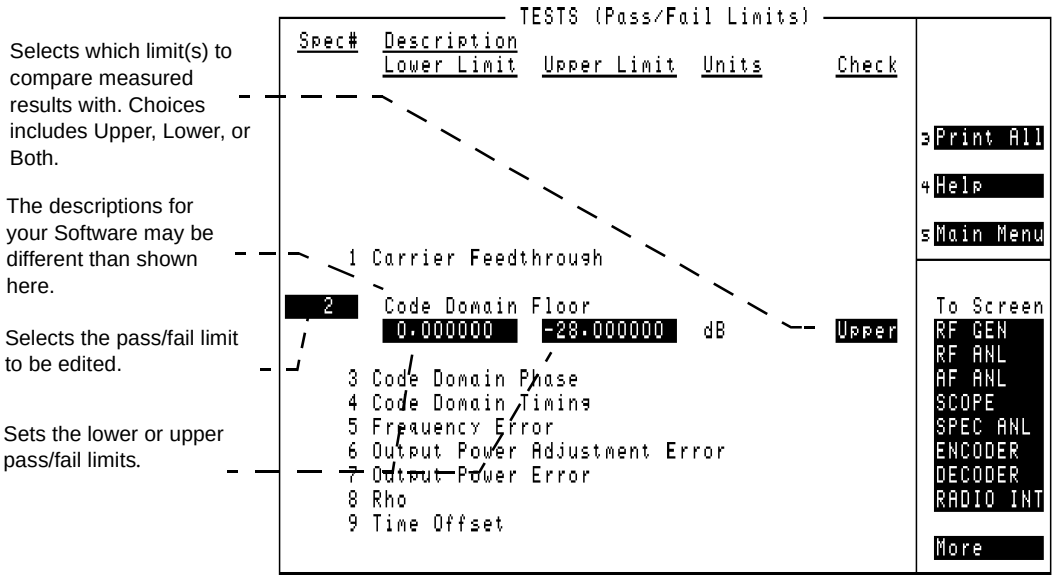
1.000000

7 *Press* **TESTS** *to return to the* **TESTS (Main Menu)** *screen.*



How to Change Pass/Fail Limits

Figure 6-8 TESTS (Pass/Fail Limits)



NOTE The TESTS (Pass/Fail Limits) screen may not be used in your particular Software package or some fields may not be present depending on the Software application. The message “Access to secure test information denied” will appear if this screen is not supported in your current Software package.

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

The following steps describe how to change the pass/fail limits, see "How to Save/Delete Procedures" on page 118 to save your new pass/fail limits.

How to Change Spec Pass/Fail Limits

Figure 6-9 Procedure for Setting Pass/Fail Limits

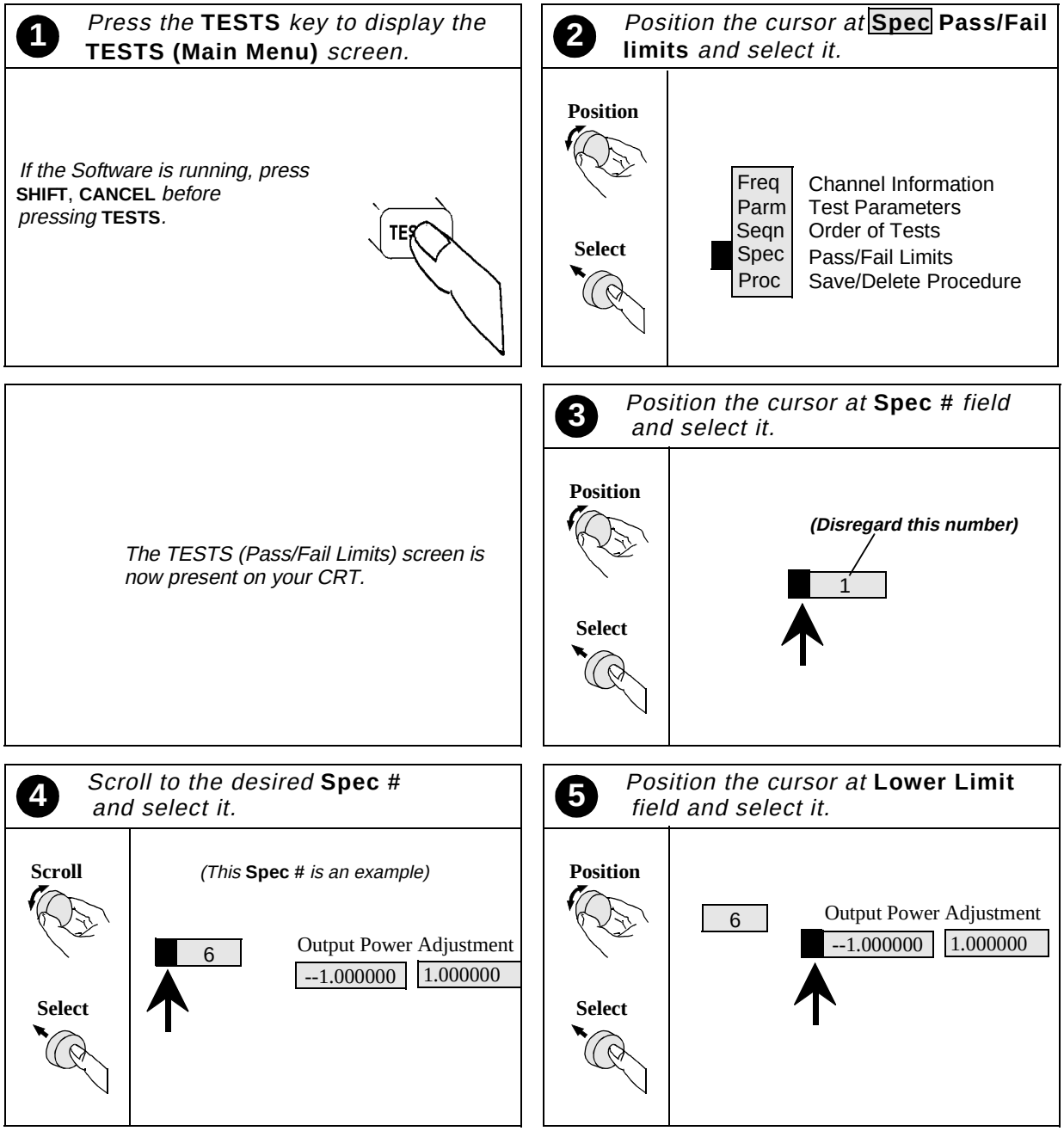


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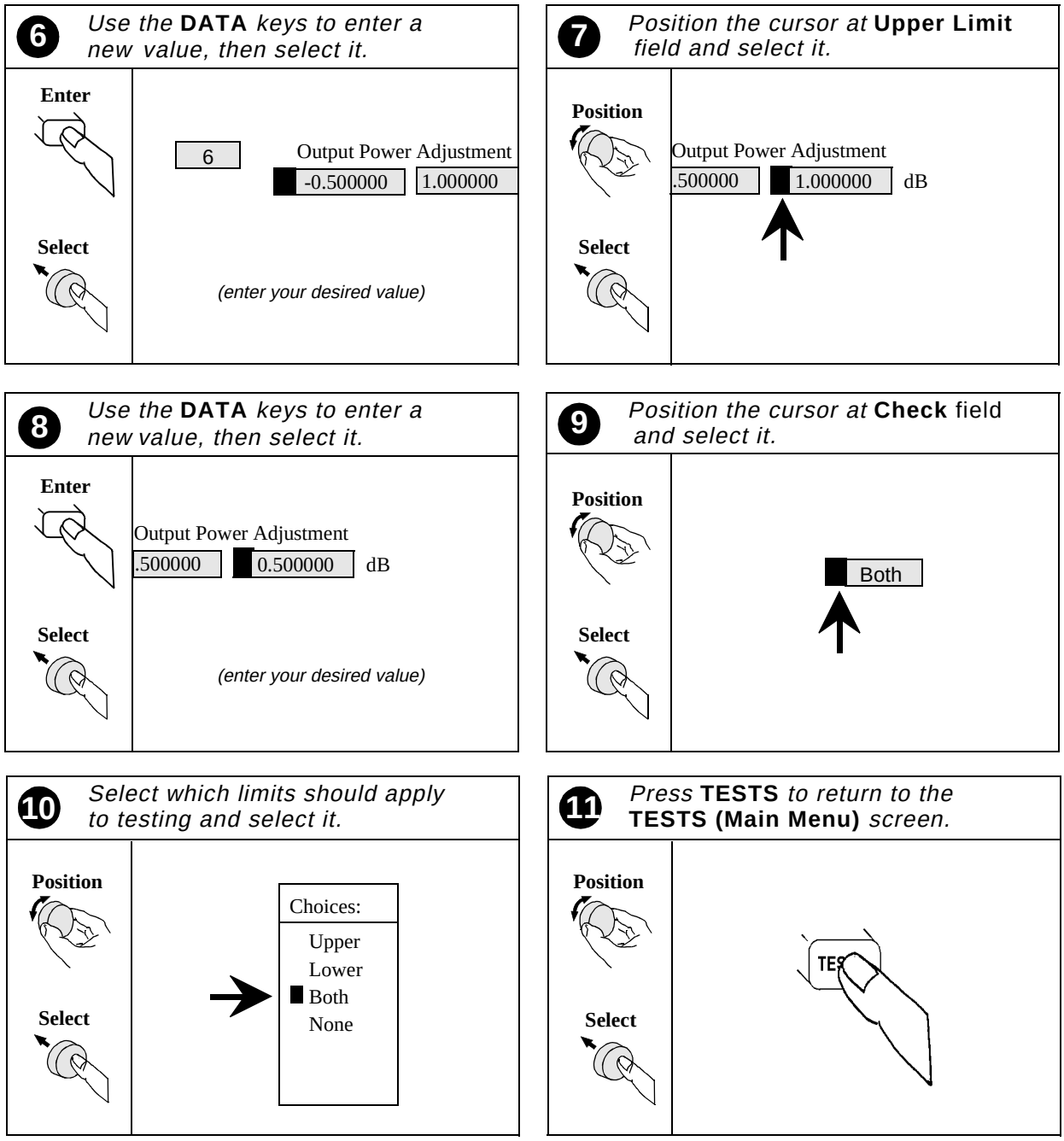
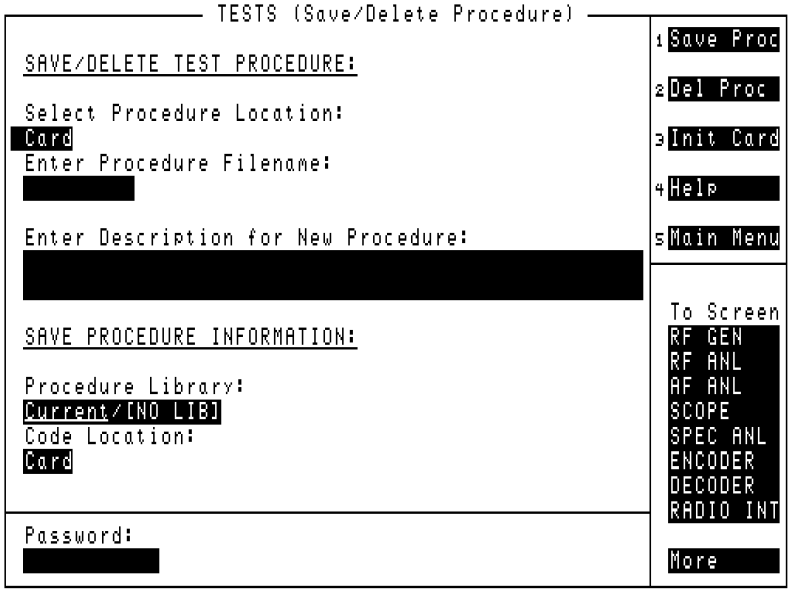
Figure 6-10 Procedure for setting pass/fail limits



How to Save/Delete Procedures

Figure 6-11 TESTS (Save/Delete Procedure) Screen



A test procedure is a collection of configuration information, test parameters, testing order, and pass/fail limits saved in a file that customizes the test Software to a specific application Normally, procedures are saved on a memory card.

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

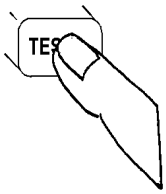
How to Save a Test Procedure

Figure 6-12, Figure 6-13, and Figure 6-14 show how to save a new procedure to a memory card.

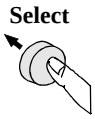
Figure 6-12 How to Save a Test Procedure

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

If ***the Software is running,*** *press* **SHIFT, CANCEL** *before pressing* **TESTS.**



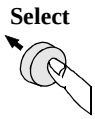
2 *Position cursor at* **Proc Save/Delete Procedure** *and select it.*



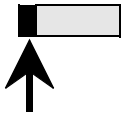
Freq — Channel Information
Parm — Test Parameters
Seqn — Order of Tests
Spec — Pass Fall Limits
Proc — Save/Delete Procedure

The TESTS (Save/Delete Procedure) screen is now on your Test Set display.

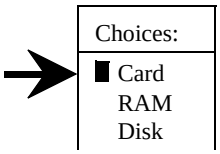
3 *Position cursor at* **Select Procedure Location** *and select it.*



Select Procedure Location:



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



(You can also save procedures to an internal RAM disk or external disk drive.)

5 *Put an initialized memory card in the front-panel slot.*

For detailed memory card initialization instructions
See "Initializing a memory card" on page 137

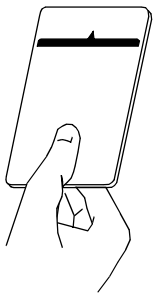


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Figure 6-13 How to Save a Test Procedure

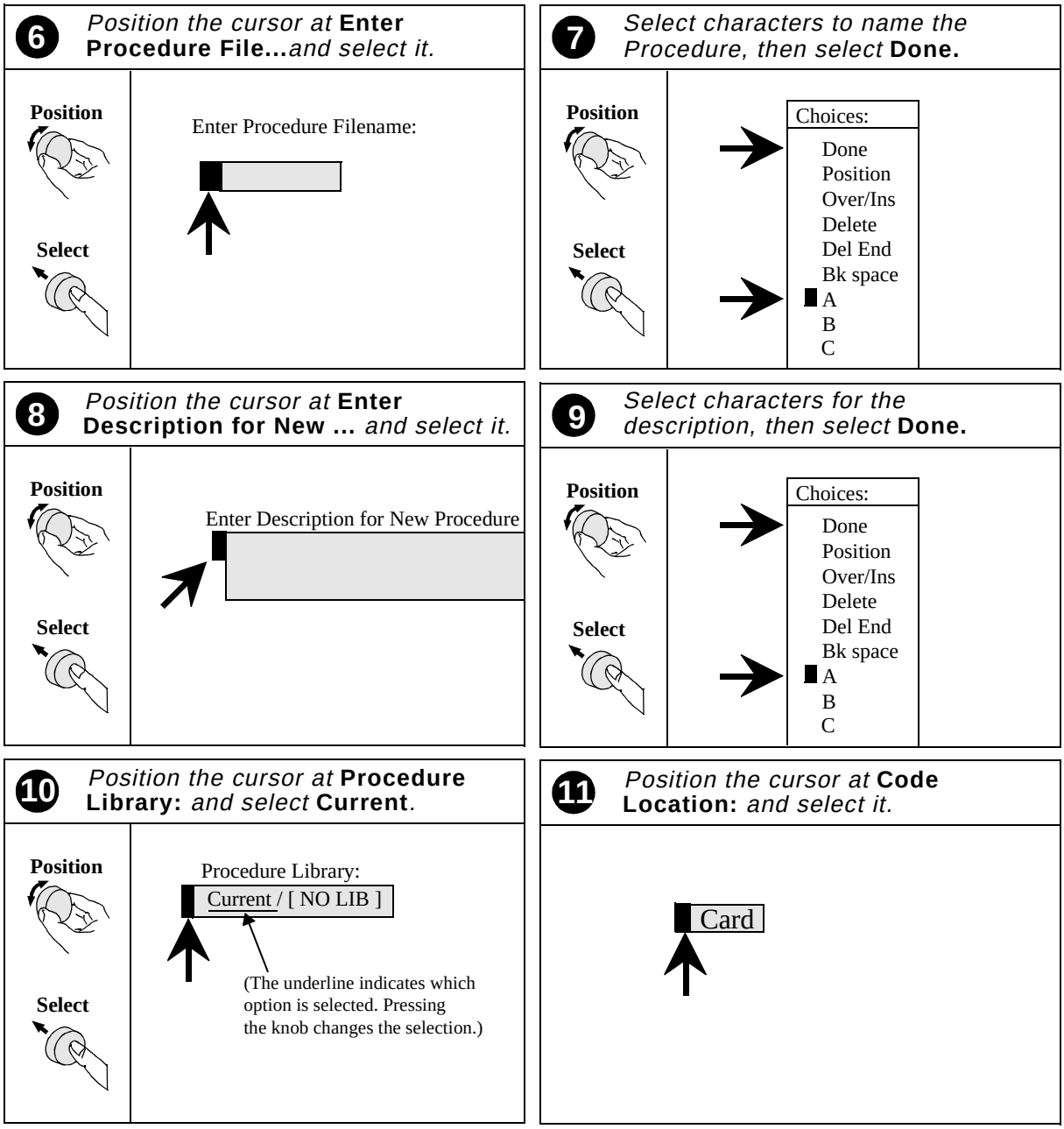

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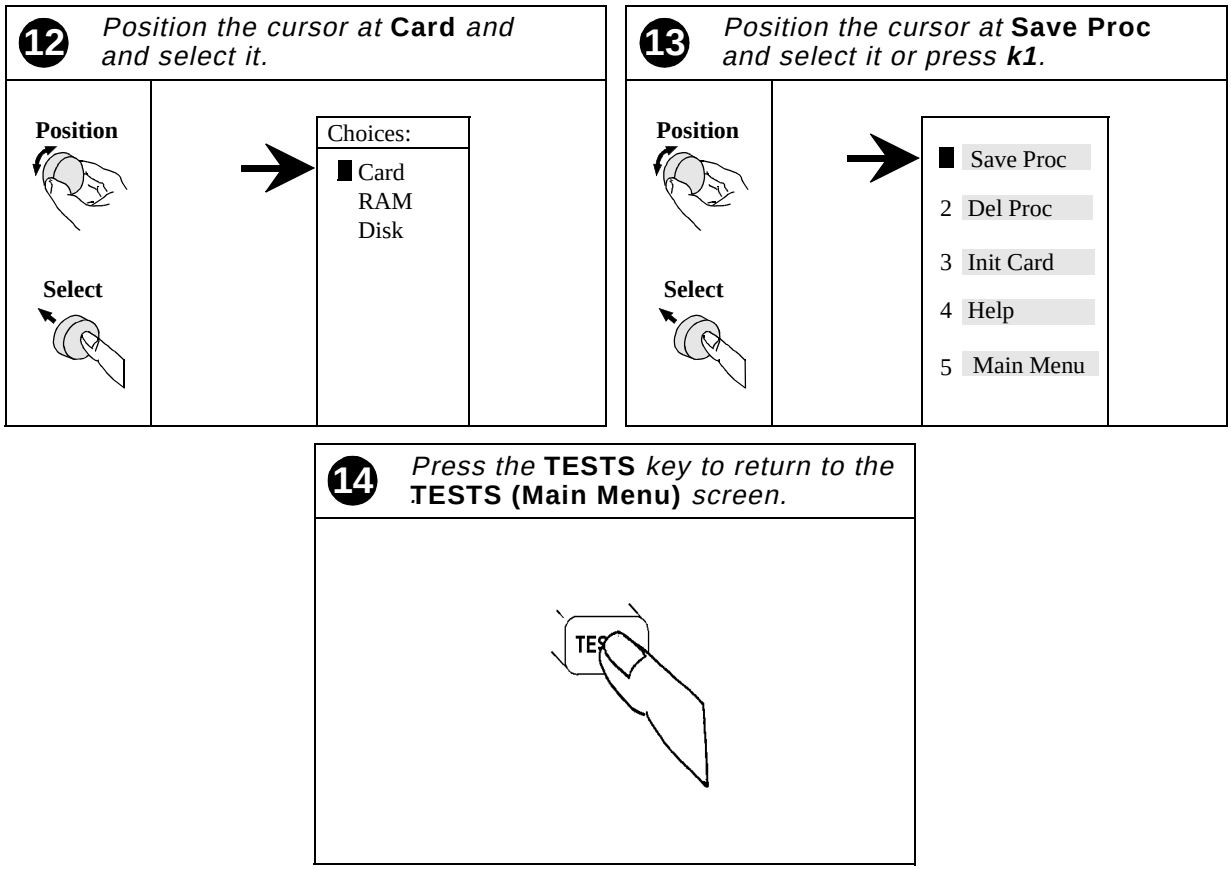
Figure 6-14 How to Save a Test Procedure



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

1) Insert the memory card with your saved procedure.

2) On the TESTS (Main Menu) screen, a) position cursor at Select Procedure Location: then select Card, b) select Select Procedure Filename:, then select your saved file name.
3) Remove your memory card then insert the original Software ROM card[1].
4) Select **Run Test** *(***k1***).*

[1]The original Software card contains the full program needed to run your procedure. The procedure cannot run without using the original IBASIC program code on the factory card.

Connecting to External Devices

The Test Set and Software offer the ability to connect to external devices such as a PC, printer, or memory card for data collection.

To find out more on this subject see:

- Data Collection
  - — See "Data Collection to a PC (Not Using the BTS Laptop Utilities)" on page 124.
  - — See "Configuring Data Collection to a memory card" on page 130.
  - — See "Transferring Data to a Printer via the Serial Port:" on page 131.
  - — See "Transferring Data to a PC via the Serial Port:" on page 132.
  - — See “Data Collection to a Printer” on page 134.

Data Collection

Sometimes it is preferable to record the test results for future reference or evaluation. The HP Software provides the capability to save test results to a memory card installed in the Test Set's front-panel card slot or to an external device such as a printer or PC.

The data collection feature stays "on" once you have performed the steps in "Data Collection to a PC (Not Using the BTS Laptop Utilities)" on page 124 or "Configuring Data Collection to a memory card" on page 130.

NOTE BTS Laptop Utilities and Data Collection

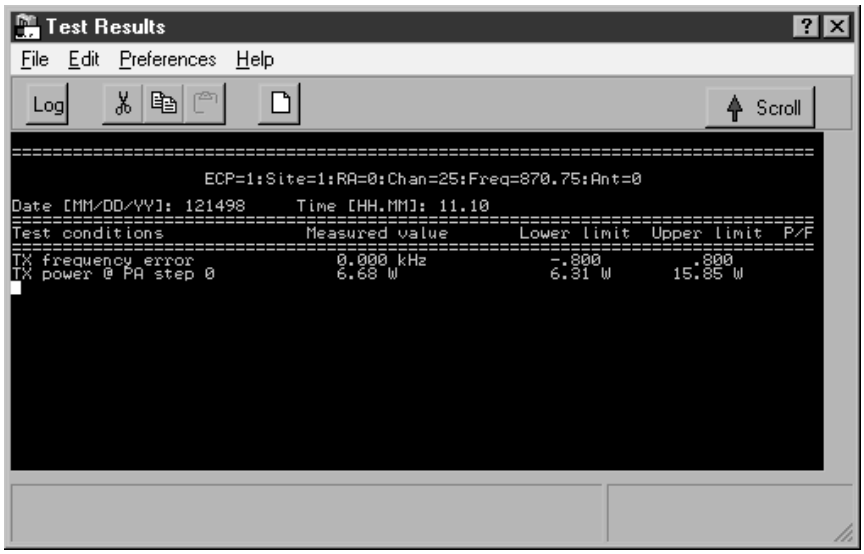
If you enable the use of the BTS Laptop Utilities on the Printer/Serial Port Configuration Menu, data collection and printing from the Test Set are disabled. To collect test data, use the Test Results window logging feature in the laptop utilities. To print the collected data, connect a serial printer to your PC, open the data file in a text editor, and then send the text to the printer.

Data Collection Using the BTS Laptop Utilities

The BTS Laptop Utilities shipped with the Software contains a Test Results window for displaying and logging (saving) test results (see Figure 6-15). After enabling data collection using the BTS Laptop Utilities and configuring the serial ports of the laptop and Test Set to the same values, test result data is automatically sent to the laptop and displayed in the Test Results window. By selecting File, Logging Enabled, you can enter a file name to save the test results to a file that can be retrieved into a text editor and printed out.

For information on installing the BTS Laptop Utility software and configuring your laptop PC and Test Set to work together, see "BTS Laptop Utility" on page 28.

Figure 6-15 Capturing Test Results Using the BTS Laptop Utility



Data Collection to a PC (Not Using the BTS Laptop Utilities)

Test results can be output directly to a PC communications program through serial port 9 on the Test Set. A variety of devices can receive the data. An HP Palmtop computer, PC, laptop, or terminal can be used. A terminal emulator can write the test results directly to a file. Examples of terminal emulator programs are Microsoft®[1] Windows®[2] HyperTerminal©[3], or ProComm.[4]

To collect data to a PC you must meet the requirements listed below.

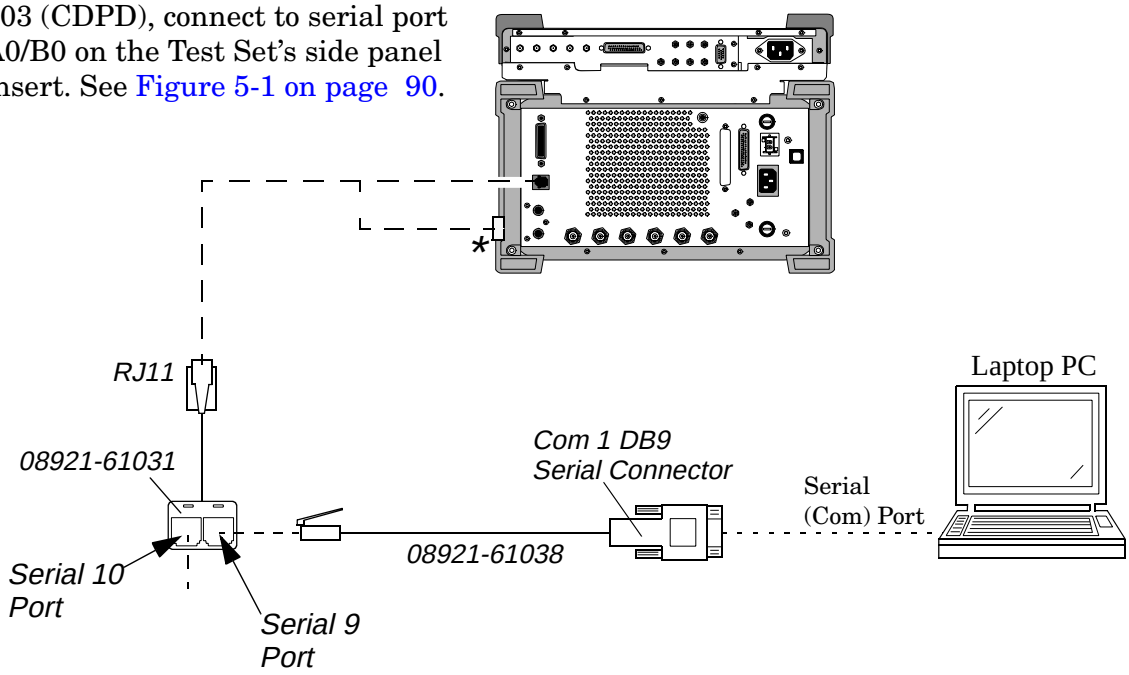
- Test Set's serial port 9 connected to a PC.
- Configured terminal program running on a PC.
- Data Collection to serial port 9 activated in the Software.
- Test Set's Serial port 9 communications parameters configured to match communications parameters of the PC.

1. Microsoft is a U.S. registered trademark of Microsoft Corp.
2. Windows is a U.S. registered trademark of Microsoft Corp.
3. Copyright Hilgraeve, Inc. USA
4. Procomm is a product of DataStorm Technologies, Inc.

Test Set Connection to a PC

Figure 6-16 Serial Connections for the HP 8921 and PC

*If your HP 83204A has Option 003 (CDPD), connect to serial port A0/B0 on the Test Set's side panel insert. See Figure 5-1 on page 90.



Turning on Data Collection to a PC

To collect the test results to a PC, you will need to turn on data collection within the Software. To activate data collection, follow these steps:

Step 1. Press the Test Set's **TESTS** key. The TESTS (Main Menu) is displayed.

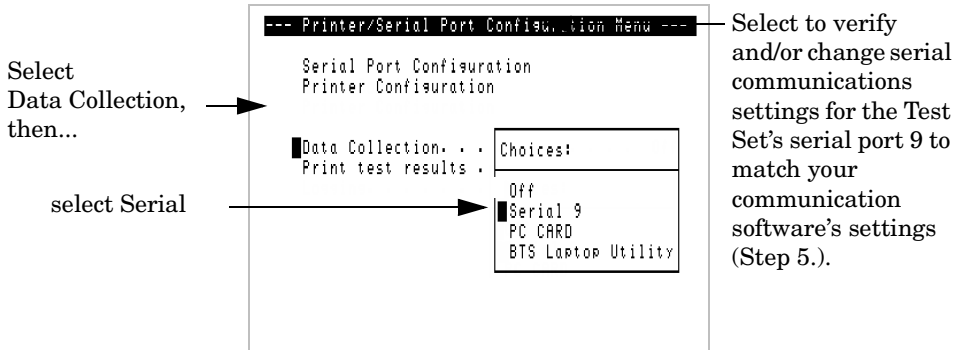
Step 2. Press **k1** (**Run Test**) to start the Software.

The Software's Main Menu is displayed. If the Software is not loaded in the Test Set, see "How to LOAD TEST PROCEDURE" on page 107 for details.

Step 3. Select the **Printer/Serial Port Configuration** field. The Printer/Serial Port Configuration screen is displayed.

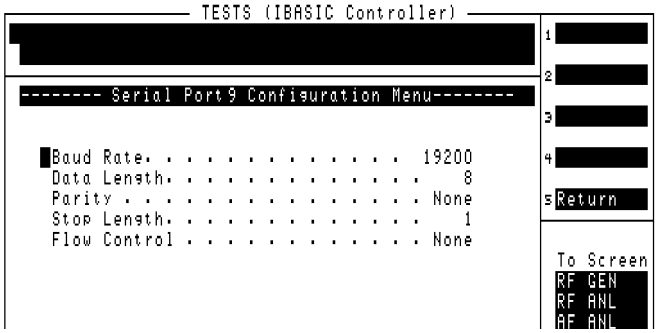
Step 4. Select **Data Collection**, then select **Serial** from the **Choices:** displayed.

Figure 6-17 Data Collection to a PC



Step 5. Scroll to and select **`Serial Port Configuration`**. (See Figure 6-17.)

Figure 6-18 Setting Serial Port 9 to Work With Your Terminal Program



The above settings should work well in most cases. Set your terminal program communication settings to match these settings.

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 name in which to save the data. The Test Set will not issue an error message if the PC's communications application is not running or configured properly.

The Test Set will now record your test results to a PC until you turn off data collection.

Configuring a PC Terminal Program

Data collection to a PC requires a terminal emulator be configured and running while data collection is enabled.

Figure 6-19 and Figure 6-20 detail the steps to configure Microsoft®[1] Windows®[2] HyperTerminal©[3] for data collection.

1. Microsoft is a U.S. registered trademark of Microsoft Corp.
2. Windows is a U.S. registered trademark of Microsoft Corp.
3. Copyright Hilgraeve, Inc. USA

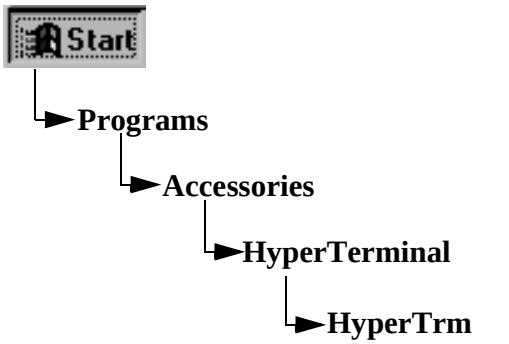
NOTE

The following instructions apply to both Windows 95 and Windows NT. However, different versions of Windows may implement the HyperTerminal program differently.

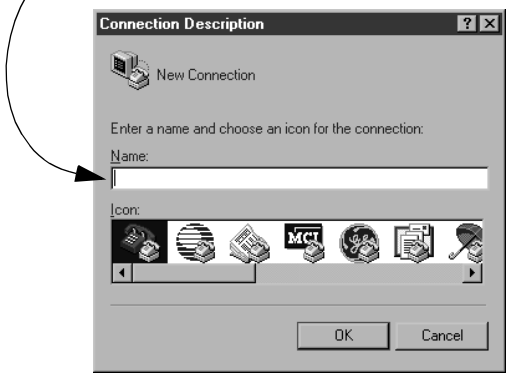
For example, the Windows 95 version may ask you to enter a phone number to dial. If this happens enter any phone number (to satisfy the software) but do not select to dial it.

Figure 6-19 Configuring the HyperTerminal Program for Data Collection

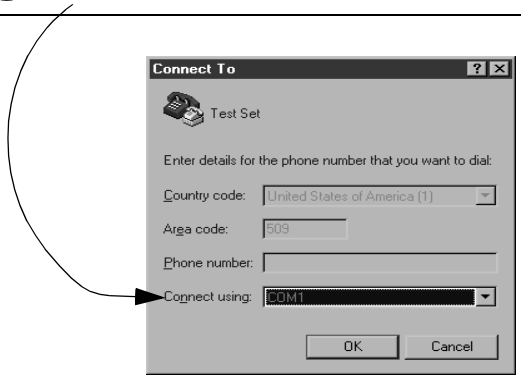
1 Start the HyperTerminal program in Windows 95 (or Windows NT).



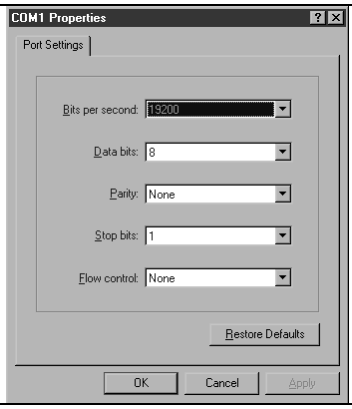
2 Enter a name for the terminal setup to use to capture test results.



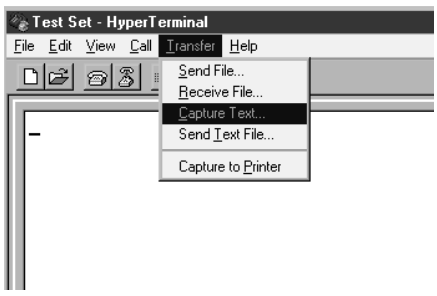
3 Select the serial port the PC will use to communicate with the Test Set.



4 Set the terminal COM port settings to match the Test Set's port 9 set-



5 Select **`Transfer`**, then select **`Capture Text...`**



6 Enter a filename to use to save the test results to.

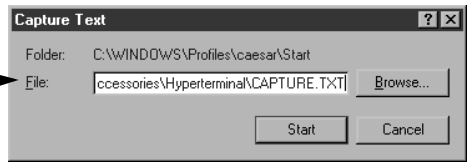


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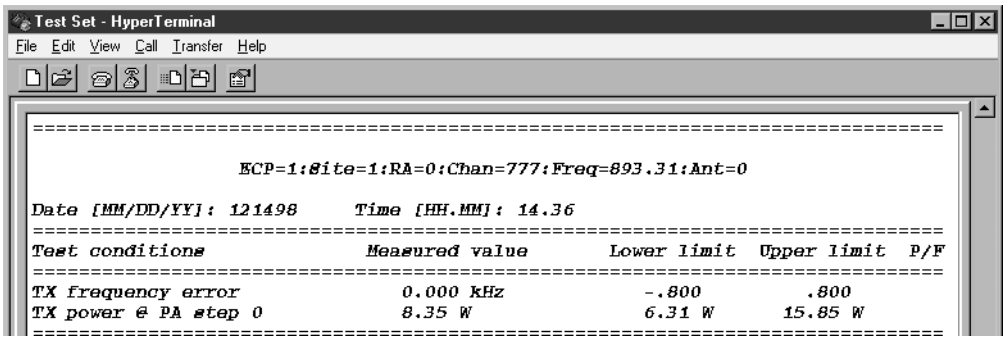
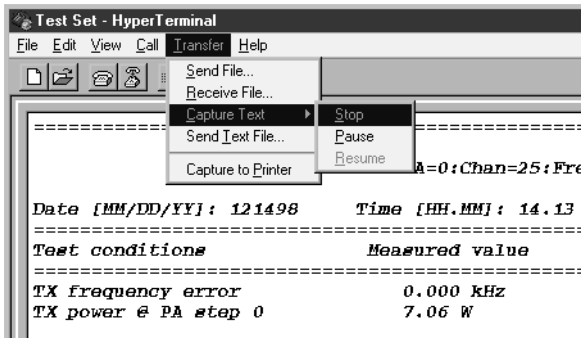
Figure 6-20 Configuring the HyperTerminal Program for Data Collection (continued)

7 Start testing your radio. The test results appear in the terminal window



8 If you want to temporarily stop collecting test results, select **Transfer**, **Capture Text**, **Pause.** Select **Transfer**, **Capture Text**, **Resume** to continue collecting test data.

When you have captured the desired test results, select **Transfer**, **Capture Text**, **Stop** to stop collecting test results.



Using HyperTerminal for data collection in the future

The next time you want to collect test results, select the HyperTerminal setup you saved when first asked to supply a name. The serial communication settings you defined are saved under that name, so you don't have to go through the process of re-defining the settings each time you want to save test results.

Configuring Data Collection to a memory card

To collect the test results to a memory card, you need to turn on data collection within the Software. The Test Set automatically creates data collection files on the memory card based on the name you enter at the start of testing. The Software appends _d to your file name so that the files are easily recognized on the memory card.

Once you have finished with your testing and have the test results in files on the memory card, follow the steps in "Retrieving Data from a memory card" on page 131 to transfer the data to a PC or printer.

To activate data collection to a memory card, follow these steps:

Step 1. Press the Test Set's **TESTS** key. The TESTS (Main Menu) is displayed.

Step 2. Scroll to and select **k1**(**Run Test**) or press the USER key to start the Software.

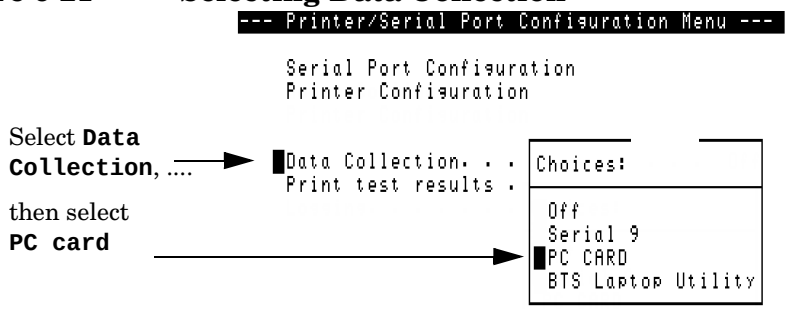
The Software's Main Menu is displayed. If the Software is not loaded in the Test Set, see "How to LOAD TEST PROCEDURE" on page 107 for details.

Step 3. Scroll to and select the **Printer/Serial Port Configuration**. The Printer/Serial Port Configuration menu is displayed.

Step 4. Insert a RAM memory card into the front-panel card slot. If the card is uninitialized see "Initializing a memory card" on page 137

Step 5. Scroll to and select **Data Collection,** then select **PC card** from the **Choices:** displayed.

Figure 6-21 Selecting Data Collection



Step 6. The Test Set will display a message asking for a data collection file name. Use the cursor and character menu to enter a file name then select **Done**.

The Test Set will now record your test results to a memory card until you turn off data collection.

Retrieving Data from a memory card

A Software utility (FILE_XFER) is used to transfer data files from the memory card to a serial printer, an HP-IB printer, or a PC via the serial port.

NOTE Loading and running the Software utility will replace any Software in the memory space of the Test Set. This means that you will have to reload the test Software when you are done with file transfer.

Transferring Data to a Printer via the Serial Port:

Step 1. Check to make sure your serial printer is turned on and connected to serial port 9 on the Test Set. (See "Data Collection to a Printer" on page 134.)

Step 2. Press the **TESTS** key.

Step 3. Position the cursor at **Selected Procedure Location:** and select it.

Step 4. In the **Choices:** menu, scroll to **ROM** and press the knob. This allows the loading of various utility programs resident in the Test Set.

Step 5. Position the cursor at **Select Procedure Filename:** and select it. A list of procedures is displayed.

Step 6. Select **FILE_XFER**.

Step 7. Press k**1** (**Run Test**).

Step 8. You will be prompted to insert the memory card containing the data collection files. Insert your card and press the knob to (**Continue**).

Step 9. The file transfer menu will be shown. Position the cursor at **Output Port** and push the knob until it shows **Serial Port, 9600 baud**. This configures the Software to send the data out serial port 9.

Step 10. Scroll down the list of file names to the file you want to transfer and press the knob. An asterisk (*) will appear after the name. You can send more than one file at a time. Scroll to any other files you would like to transfer and press the knob.

NOTE All files on the memory card are displayed, not just the data collection files. If you attempt to transfer files that are not data collection data, unexpected results at the printer can occur. Also, transferring code files can result in many pages of code being printed. Look for files with _d appended to the name, indicating they are true data collection files.

Step 11. When all files to be transferred have been selected, scroll to **Start Transfer** and press the knob. The data will be sent out the serial port to the printer.

Step 12. When finished printing, you can select other files and transfer them, or exit the Software utility by scrolling to **`Exit Data-Collection-File-Transfer`** and pressing the knob.

Step 13. To use the Software again, rerun it by following the steps in "How to LOAD TEST PROCEDURE" on page 107.

Transferring Data to a PC via the Serial Port:

Step 1. If the Software is running, stop the Software by pressing SHIFT, then press CANCEL.

Step 2. Connect the Test Set's serial port 9 to your PC. (See "Serial Connections for the HP 8921 and PC" on page 125.)

Step 3. Load a PC Software utility for communicating on the PC's serial port, such as Microsoft Windows HyperTerminal. (See "Configuring a PC Terminal Program" on page 126.)

Step 4. Configure the PC software to prepare the PC to receive a text file via the serial port.

Step 5. Press the **`TESTS`** key to access the TESTS (Main Menu).

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

Step 7. In the **`Choices:`** menu, position the cursor at **`ROM`** and select it. This allows the loading of various utility programs resident in the Test Set.

Step 8. Position the cursor at **`Select Procedure Filename:`** and select it. A list of utility procedures is displayed.

Step 9. Select **`FILE_XFER`**.

Step 10. Press **`k1`** (**`Run Test`**)

Step 11. You will be prompted to insert the memory card that contains the data collection files. Insert your card and select **`Continue`**.

Step 12. The file transfer menu will be shown. Position the cursor at **`Output Port`** and press the knob until it shows **`Serial Port, 9600 baud`**. This configures the Software to send the data out serial port 9.

Step 13. Next, scroll down the list of file names to the file you want to transfer and press the knob. An asterisk (*) will appear next to the name. You can send more than one file at a time. Scroll to any other files you would like to transfer and press the knob.

NOTE All files on the memory card are displayed, not just the data collection files. If you attempt to transfer files that are not data collection data, unexpected results at the printer can occur. Also, transferring code files can result in many pages of code being printed. Look for files with an _d appended to the name, indicating that they are true data collection files.

Step 14. When all files to be transferred have been selected, scroll to **`Start Transfer`** and press the knob. The data will be sent to the serial port.

Step 15. When finished sending data to the PC, you can select other files and transfer them, or exit the software utility by scrolling to **`Exit Data-Collection-File-Transfer`** and pressing the knob.

Step 16. To use the Software again, re-run it by following the steps in "How to LOAD TEST PROCEDURE" on page 107.

Turning Data Collection Off

To turn data collection off, follow these steps:

Step 1. Press the Test Set's **`TESTS`** key. The TESTS (Main Menu) is displayed.

Step 2. Press **`k1`** (**`Run Test`**) to start the Software. The Main Menu is displayed.

Step 3. Select the **`Printer/Serial Port Configuration`** field. The Printer/Serial Port Configuration menu is displayed.

Step 4. Select the **`Data Collection`** field, then select **`Off`** from the **`Choices:`** displayed.

Data collection is now off.

Data Collection to a Printer

Test results can be output directly to a printer connected to either the Test Set's serial port 9, parallel port, or the HP-IB port.

Turning on Data Collection to a Printer.

To collect the test results to a printer, you will need to turn on test result printing in the software.

Step 1. Press the Test Set's **TESTS** key. The TESTS (Main Menu) is displayed.

Step 2. Select **k1** (**Run Test**) to start the Software.

The software's Main Menu is displayed. If the Software is not loaded in the Test Set, see "How to LOAD TEST PROCEDURE" on page 107 for details.

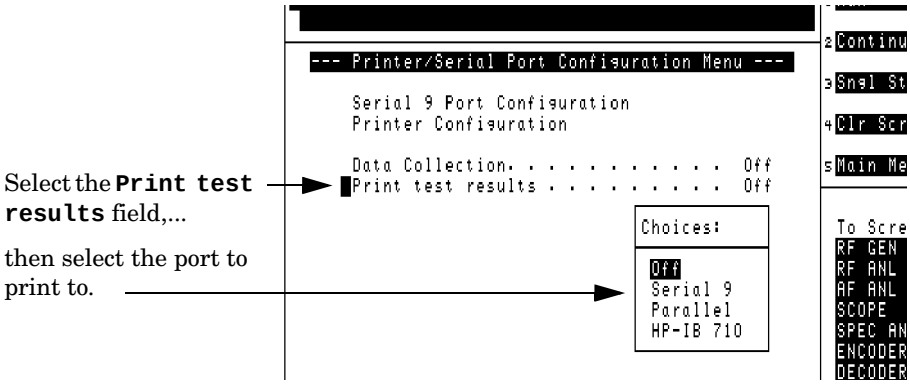
Step 3. Select the **Printer/Serial Port Configuration** field. The Printer/Serial Port Configuration menu is displayed.

Step 4. Select the **Print test results** field.

NOTE

If the **Print test results** is not displayed, it is because the **Data Collection** field is set to **BTS Laptop Utility**. Either change the **Data Collection** field setting or use the BTS Laptop Utility to collect test data and print the results from your laptop PC using a text editor program.

Figure 6-22 Data Collection to a Printer



Step 5. Select the port to print to from the **Choices:** displayed.

Step 6. Scroll to and select the **`Printer Configuration`** field. Set the following parameters:

- Lines/page
- Form Feed
- Printer Selection (model)
- HP-IB Print Address (for HP-IB printers only)
- Output Headings

Step 7. Connect the printer to the appropriate connector on the Test Set's side panel.

The Test Set will now send test results to the printer connected to the port you selected until you set the **`Print test results`** field to **`Off`**.

Figure 6-23 Serial Printer Connections

*If your HP 83204A has Option 003 (CDPD), connect to serial port A0/B0 on the Test Set's side panel insert. See Figure 5-1 on page 90.

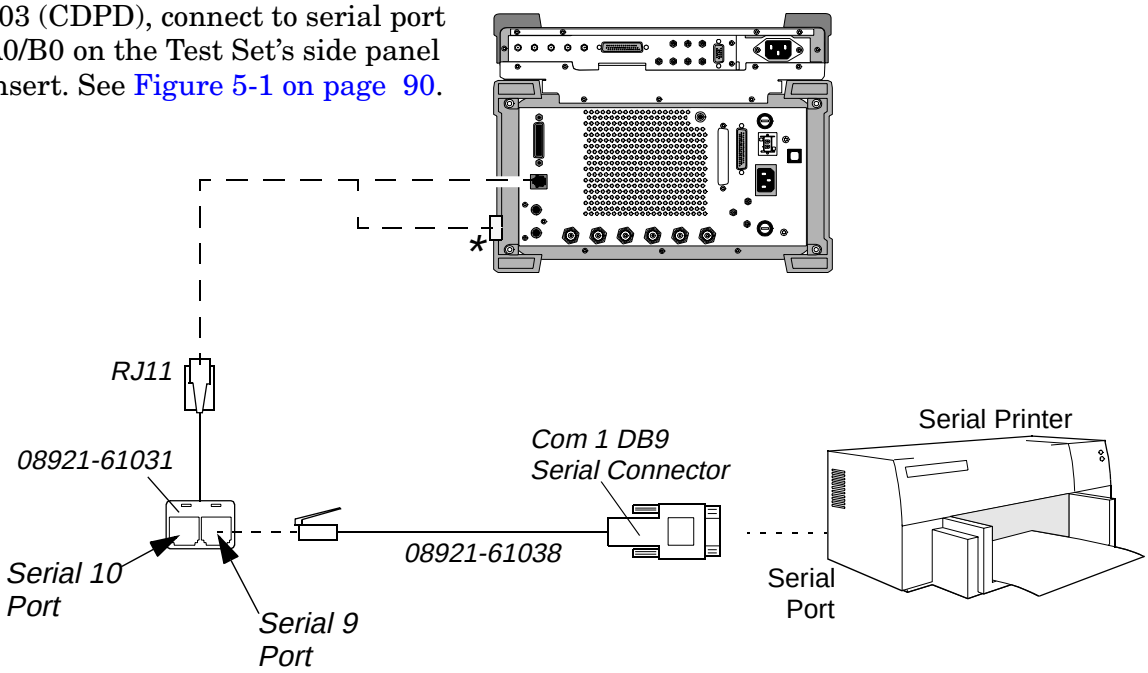


Figure 6-24 Parallel Printer Connections

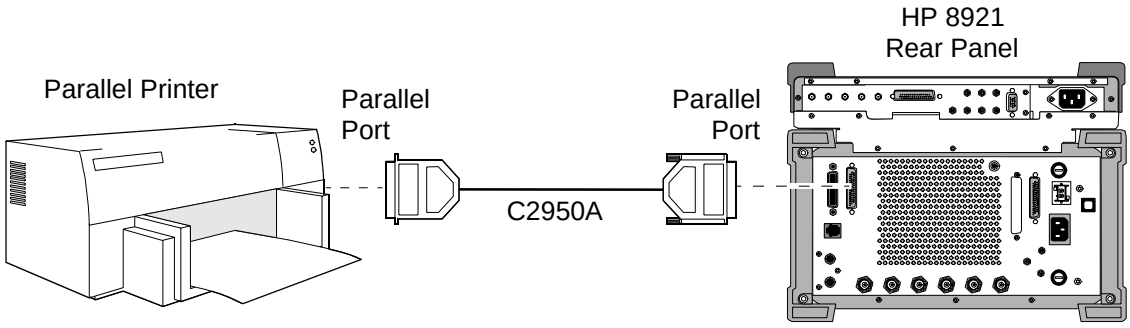
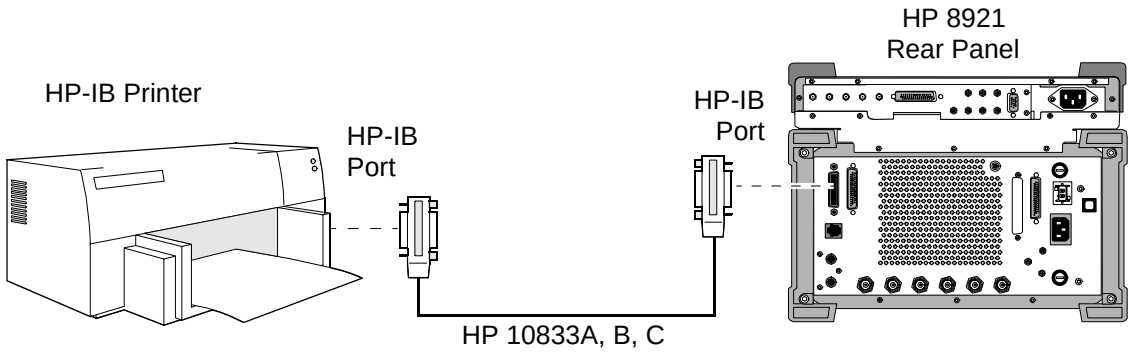


Figure 6-25 HP-IB Printer Connections



Turning Data Collection to a Printer Off

To turn data collection off, follow these steps:

Step 1. Press the Test Set's **TESTS** key. The TESTS (Main Menu) is displayed.

Step 2. Select **k1** (**Run Test**) to start the Software. The Main Menu is displayed.

Step 3. Select the **Printer/Serial Port Configuration** field, the Printer/Serial Port Configuration menu is displayed.

Step 4. Select the **Print test results** field, then select **Off** from the **Choices:** displayed.

Data collection has now been turned off.

Using a memory card

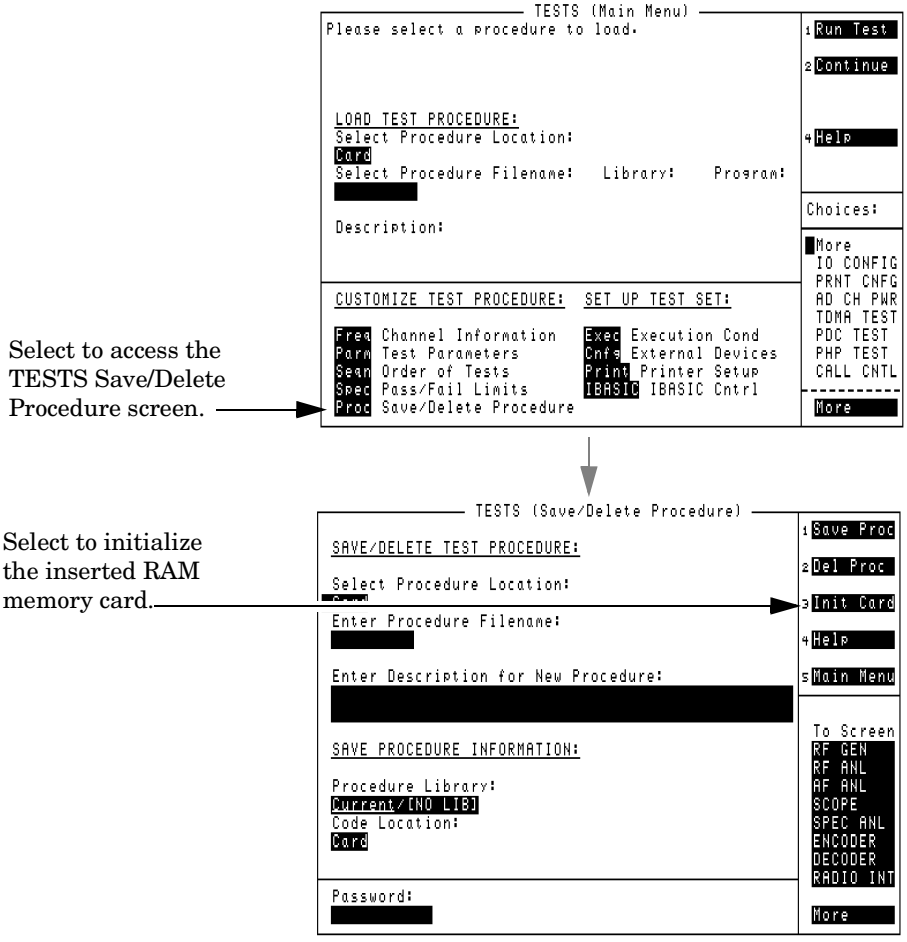
Initializing a memory card

When a card is new, or the battery has been removed when the card is not inserted into the Test Set, then the card must be initialized to store data. Re-initializing a card erases any data previously saved to the card. To initialize a memory card follow these steps:

Step 1. Insert the RAM memory card into the MEMORY CARD slot

Step 2. If a software package is running, press **SHIFT** then **CANCEL** to stop program operation. Press **TESTS**.

Step 3. Select **`Proc Save/Delete Procedure`**.



Step 4. Press **k3**(**`Init Card`**), then press the **ON/OFF** key to initialize the card. It takes about 5 seconds to initialize the card.

Troubleshooting memory card Usage

Each of the messages listed below is followed by an explanation of the probable cause.

`Directory Overflow.`

- The memory card is probably full and cannot store new files. You may have to delete some files on the card to free up memory space or use a new memory card.

`Medium uninitialized. Do you want to initialize?`

- This is a card which has either not been initialized or has other information stored on it. Initializing overwrites any data which may already be on the card. Press the **On/Off** key to initialize the installed card.

`Write protected.`

- This card has been write protected (the switch in the WP position). Slide the write protect switch into the other position before writing.

`Medium changed or not in drive. No information was loaded.`

- This card has possibly not been inserted properly. Re-insert and try again.

`File name is undefined. No information was loaded.`

- There may be no information (files) stored on the card.
- You may not have the correct card in the memory card slot. Try again with a different card.

7 Troubleshooting

Use this chapter if you have encountered Software or measurement errors or if you are questioning measurement results.

Error Summary

Overview

This chapter lists errors that might be encountered when loading or running the Software. The errors are listed roughly in the order that you might encounter them when getting started using the Software:

Help for Communications Errors:

The following sections have checks and tools that can be used to troubleshoot communication errors between the Test System and the MSC:

Errors When Loading and Running the Software

This group of errors would most often be encountered before you get to the Software's Main Menu. They would be most likely to appear the first time you load and run the Software, as outlined in "Installation" on page 17. The errors are presented with the error text, followed by a description of the cause, followed by some possible solutions.

❑ Symptom: Memory Overflow Errors

The random access memory (RAM) space of the Test Set is shared by IBASIC programs and save/recall registers. If you have saved a large number of registers in your Test Set, you may encounter a memory overflow error when you first attempt to load the Software.

To correct this, you will need to clear up some RAM space by deleting some or all of your saved registers. You can do this selectively (one register at a time) or you can clear globally (all storage registers at once).

NOTE Clearing the registers, whether selectively or globally, is *permanent*. *You cannot retrieve the registers once they are deleted*. You have an option to save registers to a RAM memory card, as well. Consult the *HP 8921A Reference Guide* for instructions on this procedure.

To delete a single register:

Step 1. Press the **Recall** key.

Step 2. Scroll the cursor to the register to be deleted.

Step 3. Press the **Yes On/Off** key to indicate you want to clear the register.

Step 4. Press the **Yes On/Off** key again to confirm.

Step 5. The register is cleared.

To delete *all* saved registers:

Step 1. Press the **Recall** key.

Step 2. Scroll to **`*Clr All*`** and press the knob.

Step 3. Press the **Yes On/Off** key to confirm.

Step 4. All save registers are now cleared.

Communications Errors

Errors When First Setting Up or Connecting to MSC

- Message: Base station did not answer command: <command name> with a response of: <command response> in three tries. Use the BTS Laptop Utility to correct problem and to return all configured BBAs back to active status. Press 'Abort' to return to main menu.

  This message indicates that basic communication with the MSC is taking place, but that the control commands to set the site up for service are not being responded to. Refer to "Troubleshooting Checks for Communications Problems" on page 143 for a list of items to check when you have received this error.

- Message: Improper communication with MSC. Use the BTS Laptop Utility to correct problem and to return all configured BBAs back to active status. Press 'Abort' to return to main menu.

  If commands are misunderstood at the MSC end, this error message can occur. Use the BTS Laptop Utility to send commands and monitor the response in the Switch window.

- The unit-under-test is unavailable. Use the BTS Laptop Utility to correct problem and to return all configured BBAs back to active status. Press 'Abort' to return to main menu.

  If the MSC is unable to free up the requested BBA at the site, it will send a message indicating that the equipment is unavailable. You may have to try testing that BBA at a later time or contact switch personnel for assistance.

Communications Errors During Testing

Message: Lost the modem carrier. Use the BTS Laptop Utility to correct problem and to return all configured BBAs back to active status. Press 'Abort' to return to the main menu.

This error indicates that communication with the MSC was taking place, but the link was lost sometime during the testing process.

As indicated in the message, you can go to the BTS Laptop Utility Switch Window to try to re-establish the link with the MSC.

Also check the items in "Troubleshooting Checks for Communications Problems" for possible causes of interruptions to the communication between the Test System and the MSC.

Troubleshooting Checks for Communications Problems

The following list provides items to check when you are having communication difficulties using the external modem to connect to the MSC.

- ❏ Cable connections between the Test System, laptop, and phone line:

  Make sure that you have made the proper connections between the Test Set's serial port, the PC, and the phone line. See the connection diagram in Figure 5-3 on page 92.

  A list of cables and their part numbers is provided in Table 5-1 on page 93.

- ❏ Dialing difficulties:

  In some cases, you may have to customize the dialing information in order to properly dial and connect to the MSC. For example, if you have a 9 in your dialing sequence to get an outside phone line there may be a short delay before the dial tone is heard. Therefore, you may need a delay after the 9 before the rest of the digits in the sequence are sent. This can be done directly in the BTS Laptop Utility Switch Window. See help on the topic Dial in BTS Laptop Utility.

- ❏ MSC is not configured to send responses to commands:

  After sending a control command to the MSC, the Software looks for response commands from the MSC before going on. It may be that the MSC you are communicating with has been configured to not send responses to remote computers. You may need to check with a switch technician to see if this is the case for the MSC that you use.

Troubleshooting Tools for Communications Problems

The following tools can be used to troubleshoot communications problems between the Test System and the MSC:

- ❏ Logging Data Communications:

  The Software provides a logging feature that prints the commands between the Test Set and the MSC. This allows you to view the outgoing commands and the MSC's responses (if any).

  If no responses are being received, you may need to verify with a switch technician that the MSC is set to send responses to a remote computer. See "Communications with the MSC" on page 28.

Errors While Attempting Measurements

The following error messages can be posted once a test mode has begun making CDMA measurements:

- Code domain power test failed. Use the BTS Laptop Utility to correct the problem and to return all configured BBAs back to active status. Press 'Abort' to return to main menu.

  If the Test System is unable to correlate the code domain power measurements, this error will result. Check the following items and re-run the test:

  - Entry for **`Channel Number`** in the Base Station Configuration Menu—this could be a problem *if you are not using a modem to control the base station via the MSC*. If you enter the wrong channel number, the Test Set will be tuned to the wrong frequency. You can use the spectrum analyzer mode to verify the presence of a signal.
  - Entry for **`PN Offset`** in the Base Station Configuration Menu—if you have entered an incorrect value for PN offset, the Test Set will not be able to correlate CDMA measurements. You may use the PN Offset Search test from the Main Menu to find the valid PN offset value (see "PN Offset Search" on page 76).
  - Even-second clock connection—check your connection from the source of the even-second clock (at the base station). You may have to set the TST CLK switch to the ON position to enable the clock signal. The even-second clock signal should be connected from the base station to the EVEN SECOND SYNC IN port on the Test Set.
  - Timebase reference clock connection—check your connection from the source of the timebase reference signal (typically 19.6608 MHz) at the base station. You may have to set the TST CLK switch to ON to enable the reference signal. The timebase reference should be connected to the REF IN port on the Test Set (there are alternative connections; see "Connections" on page 89). If a valid clock signal is present during testing, the front-panel Unlock LED on the Test Set will be off.
  - Transmitter turned on at time of testing—if you are using a modem connected to the MSC for base station control, the Test Set will turn on the transmitter when needed for testing. You may verify that the transmitter is on by checking the green ACT LEDs on the front of the ACU and BCR modules. If you are *not* using the modem, you will have to enable the transmitter yourself as prompted by the Software.

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